Algorîthmic Anxiety in Contemporary Art

A KIERKEGAARDIAN INQUIRY INTO THE IMAGINARY OF POSSIBILITY

—

Algorithmische angst in hedendaagse kunst

Een Kierkegaardiaans onderzoek naar de verbeelding van mogelijkheid

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus

Prof.dr. R.C.M.E. Engels

en volgens besluit van het College voor Promoties.
De openbare verdediging zal plaatsvinden op

donderdag 11 juni 2020 om 13:30 uur

door

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geboren te Amstelveen

Erasmus University Rotterdam

She wasn't brought up in the woods to be scared by owls

Voor mijn zus

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to Boukje, Marjanne, Ammelie, Frank, and Marcel, for sharing their wisdom and for helping me swim upstream in the muddiest of waters. For their love, friendship, warmth, and support: Maartje, Marie, Moosje, Narges, Lex, Thijs, Sanja, Erika, Sam, Nastaran, Maryn, Bas, James, Marijke, Cesare, Merel, Sanne, Alia, Rebekka, Nina, Mila, Melle, Andrea, and Lynn. For being my dearly beloved cheerleaders: Shailoh, Loes, Laura, Josje, Janna, Donny, Rieke, Ludivine, Laurie, Rosanne, Tamara, and Joram. For keeping me laughing a good deal: Clemens, Daniel, and Elise. I am so fortunate with all of you in my life. My gratitude extends to Sibbe, Toru and Ack-Tjal for reminding me of the existence of different temporalities and of the importance of the larger ethics of things.

    I want to give a shout-out to my sister, a giant in empathy, in generosity, in strength, in encouragement, in optimism, and in sisterhood, and to my mom for her unconditional love, her calm endurance, and for being right by my side, always. I am blessed with you.

SIGLA USED FOR KIERKEGAARD'S WRITINGS

CA   *The Concept of Anxiety. A Simple Psychologically Oriented Deliberation in View of The Dogmatic Problem of Hereditary Sin*. (A. Hannay, Trans. & Ed.). New York, NY: Liveright Publishing Company, 2014.

CI   *The Concept of Irony With Continual Reference to Socrates*. (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1989.

CUP   *Concluding Unscientific Postscript to* Philosophical Fragments. *Volume 1*. (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1992.

E/O   *Either/Or. A Fragment of Life*. (A. Hannay, Trans. & Eremita, V. Ed.). New York: Penguin Books, 2004.

FT   *Fear and Trembling.* (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1983.

PA   *The Present Age. On the Death of Rebellion*. (A. Dru, Trans.). New York & London: Harper Perennial, 2010.

PF   *Philosophical Fragments*. (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1985.

Rep. *Repetition.* (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1983.

SUD   *The Sickness unto Death. A Christian Psychological Exposition for Upbuilding and Awakening*. (Hong H.V. & Hong, E.H., Trans & Eds.). Princeton, NJ: Princeton University Press, 1983.

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Introduction:
From Algorithms
to Algorithmic Culture

FOR A LONG TIME, ARTISTIC ENGAGEMENT WITH ALGORITHMS WAS MARGIN-
AL IN CONTEMPORARY ART. Over the past eight years, however, a grow-
ing number of artists and critical practitioners have become engaged
with algorithms, resulting in algorithmic theatre, bot art, and algorith-
mic media and performance art of various kinds, which thematise the
dissemination and deployment of algorithms in everyday life. The nu-
merous art exhibitions that have been curated over the past years in
art institutions, at festivals, in galleries and at conferences—both large
and small—in Europe, the Americas, Canada, and in China, reflect this
rising prominence of algorithmic art. These exhibitions aim at imag-
ining, representing and narrativising aspects of what is called algorith-
mic culture: for instance, in exhibitions that address the modulation
of behaviour and algorithmic governance; shows on algorithmic cap-
italism and data surveillance; shows on self-quantification; as well as
shows on information technology and cybernetic culture and human
and machine relations in general. Indeed, one might say, in the spirit
of Langdon Winner, that 'algorithm' is a word whose time has come. If
theorists of media and technology are to be believed, we live in an 'algo-
rithmic culture' (Galloway 2006; Striphas 2015; Dourish 2016).

Algorithms sort, search, recommend, filter, recognise, prioritise,
predict and decide on matters in a range of fields. They are embedded in
high-frequency trading in the financial markets and in predicting crime
rates through data profiling, for instance. They are deployed to analyse
traffic, to detect autoimmune diseases, to recognise faces, and to detect
copyright infringements. Mundane aspects of our lives, such as work,
travel, play, consumption, dating, friendships, and shopping are also, in
part, delegated to algorithms; they've come to play a role in the produc-
tion of knowledge, in security systems, in the partners we choose, the
news and information we receive (or not), the politicians we vote for,

the jobs we get (or not). They also help automate routine jobs, and they are used in drone warfare, education evaluations, social services, and in numerous other fields1. A time of ubiquitous algorithmic computing is "firmly established," writes Rob Kitchin (2016, p. 14).

Ted Striphas describes this developing algorithmic culture as a "shift" which first began 30 years ago, as humans increasingly started to delegate "the work of culture – the sorting, classifying and hierarchising of people, places, objects and ideas – to computational processes" (Striphas 2015, p. 395). Aspects of everyday life are increasingly delegated to algorithms and accompanied by an algorithmic type of rationality (e.g. Halpern 2014). "The algorithmic", Paul Dourish observes, has become incorporated into broader and ongoing conversations about how our lives are shaped and organised (Dourish, 2016, p.1). Algorithms are part of mechanisms that privilege quantification, proceduralisation and automation in human endeavours, Tarleton Gillespie argues (2016, p. 27). Further, Taina Bucher (2018) contends that as everyday life increasingly takes place in and through an algorithmic media landscape, algorithms co-produce social life and political practices. "In ranking, classifying, sorting, predicting, and processing data, algorithms are political in that they help to make the world appear in certain ways rather than others" (Bucher, 2018, p. 3). They do so, to an extent, in ways that are invisible to the human eye—an effect of, amongst other things, proprietary laws and regulations, computational scale, speed and complexity. This is why Gillespie (2012) argues algorithms remain outside human grasp, that there is something "impenetrable" about their performance (p. 26). Their pervasiveness, the claim that algorithms shape our socio-technical world, the alleged "merging of algorithms into the everyday," and

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1 –   E.g. Beer 2009; Lenglet 2011; Gillespie 2016; Kitchin 2016; Diakopoulos 2013; Cheney-Lippold 2017; O'Neil 2016.

the notion that they are "taking decisions out of the hands of human actors" are all taken to be indicative of the ways algorithms have become a critical infrastructural element of contemporary life (Beer, 2017, p. 5). Like infrastructure, algorithms have become a key site and gatekeepers of power and power relations (e.g. Bucher 2018; Cheney-Lippold 2017; O'Neil 2016). Altogether, this has made for an intriguing art object—invisible yet omnipresent, proprietary yet pervasive, and with assumed socio-political powers that co-produce our lives.

The claim that algorithms shape, organise and co-produce everyday life, in ways that vary from the seemingly-quotidian to the heavily-politicised, has also given impetus to anxieties about the present and future of algorithmic culture in light of these developments. It seems "the algorithmic" and "algorithmic culture" have become shorthands for a nexus of concerns about the entanglement of the social and the algorithmic. Having visited numerous exhibitions thematising algorithmic culture, what I have found striking is the high volume of artistic engagements with facial recognition algorithms, trading algorithms and search engine algorithms. It seems these types of algorithms have garnered more artistic responses than other types of algorithms. What is more, a limited number of artworks that engage explicitly with these three types of algorithms have been circulating widely; they have been included again and again and again in a wide range of thematised group exhibitions on different aspects of algorithmic culture throughout Europe, Canada, and the Americas. Some of the artists of these works received a great deal of attention in the international press and have given numerous lectures at international art and digital culture conferences, festivals, and other public events. This attention on facial recognition algorithms, trading algorithms and search engine algorithms might not be surprising. After all, facial recognition algorithms, trading algorithms

and search engine algorithms are associated with a range of concerns and uncertainties about the deployment, future developments, and possible implications of algorithms. Facial recognition algorithms are associated with repressive political regimes, with influencing people's personal decisions, with amplifying racism, sexism and homophobia, with deep fake videos, invasive aggregation of data, and with preempting political dissent. Trading algorithms are linked to the global financial crisis, volatility on the financial markets, to job losses due to automated labour, and are said to undermine open societies and markets. Search algorithms are blamed for filter bubbles, the spread of fake news, personal data abuse, and the corporatization and financialisation of the production of and access to online information. Taken together, these three types of algorithms address significant supra-individual anxieties of this decade: socio-political uncertainty, the global economic crisis, job insecurity and ongoing recession, the centralisation and financialization of access to online information, and political polarisation and instability. However, what *underpins* of these anxieties and why these three types of algorithms form the subject of critique is rarely interrogated, less so when this criticism takes the form of artistic portrayals. This is one issue that this dissertation wishes to address.

This renewed artistic attention to algorithms in general—and facial recognition algorithms, trading algorithms and search engine algorithms in particular—would not have surprised Marshall McLuhan, who wrote in *Understanding Media: The Extensions of Man* that reflections on new media technologies require the artistic eye: "The serious artist is the only person able to encounter technology with impunity, just because he is an expert aware of the changes in sense perception" ([1964] 2011, p. 31). Such a statement might ring too Romantic for our time. While I do not agree with his notion that *only* artists can under-

stand the days and age we live in, there is a shortage of scholarship that relates algorithms to the broader artistic and cultural contexts in which they are embedded. Reflections on algorithmic culture require materialising what is, mostly, invisible, and this is done, *in part*, by artists from various perspectives and disciplines. What is lacking is an analysis of how the algorithm is *imagined*, represented, and narrativised by artists, which can also be understood as an effect of algorithms in and of itself. Artworks are sites of meaning on which ideas and stories about algorithms are circulated, stretched, organised, and shaped. Therefore, this dissertation uses prominent artistic representations of facial recognition algorithms, trading algorithms and search algorithms as the entry point into an exploration of the constituents of the anxieties braided around these algorithms.

Focusing on the artistic portrayals of algorithmic entanglements takes us away from questions revolving around what, when, and where algorithms are. While acknowledging that technical details about algorithms are important, this dissertation aims to respond to the idea that algorithms "do" things beyond their technical capabilities. There is nothing novel about algorithms—depending on one's definition, they can be traced back to Babylonian times. The question we must therefore ask is why algorithms arise *now* as objects of concern, not just for artists but for academics and numerous commentators in a variety of fields. Should we see them as synonymous with the anxieties about Big Tech? What is the object of concern, the input or the output of algorithms? And which came first: the data or the algorithm? If data and algorithms are mutually dependent, can we analyse them separately? Should we perhaps write a typology of all existing types of algorithms, down to the technical minutiae of lines of computer code? Do we need to study their formal automation structures, or rather the mathemati-

cal formulae with which they calculate? Should we instead study the instructions for navigation, the parameters, the encoded procedures that transform input data into output data? Or should we study the entire software ecology that supports them? Should we historicise the algorithm and situate it within the persistent modernist desire for mechanisation and automation? Are algorithms agents, objects or artefacts, or merely automated statistics? Particular algorithms often operate as part of a collection of algorithms that are part of networked systems, which raises the question: *Where* is "the algorithm"? Put simply: 'the algorithm' is more than the sum of its parts; it stands for more than its technical capabilities. As David Beer puts it,

> **The algorithm is now a cultural presence, perhaps even an iconic cultural presence, not just because of what they can do but also because of what the notion of the algorithm is used to project... [W]e need to develop an analysis of the cultural prominence of the notion of the algorithm, what this stands for (2017, p. 11).**

These questions inform the investigation of algorithms in this dissertation. Nevertheless, the approach to algorithms it will take is slightly different or perhaps even unexpected.

Outstanding work on aspects of algorithmic culture has been done over the years. Drawing on software studies, philosophy of technology, ethics, media studies, race and gender studies, decolonial studies, STS, and social sciences, a wealth of thorough critical research has been conducted on algorithmic culture from a wide variety of disciplines (e.g. Mackenzie 2006; Nakamura 2009; Browne 2010; Diakopoulos 2013; Hansen 2015; Kitchin 2016; O'Neil 2016; Cheney-Lippold 2017; Richardson, R., Schultz, J. and Crawford, K. 2019). However, one crucial aspect

of algorithmic culture that has yet to be studied by scholars working in these fields is the anxieties that underpin the cultural prominence of algorithms. Anxiety is a recurrent theme of commentary on these computational processes. It is also central to our experience of algorithmic culture. It therefore merits closer reading. I propose that the work of Søren Kierkegaard—one of the first theorists of anxiety—can help us to investigate and to analyse different anxieties about algorithmic culture critically. Much has been written on Kierkegaard's conception of anxiety, but it has not been applied to anxieties around algorithmic culture. Doing so obviously brings his work into a context that it could not have anticipated, yet one in which it will be useful nonetheless.

In *The Concept of Anxiety* ([1844] 2014),[2] Kierkegaard argues that anxiety, different from fear, has no object and no determinate character. When one feels anxious, one's anxiety is caused by nothing in particular or a "not-yet" of unknown character. Anxiety is a term for a concept, an experience and a response to events and phenomena that are not knowable, not fully graspable, ambiguous or vague. One is not anxious about "persons" or "finitudes", Kierkegaard explains (CA, p. 259). One is also not anxious about yesterday either because anxiety is future-oriented. Though it may be felt in the here and now, in your body, anxiety points to the future, to the not yet and the yonder. We are anxious about possible future events and phenomena that we cannot anticipate, know, or predict. It is the inability to fully comprehend or know the future, which conditions anxiety.

This radical openness of the future is what Kierkegaard calls possibility or the possible. Kierkegaard writes that when anxiety seizes, one is seized by the possible. The possible is about future possibility—a con-
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2 –   The Concept of Anxiety will hereafter be referred to as "CA" in-text. For a complete list of sigla, please see the note in the front of this dissertation.

dition that is not. Therefore, he argues, possibility—and, counterintuitively, not impossibility—"is the most difficult of all categories" (CA, p. 257). He writes, "In possibility all things are equally possible and anyone truly brought up by possibility has grasped the terrifying just as well as the smiling…" (CA, p. 257). Everything is possible within the possible, and "everything" includes the unthinkable, unknowable and unimaginable. If everything were not possible, there would be no possibility, and the future would then be to a great extent calculable, predictable, probable, which does not mean that people do not try to predict the future or aim to reduce risks with the help of calculations and probabilities. However, that does not change anything about the fundamental openness of the future, according to Kierkegaard, as "[a]nxiety is freedom's possibility" (CA, p. 256). Without possibility there would be no anxiety, because "anxiety is freedom's actuality as the possibility of possibility" (CA, p. 86). Anxiety is about what is possible, and what is possible is fundamentally unknown to mortals. Further, "learning to be anxious" means to not avoid feeling anxious nor being ruined by it, but to learn to "live through" it (CA, p. 255). Importantly, it entails being aware "that absolutely nothing can be demanded of life, and that horror, perdition, and annihilation live next door to every human being" (CA, p. 257).[3] It has to do with the vague awareness that sudden "cataclysmic events" are as much a part of life as the moments of serenity and joy (Ruefle, 2012, p. 112).

Further, for Kierkegaard anxiety is both an ontological and epistemological concept. In CA, he argues that all epistemology is rooted

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3 –   Kierkegaard experienced much suffering. By the time he was 21 years of age, he had lost his mother and five of his six siblings. His father would die a few years later. He also suffered from a spinal disease, epilepsy, and from what was then called melancholia.

in anxiety and those moments of anxiety are fundamental to human existence. Importantly, anxiety is not merely a personal feeling; it is grounded in the social, Kierkegaard explains in *The Present Age: On the Death of Rebellion* (1846).[4] Referring to Kierkegaard, and writing on anxiety, Sianne Ngai explains this connection between anxiety, ontology and epistemology in *Ugly Feelings* (2005) as follows:

> **[T]here is an indissociable relation between affect and concept in which every cognitive structure is said to presuppose a mood — so much so that an error in the modulation becomes just as disturbing as an error in the development of thought. (2005, p.228)**

Anxiety is also a social emotion. Ngai explains:

> **…feelings are fundamentally 'social' as the institutions and collective practices that have been the more traditional objects of criticism (as Raymond Williams was perhaps the earliest to argue in his analyses of "structures of feelings")… and 'infrastructural' in its effects. (2005, p. 25)**

Understood this way, anxiety gives shape to the ways in which the entanglement of the social and the algorithmic is conceived, while this entanglement also harbours beliefs and structures of feeling and understanding. It pertains to possible future forms of being, presence and knowledge in entanglement with algorithms that are uncertain or unknown to us. The prominent artistic engagements this dissertation

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4 –   *The Present Age: On the Death of Rebellion* will hereafter be referred to as "PA" in-text. For a complete list of sigla, please see the note in the front of this dissertation.

focuses on are emblematic of ways of perceiving the entanglement with algorithms that can be described as structured by anxiety. What I will call 'algorithmic anxiety' refers to the ways in which anxiety—as both an ontological and epistemic concept—is shaped by anxieties about the future of algorithmic culture, which shapes perceptions of algorithms in the present and which, in turn, is reflected in prominent contemporary artworks that address specific practices of facial recognition, trading algorithms and search algorithms.

Of course, one might argue that the anxiety around algorithms, in general, is the umpteenth version of the age-old trope of the fear of what Langdon Winner called autonomous technology. Another might claim that algorithmic anxiety is nothing more than a reassertion of a type of Romantic humanism which arises as a result of socio-technical developments that put pressure on the boundaries of a particular symbolic order. Indeed, anxiety about algorithms seems to be synonymous with the anxiety about the totality of information technology, with networks of ultra-speed data travelling and the management of its protocols by state institutions and for-profit corporations. Some could argue that anxiety around algorithms is part of the anxiety about the "societies of control" (Deleuze, 1992) or "control societies" (Galloway, 2004). Furthermore, others might say algorithms are imbued in and are a continuation of histories of war-time machinery and colonialism, which intersect with mechanisms of bureaucratisation and the management and control of human endeavours, as well as with the long histories of statistics, accounting, and quantification. I do *not* mean to argue against this. However, to acknowledge this does not address the question of why specific aspects and implementations of algorithms are at the forefront of critique rather than others. More specifically, it leaves open how specific algorithms are imagined such that they are genera-

tive of different anxieties that seem to reach far beyond their specific and respective technological capabilities. Facial recognition algorithms trigger different anxieties than search algorithms, which trigger different anxieties than trading algorithms, which trigger different anxieties than facial recognition and search algorithms.

This leads me to the central question of my dissertation: What anxieties are interwoven with algorithms as represented within prominent art practices and how is the possible constituted therein?

OBJECTIVES, METHODOLOGY & OUTLINE

The concept of algorithmic anxiety will be developed throughout this dissertation. To flesh out this concept, I use what is called a "concept-based methodology" (Bal, 2002, p.5) to read prominent artistic engagements with facial recognition, trading algorithms and search algorithms alongside Kierkegaard's conception of anxiety. Algorithmic anxiety builds on Kierkegaard's conception of anxiety, yet, by using it to think contemporary algorithmic culture, inevitably also moves beyond it. This dissertation does not use Kierkegaard's conception of anxiety as a looking glass through which artworks are analysed or explained. Rather than presupposing what algorithmic anxiety might be, this dissertation will develop a concept of algorithmic anxiety through its engagements with artworks that engage with algorithms and the interplay between these artworks and Kierkegaard's conception of anxiety. In order to think further about its implications in today's algorithmic culture, concepts from the fields of philosophy, science and technology studies, algorithmic studies, comparative literature, as well as from cultural studies and media studies, will be put into dialogue with concepts and motifs present in the artworks. This concept-based method helps to

understand why specific types of algorithms inspire anxiety more than others, and how algorithms gain meaning beyond their input and output, the code they run on, the data they process, or the specific corporate and technical infrastructural contexts in which they operate. This dissertation thereby aims to contribute to discussions about how the entanglement of the social and the algorithmic is perceived, in different instances and from different perspectives, such that it evokes anxiety.

Chapter 1 comprises the conceptual framework of this dissertation. I first introduce key anxieties discussed in academic studies on the entanglement of humans with facial recognition, trading algorithms and search algorithms. I then move on to Kierkegaard's conception of anxiety. Since this dissertation is primarily intended as a contribution to a better understanding of the underpinning of the anxieties about specific types of algorithms, the first question I want to raise is: What does it mean to speak of anxiety in Kierkegaard's conception of the term? Chapter 1 provides an outline of Kierkegaard's account of anxiety and, specifically, how it is conceptualized in relation to his other vital concepts that inform his work on anxiety: the self, faith, knowledge and the possible. Chapter 1 closes with a preliminary sketch of the concept of algorithmic anxiety.

After this preliminary sketch of some of the critical constituents of algorithmic anxiety, the subsequent chapters 2, 3 and 4 are each organised around an artistic portrayal of a particular algorithmic process: facial recognition, trading and search algorithms, respectively. Algorithmic anxiety in contemporary art takes different forms. In one more dominant trend, artists reflect on how algorithmic culture affects conceptions of self and values like freedom, transparency, autonomy, or objectivity. Other artists seek to materialise the alleged immateriality of trading algorithms. Some mock the trust in algorithmic computing;

others soak it up. Yet others deploy algorithms to specific political ends to criticise the rationality behind some of their features. Each of these artistic portrayals of algorithms performs and produces different anxieties. Each of these chapters is framed by a close reading of a number of these artworks. I develop the concept of algorithmic anxiety through a close reading of the recurring motifs and concepts in particular artistic imaginaries, drawing on masks and camouflage (chapter 2); hybrids and spectres (chapter 3); and collectors and collections (chapter 4). Artists design face masks and camouflage wear, evoke spectres and hybrids, and imagine infinite collections to narrativise and imagine the evolving and ambiguous phenomena of "the algorithmic." The inherent ambiguity of the range of concepts and motifs that this dissertation engages with is part of the dynamic of algorithmic anxiety that it will contextualise and conceptualise.

It has to be noted that the artworks I have selected for analysis are preponderantly made by Western artists who have received a great deal of critical attention and who have been exhibited repeatedly in art exhibitions about algorithmic culture primarily—but not exclusively—in Western Europe and the U.S. This focus on Western artists in Western exhibitions is for reasons of access: over the past seven years, I have visited numerous exhibitions on algorithmic culture, mainly in Western Europe and in the U.S., that reflected an anxiety that one could also find in popular and mainstream Western media reports—written in languages I can read—on the developments of algorithmic culture. That said, the examples covered in this dissertation provide a thorough cross-section of contemporary art about algorithms.

Chapter 2 explores mask and camouflage wear designed by artists in an attempt to thwart off and criticise facial recognition algorithms. It focuses on Zach Blas' *Facial Weaponization Suite* (2012), Adam Harvey's *Hy-*

perFace (2017), and Sterling Crispin's *Data-Masks* (2014), offering a reading of these prominent artworks in relation to Kierkegaard's conception of the self as a synthesis between the finite and the infinite. The algorithmic capture of the face causes anxiety partly because of the powerful capabilities with which facial recognition technology is associated. In this chapter, I explore how the self is performed in these mask and camouflage works and how a Kierkegaardian conception of the self presents a play with relations between self, environment and the algorithmic medium of capture. Combined with a Kierkegaardian notion of the self as a relational synthesis, masks and camouflage show the possibilities inherent in emphasising different forms of being and relating—such as interdependency, community, collaboration, and collectivity—which may defy anxieties evoked by facial recognition technology.

Chapter 3 centres on the close reading of prominent artworks that engage with trading algorithms. Algorithmic trading causes anxiety in part because the infrastructure of trading algorithms is conceived as an invisible and impenetrable black box, impervious to change. This chapter uses Rita Felski's concepts of 'digging down' and 'standing back' to distinguish between two popular artistic approaches to trading algorithms. Artists that 'stand back' visualise aspects of the infrastructure of the black box of finance, such as server racks, cables of different kinds, and market index graphs. This rendering visible of supposedly invisible aspects of the black box of finance is perceived as a key to grasp and open it. The second approach is characterised by artists that in various ways tinker with or reenact the inner workings of aspects algorithmic trading. Both tend to focus on, and add emphasis to, a limited set of infrastructural aspects of algorithmic trading. This is followed by an analysis of a third approach which focuses on a spectral imaginary of trading algorithms, exemplified in this chapter by Emma Charles' ex-

perimental video artwork, *Fragments on Machines* (2013), and Femke Herregraven's work *Pull everything, pull everything* (2018). Their spectral imaginary of trading algorithms focuses on the broader relational context within which algorithmic trading is embedded. What is more, their spectral representations allude to subversive and possibly catastrophic events under which change becomes possible. To unpack the relation between catastrophe and change, I read these artworks alongside Kierkegaard's notion of the possible.

Chapter 4 engages with the anxieties that Google's search engine evokes. This chapter focuses on Google primarily because it is the most used search engine, at least in Europe and the U.S.: this service evokes anxiety about the abuse of aggregated data and the for-profit logic behind the algorithmically ranking and listing of search results. In response, artists have created alternative search engines, or perform or ridicule specific features of Google's search engine. Another recurring motif in artistic representations of web searches is the act of collecting or the formation of a collection. Camille Henrot's experimental film *Grosse Fatigue* (2013) frames web search as a form of collecting and refers to Walter Benjamin's conceptualisation of the collector. When read alongside Kierkegaard's notion of the relation between faith and knowledge, I argue that *Grosse Fatigue* offers a repositioning, a different relation, to the pervading discourse on the centralised, monetised and monopolised structures of Google's search engine. Further, by adopting a Kierkegaardian understanding of the act of collecting as a passionate act, I argue that we can move through search anxiety by moving towards what exceeds it.

The final chapter of this dissertation draws the preceding analyses together. It offers in-depth explanations as to why specific algorithms trigger algorithmic anxiety, and it provides reflections on how to live

through it. The central Kierkegaardian concept of this chapter, which ties together the concepts discussed in the previous chapters, is 'movement at the spot.' Movement at the spot is a way to relate to possibility, and it will be framed as a productive form of living through algorithmic anxiety. To move at the spot is to make room for alternative imaginations and possibilities in order to live with and through algorithmic anxiety. In this chapter, the alternative imaginations of masks and camouflage (chapter 2), hybrids and spectres (chapter 3), collectors and collections (chapter 4) will be framed as figures of movement at the spot. These figures of motion show that the algorithmic structures we inhabit and that inhibit us can be opened by moving beyond the limitations detected by algorithms. They point to the many contradictory relations within algorithmic culture and represent different ways to relate to possibility, in order to live through algorithmic anxiety.

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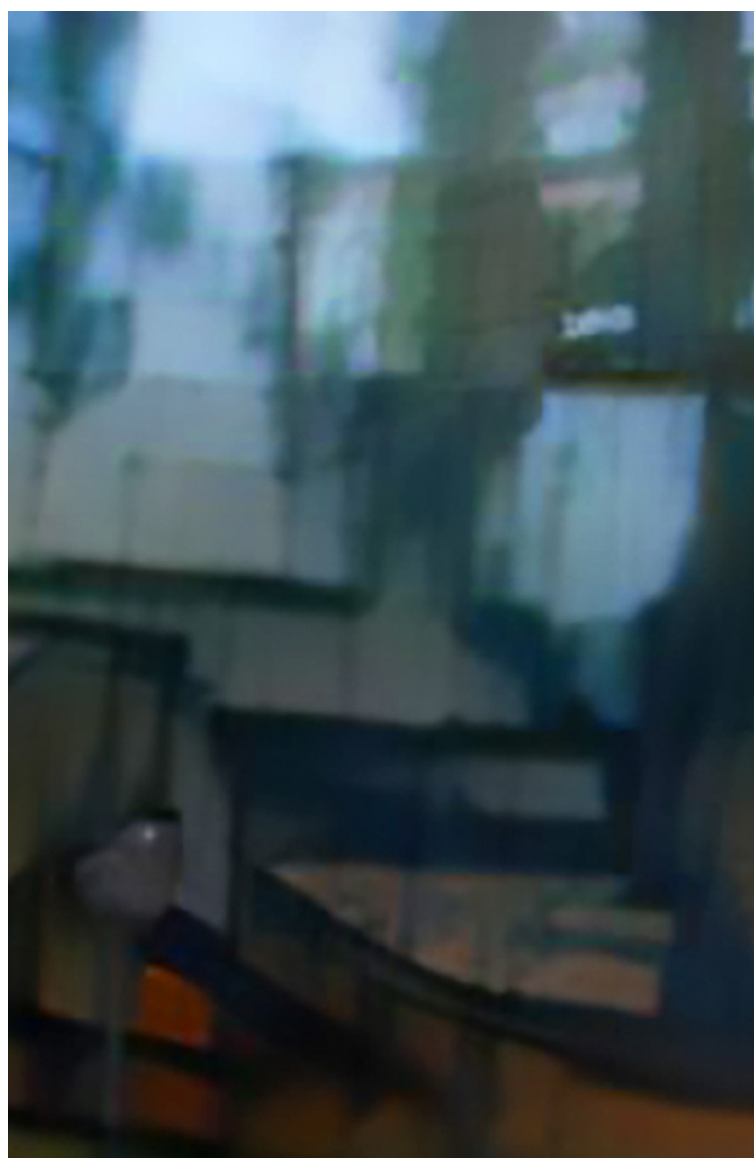
From Algoríthmic Culture to Algoríthmic Anxiety

We would rather be ruined than changed
We would rather die in our dread
Than climb the cross of the moment
And let our illusions die.

— **W.H. AUDEN**, *THE AGE OF ANXIETY*

THE POINT OF DEPARTURE OF THIS CHAPTER IS THE OBSERVATION THAT FACIAL RECOGNITION ALGORITHMS, TRADING ALGORITHMS AND SEARCH ALGORITHMS HAVE BECOME ADDRESSEES OF ANXIETY IN PUBLIC DEBATE, IN ACADEMIC DISCIPLINES, AND CONTEMPORARY ART. The entanglement of human beings in algorithmic networks has become a cause of concern for artists and critics alike. The anxiety evoked by algorithms is not a sentimental subjectivity or a personal pathology related to one's feelings regarding algorithms. What artists and academics share are worries about the possible effects caused by the developing entwinement of humans with algorithms on societies and the people living in them. This has created a fervour around the supposed corresponding loss of certain aspects of the self, of what constitutes visible reality, and of the possible affordances of algorithmically produced information on socio-political relations.

As mentioned in the introduction, this dissertation is not primarily concerned about the computational, mathematic or technical aspects of algorithms—what they are or what they technically do. Neither does it seek to find one underlying and comprehensive cause for a multitude of anxieties, as that would not do justice to the different concerns algorithms raise and also runs the risks of falling in the trap of generalisation. The different anxieties conditioned by different types of entanglements reveal a more complicated image. Therefore, this dissertation is structured around specific types of algorithms and the different anxieties they inspire.

To start this chapter, I briefly introduce the main focus points of concern in the academic literature about the close-knit relationship of humans to algorithms—namely, what I describe as algorithmic governance, algorithmic selves, algorithmic opacity, and algorithmic replacement. In the second part of this chapter, I present an outline of the

central concepts and dynamics that structures Kierkegaard's conception of anxiety—the self as a synthesis, the limits of knowledge, and the possible. Anxiety concerns the possibility of the possible. The possible exceeds the self and defies rationalisation, systematisation, prediction, and calculation. After sketching out the major constituents of Kierkegaard's account of anxiety, I move to and close this chapter with a first rough sketch of the concept of algorithmic anxiety, which will be further developed in the chapters that follow this one.

ALGORITHMIC GOVERNANCE

Concerns about the dynamics and mechanics between algorithmic systems and human actors and between the facial recognition algorithms, trading algorithms and search algorithms and the social seem to be widely shared amongst a growing group of academics. Algorithms, in general, are associated with having and exerting commanding powers. The nature and extent of these powers are based on the different ideas critics have of how algorithms organise, produce, order or impede socio-political life. Nicholas Diakopoulos (2013), for instance, sees algorithms as powerful wire-pullers. He writes: "we're living in a world now where algorithms adjudicate more and more consequential decisions in our lives. Algorithms, driven by vast troves of data, are the new power brokers in society" (2013, p.2). In *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*, Cathy O'Neil (2016) writes that decisions such as whether someone gets a job, gets into a particular college, gets sentenced to jail, gets a loan or is considered a possible fraud, is increasingly controlled by algorithmic routines (O'Neil, 2016, p. 13). What she calls "weapons of math destruction" are "churning away in every conceivable industry" (p. 11). This situation

"slams doors in the face of millions of people, often for the flimsiest of reasons, and offer no appeal" (p. 31), she argues. Antoinette Rouvroy and Thomas Berns (2013) speak of "algorithmic governmentality" (p. 10). They argue that the ubiquity and trust in algorithms and the logic of numbers on which they are centred mark a "transition from statistical governance to algorithmic governance" and that this algorithmic governmentally can be described as "a type of rationality founded on the automated collection, aggregation and analysis of big data so as to model, anticipate and pre-emptively affect possible behaviours" (Rouvroy & Berns, 2013, p. 10). Algorithmic governance is self-referential, they contend. "[A]lgorithmic governance 'creates' a reality at least as much as it records it" (Rouvroy & Berns, 2013, p. 25). Referring to Rouvroy and Berns in his book *We Are Data: Algorithms and the Making of our Digital Selves*, John Cheney-Lippold (2017) claims that "when our embodied individualities get ignored, we increasingly lose control not just over life but over how life itself is defined" (p. 5). Matteo Pasquinelli would likely agree. He makes a similar point when he contends that algorithms operate as an automated bureaucracy that silently reinforces dominant patterns of behaviour, where the norm of what counts as dominant behaviour is standardised by algorithms (Pasquinelli, 2016, p. 288). Tarleton Gillespie (2016) follows a similar line. He argues that algorithms are part of mechanisms that privilege quantification, proceduralisation and automation in human endeavours (2016, p. 27). I will discuss concerns about the algorithmic governance of socio-political life, specifically in relation to facial recognition algorithms in chapter 2, and also in chapter 3. Chapter 2 focuses on masks and camouflage wear as artistic responses to facial recognition algorithms, and chapter 3 explores the spectral imaginary of trading algorithms.

ALGORITHMIC SELVES

As algorithms are deployed by the governments, institutions and corporations that impact on individual lives, there is concern amongst artists and critics about the social implications of these often invisible and secretive algorithmic practices, specifically in relation to the way individuals are perceived and treated. Cheney-Lippold (2017) argues, "who we are in the face of algorithmic interpretation is who we are computationally calculated to be" (p. 6). Who you are, he writes, is decided by advertisers, marketeers, and governments' their secretive, proprietary algorithmic scripts, recasting identity "into the exclusive, private parlance of capital or state power" (2017, p. 6). Data analytics firms may mark an employee as "high cost" or as "unreliable worker" without their knowledge or participation (p. 4). Stefania Milan (2015) puts it thus: "creators, owners and exploiters of algorithms control much of our digital life" and "deeply influence our ways of making sense of interpersonal and spatial interactions... altering our perception of self and our relational being-in-the-world," she observes (p. 22). "[I]ndividuals," she fears, "become merely a pile of data" (Milan, 2015, p. 22). Adam Morris (2012) argues that people are treated "as a conduit of wealth" and "a mine of data" to the twin imperatives of marketing and surveillance (p. 107). He associates data mining and data profiling by companies and governments as a form of exposure. These practices "give transparency to the fundamental opacity of the population," he argues (p. 107). Finally, Tarleton Gillespie (2014) is worried about the ways algorithms influence our notions of ourselves. He is specifically concerned about search engine algorithms. Search algorithms shape ways of relating to the self, Gillespie argues. He explains how search engine algorithms self-referentially present publics back to themselves and in doing so "shape a public's sense of itself" and generate

a "calculated publics" (Gillespie, 2014).

Algorithms also shape our social life. Stephanie Hankey and Marek Tuszynski argue in *Nervous Systems* that every individual, locked inside algorithmic filter bubbles, "becomes a digit, a dot, a self-entered data point" (Franke et al., 2016, p. 14; 22). Our social life is "filtered into patterns," Hankey and Tuszynski claim, and in this process, subjectivity changes fundamentally while normative patterns are reinforced, "flattening and smoothing out our lifeworlds and singling out any form of dissent" (Franke et al., 2016, p 11; 13). In this context, Pasquinelli writes about an "epistemic revolution comparable to previous paradigm shifts, displacing the centrality of the human" (2016, p. 281). I will discuss algorithmic anxiety about rigid algorithmic regimes that conscript the self and its lifeworld further in chapter 2, as part of the artistic portrayals of facial recognition algorithms. I will also further analyse the self-referential filter bubbles that search algorithms produce in chapter 4, as part of the assessment of artistic representations of Google's search engine algorithms.

ALGORITHMIC OPACITY

The opacity of algorithms is another dominant concern among artists and critics. Again and again, in art and academia, algorithms are invoked as omnipresent yet invisible, powerful yet elusive, inscrutable yet invasive, and shaping social worlds and the people living in them. This dissertation will address anxiety as a response to the opacity and unknowability of algorithms repeatedly in artistic portrayals of trading algorithms and search algorithms in, respectively, chapter 3 and 4. For context, we can identify several reasons for this response.

For one, algorithms' operational mechanisms cannot be observed at

work. Algorithmic routines are mostly invisible, not in the least because of the secrecy surrounding algorithms used by tech giants, for-profit corporations and on financial markets. "Many of the algorithms we encounter daily are proprietarily owned—and thus opaque and inaccessible to outside critique," Michele Willson explains (2017, p. 140). Trade-secret protection governs many of the algorithms that are used daily, notably on the financial markets and in search engines. The opacity surrounding algorithms has led Frank Pasquale (2015) to contend that we live in a black box society, or a society in which "decisions that used to be made by humans are now made by algorithms of which we know little to nothing" (2015, p. 83). Pasquale calls for transparency and intelligibility of these systems and the possibility of auditing algorithms. As regards to search algorithms, he argues that

> **...without knowing what Google actually does when it ranks sites, we cannot assess when it is acting in good faith to help users, and when it is biasing results to favour its own commercial interests (2015, p. 9).**

The encoded rules of algorithms, which he calls "enigmatic technologies" (p. 141) and their concomitant values, biases and prerogatives, are well-hidden and guarded secrets that must be opened to inspection, according to Pasquale, because they "undermine the openness of our society and the fairness of our markets" (p. 5).

Secondly, according to Jenna Burrell, the opaqueness of algorithmic systems is not limited to corporate secrecy and hence cannot be countered by inspection. Algorithmic opacity stems from the level of technical complexity and the expertise required to understand the entire structure of the software algorithms are embedded in (Burrell, 2016, p. 4). Algorithmic opacity also relates to the techniques used in algorithms

and the complexity of and the scale distinctive to algorithmic systems (Burell, 2016, p. 5). Machine learning algorithms, for example, are deployed in areas where they augment or replace white-collar labour and in "consequential [classification] processes that were previously human-determined"— such as credit evaluation and insurance or loan qualification, but also in search engines, spam filters and for marketing purposes (p. 2). However, the high speed at which these algorithms calculate billions of data examples and tens of thousands of features of data in a matter of microseconds makes them opaque and illegible to humans. Their internal decision logic, Burrell points out,

> **...is altered as it 'learns' on training data. [...] While datasets may be extremely large but possible to comprehend, and code may be written with clarity, the interplay between the two in the mechanism of the algorithm is what yields the complexity (and thus opacity) (p. 5).[5]**

The artistic responses to the different forms of opacity and incomprehensibility of algorithms will be discussed predominantly in chapter 3.

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5 –   That is to say, models for machine learning are developed in line with how algorithms process data, without regard for human comprehension. They are not legible to humans as the scale required to apply them makes them illegible to humans. On June 15, 2017, *The Atlantic* published an article titled "An Artificial Intelligence Developed Its Own Non-Human Language." The piece reports about a paper, published by researchers at Facebook Artificial Intelligence Research Lab, on an experiment it ran to train chatbots to negotiate with one another. The researchers at Facebook used a large dataset of human-human negotiations that ran on machine learning algorithms used to train chat-bots with the communication and reasoning skills required to negotiate with other chat-bots. Over time, however, the bots started to negotiate with each other, but they did so in a language incomprehensible to the researchers involved. The article went viral.

ALGORITHMIC REPLACEMENT

Future scenarios of human displacement or replacement by algorithms are a topic of concern amongst critics of algorithmic culture. Anxieties about the future self are widespread in the work of critics of algorithmic culture. They range from scenarios of automated societies in which fascism reigns with the helping hand of a small elite running algorithmic systems, or—and worse—scenarios in which humans live in the service of self-operating algorithms, that may, at some point in the future, turn against humans when their services are no longer needed. In his often-cited book *Automate This: How Algorithms Came to Rule Our World* (2012), Christopher Steiner concedes, "the bounds of algorithms get pushed further each day" (p.18). He argues that algorithms have augmented and displaced human labour in a growing number of industries: "[t]hey're faster than us, they're cheaper than us, and, when things work as they should, they make far fewer mistakes than we do" (p. 18). This gives reason to pause, according to Steiner. He claims that algorithms can evolve: "[t]hey observe, experiment, and learn—all independently of their human creators" (p. 19). Algorithms can create improved algorithms, Steiner cautions. Worrying about these developments and what it means for human agency, Steiner contends:

> **As our world shifts from one where humans have made all of the important decisions to one in which we share that role with algorithms, the value of superior intellect has increased at a compounding rate (p. 419).**

On the dark side of replacement theories, being outsmarted by algorithms is taken as a warning sign for the future of human labour. In part, this is because intelligence has been used (and is still used) as a

"fig-leaf to justify domination and destruction," Stephen Cave (2017) explains in his essay on the dark history of the concept of intelligence. Cave argues that intelligence is a political concept with a long history as the rationale for domination. He traces this political conception of intelligence to Plato's *The Republic*, early Greek experiments with democracy, and Aristotle's *Politics*. Not inherited elites—neither those with the strongest army, nor those who were said to have received divine instruction—should rule, but the cleverest of men should rule over the rest. Lest one forgets, to be counted as a citizen of the Greek polis one had to be a European, educated, *male* citizen. Cave:

> **"What marked the ruler was his command of reason and rationality which both justified and naturalised his rule over those deemed less intelligent, irrational, emotional and so forth" (2017).**

According to Cave, as Westerners have justified their positions of power and repression of others by virtue of their supposed superior intelligence, this makes algorithms that outsmart and outperform Westerners a possible deadly threat.[6] Anxieties about human replacement or

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6 –   Not all scholars consider algorithmic culture to be a cause of concern. Some academics muse optimistically about the algorithmic replacement of human labour and envision scenarios of happy post-work co-existence. On this end of the spectrum, we find the work of, amongst others, Pedro Domingos. In his *The Master Algorithm: How the Quest for the Ultimate Learning Machine will Remake our World*, Domingos (2015) he foreshadows that the line between "automatable and non-automatable jobs" will drastically change (p. 278). He assumes that soon there will be a robot in every household, running all quotidian chores, perhaps even looking after children and pets while you are seeking self-actualisation in a post-work world. How soon this will happen "depends on how hard finding the Master Algorithm turns out to be," he writes (p. 42). Domingos: "For those of us not working, life will not be meaningless... People will seek meaning in human relationships, self-actualization,

displacement have found its way into prominent artworks that engage with facial recognition algorithms, trading algorithms, and search algorithms, to which I return in chapter 2, 3, and 4.

KIERKEGAARD'S CONCEPT OF ANXIETY

In the following section, I provide an outline of the central concepts and dynamics that structure Kierkegaard's conception of anxiety—the self as a synthesis and the self in despair, faith and the limits of knowledge, and the synthesis between possibility and necessity. But to start, a few words on Kierkegaard the author, philosopher, theologian, Socratic ironist, humorist, and novelist.

A FEW WORDS ON KIERKEGAARD

Most of Kierkegaard's philosophical writings do not bear his name; they were written pseudonymously, though some carry his name as the editor of the book. A pseudonym makes a point of separating the author from its written words, acting as a form of indirect communication. In the case of Kierkegaard, it was not a strategy to protect his anonymity. Multiple pseudonyms are used by him, creating novel-like characters; these pseudonyms say different things and reappear in other books, for example *Stages On Life's Way* (1845) and *Either/Or: A Fragment of Life* (1843). These pseudonyms represent different personas. In E/O, there are multiple personas in the same book with different points of view, each representing different philosophic standpoints.[7] Yet, they are all too

and spirituality, much as they do now. The need to earn a living will be a distant memory, another piece of humanity's barbaric past that we rose above" (p. 279).

7 –   *Either/Or* will hereafter be referred to as "E/O" in-text. For a complete list of sigla, please see the note in the front of this dissertation.

often (self-)contradictory, too; they are divided by opposing thoughts or reflect on the contingency of their own deliberations. Obviously, then, one cannot understand Kierkegaard's philosophy by reading only one book. However, reading all of his work does not give its reader a clear and ordered idea of his thinking either. And this is the point.

Kierkegaard opposed the way philosophy was taught at his time—which was much dominated by Hegelians. While his contemporaries focused on over-arching systems of thought and theories of everything, Kierkegaard opposed this kind of philosophy by performing anti-systemic thinking in his writing, by contradicting himself, taking different positions in and within his different books, as well as by writing in different styles and adopting a range of genres. With these different pseudonyms, styles, genres and positions his oeuvre takes the form of one of his central concepts, movement at the spot – that I discuss in more detail below – as well as his conviction that one has to synthesise thinking and being. One's thinking "should bear on a person's existence, it should bear on how life is lived" (Evans, 2009, p. 30). With the constant play of positions and stances, he also disorients his readers in order to help them to remain open to other perspectives and different ways of understanding being and thinking.

Some of his books — *The Sickness Unto Death (1849), Repetition (1843)* and E/O among others— are set up as a dialectical movement between a philosophical and religious approach. But there is also a dialectic at work within his books. A reader may find shifts in position, from the particular to the transcendental, from unity to multiplicity, and from interiority and exteriority—and the reverse. Further, SUD and CA, the two works in which he writes about anxiety in relation to conceptions of self and knowledge, seem thematically related, yet differ in approach, whilst *Philosophical Fragments (1844)* and SUD, two works in which he

writes much about the self and knowledge, seem to form each other's counterparts.[8]

Kierkegaard also has a knack for turning phrases and does so throughout many of his books. For example, subjective truth is described as an objective uncertainty. Anxiety is described as an antipathetic sympathy. And 'authenticity' [*autenticitet*], which is qualitatively different from the notion of being 'genuine' or a 'true self,' is described as stepping into character — "*traadt i Charakteer.*"[9] The meaning of the major concepts in his work is never straight forward, and he refuses to provide a conclusive answer to what the major concepts in his work mean. Adding to this, Kierkegaard's oeuvre consists of journals, letters, sermons, poetry, literature, and philosophical tractates, and all written in diverse styles, tones, formats, and lengths. He mixes irony with devotional comments on Biblical history, polemics with dense philosophical writing, and epistolary writings, that at times approach kitsch, with lyrical tales.

The pseudonyms, the shifting positions, the self-contradiction, the rhetorical devices, the mockery, the puns, they are not made in jest, but stress his conviction that we lack a 'timeless,' 'impersonal,' or 'objective' view from which the world can be understood. His philosophy is not one of finding *the* truth, but one of questioning what you thought you

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8 –   *The Sickness Unto Death* will hereafter be referred to as "SUD" in-text. *Philosophical Fragments* will hereafter be referred to as "PF" in-text. For a complete list of sigla, please see the note in the front of this dissertation.

9 –   Translated by Kierkegaard scholar Bruce Kirmmse as "step into character." Kierkegaard's oeuvre could be considered a series of steps into different characters; each pseudonym takes on a different character that relates in its own way to the central concepts in his work. Thus, there is no conclusive answer to what these concepts mean because they are thought out and acted out in different and often contradictory ways and fail to provide closure.

knew to be the truth and then questioning *that* truth, too. Kierkegaard does not want to add to the pile of all-explaining theories, but rather to unscrew these theories and give them a good kick. Altogether, this makes his writings bristling with problems of interpretation and signification. It has resulted in a notoriously difficult body of work that is resistant to definitions and also to citation and paraphrase because of its density, complexity and idiosyncratic style and because of the endless winding on of conflicting views with no clear resolution. "What are we to make of his conception and your interpretation of anxiety, then?", you may rightfully ask. "That it is embodied, embedded, partial, subject to interpretation, and time-bound", is my answer. As Kierkegaard scholar C. Stephen Evans argues, many of Kierkegaard's ideas are inextricably intertwined, and the best remedy to this is to sketch key related ideas—which I will try to do in the following sections (Evans 2009, p. 29).

THE SELF AS A RELATIONAL SYNTHESIS

Kierkegaard links anxiety to forms of being, presence and knowledge. Kierkegaard's conception of the self differs from that which is dominant in western philosophy, which typically views the self as private conscience, a type of substance, an autonomous entity, or as a subject of knowledge. In contrast, Kierkegaard rethinks the self as a relational synthesis. In an often-cited paragraph from SUD, he explains in turgid prose his notion of the self as a synthesis:

> **But what is the self? The self is a relation that relates itself to itself or is the relation's relating itself to itself in the relation… A human being is a synthesis of the infinite and the finite, of the temporal and the eternal, of freedom and necessity, in short, a synthesis (SUD, p. 13).**

The self is relational, a synthesis of contrasting elements and this synthesis must relate to itself (become self-aware), and it must relate to something outside of itself. To say that the self is merely a finite being is to emphasise one side of this synthesis. It is to emphasise gender, ethnicity, geographic location, abilities, and weaknesses and aspects of one's social, political, and cultural habitat, which are indeed finite. They matter to how one appears to the world, how one appears to oneself, and how the world appears to this self, even though it is not all that one is and no one can be reduced to these finite aspects. Many of these things are not up to us to begin with. We cannot freely choose our gender, ethnicity, the family we are born in, our place of birth, or numerous other things. We are inseparable from, but cannot be reduced to, our finitudes. We cannot be reduced to finitudes as the self is always grounded in something other and something larger than its finitudes. The self is both individual and social and also exceeds the individual and the social. Kierkegaard further explains this in SUD. He writes: "[f]or the self is the synthesis of which the finite is the limiting and the infinite the extending constituent" (p 29-30). One does not *have* a self; the self is not a substance, not a unit or a thing somewhere inside the self. Kierkegaard's point is, I would argue, that the self is not the sum of its finite parts but is open to the dimension of the infinite. Thus, a human being is a synthesis of (f)actual and concrete existence and abstract infinitude.

With his conception of the self as a relational synthesis, Kierkegaard rejects what he calls the "standard of his age" which holds the individual responsible for their own life, without further ado. The illusion that the individual is the creator of their own life "[leaves] the individual entirely to himself so that in a stricter sense he becomes his own creator" (E/O, p. 404). That is, within such an understanding, the individual likens with God. Kierkegaard: "It leads you to think this must be a kingdom of

gods, this generation in which I too have the honour to live. However, that is by no means the case…" (E/O, p. 392). In E/O, he calls the notion of the autonomous self "ridiculous" (E/O, p. 393). It is ridiculous because any such attempt denies the existence of God (E/O, p. 392). This is not to say that the individual has no responsibility whatsoever, it is to say that "[e]very individual, however original, is still a child of God, of his age, of his nation, of his family, of his friends. Only thus does he have his truth" (E/O, p. 393). It is to say that a self is inevitably grounded, embedded and situated in sociality, but also composed of extending constituents that transcend other people and society. There is a constant tension between what is and what ought to be, between necessity and possibility. In Concluding Unscientific Postscript (CUP), Kierkegaard describes this dynamic as if "a Pegasus and an old nag were hitched to a carriage" (CUP, p. 680).10 The self is the dynamic relationship between what has shaped you, or your historicity of which you are intimately familiar, and infinitude and possibility.

There is the self that is self-aware (aware of its self as a self); there is the self that is constituted by an unchangeable past and limited by finitudes and necessities (the self embedded and situated in a social order with the ideals expressed by the state); and there is the self that is constituted by possibility and infinity of (the self before God, or the possible self (Evans, 2009, p. 48-50). As the human self exists in relation, we are not autonomous, and neither are we transparent to ourselves or others, nor are others transparent to us; there is always something that slips out of our grasp. One exists in relation, Kierkegaard explains, to our body, to our abilities and inabilities, to the cognitive skills we have

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10 –   *Concluding Unscientific Postscript* will hereafter be referred to as "CUP" in-text. For a complete list of sigla, please see the note in the front of this dissertation.

and lack, to our surroundings, our family, our past and future, the nation we inhabit, its culture, *and* to the extending constituents of the infinite, the possible—to God. (CA, p. 68-69). Human existence is the never-ending attempt to synthesise these limiting and extending aspects, Kierkegaard explains in SUD. It is never-ending because this attempt to synthesis is never fully realized and, although some people are more successful than others, tension, contradiction, and mishap remain. "Through being a synthesis the human being can be made anxious…," he writes (CA, p. 256). Which is to say, because the self is a relational synthesis of opposites – necessity and possibility, the temporary and the eternal and finitude and infinity – it experiences anxiety. Anxiety follows from this delicate and wobbly synthesis that is the self. He describes the never-ending attempt to synthesis as a process of becoming in CUP: "The process of becoming is the thinker's very existence…" (CUP, p. 182). This process of becoming has no endpoint or resolution; it is a constant striving.

> **How far the subjective thinker might be along that road, whether a long way or a short, makes no essential difference (it is, after all, just a finitely relative comparison); as long as he is existing, he is in the process of becoming (CUP, p. 182).**

Thus, although this continual striving directed toward the infinite, the infinite remains unreachable, which makes existence "as pathos-filled as it is comic" (CUP, p. 182). As well as filled with anxiety.

ANXIETY AND DESPAIR

Anxiety and despair, two connected concepts in the work of Kierkegaard, are not personal pathologies. Kierkegaard discusses these concepts primarily in *The Concept of Anxiety* and *The Sickness Unto Death*. Howard V. Hong argues that the two books

> **...might be regarded as a two-stage explication. Both are based on the concept of man as a synthesis of the finite and infinite, the temporal and the eternal (Howard quoted in Beabout 1988).**

Gregory Beabout explains in *Kierkegaard on Anxiety and Despair* (1988) that "anxiety is the condition for despair" (Beabout, 1988). It is the radical openness of the possible which conditions anxiety. Kierkegaard understands anxiety as a form of *angst* related to the unknowability of future possibilities. Anxiety pertains to the possibility of the possible, to possible events that are unknown and unknowable and thus cannot be anticipated. He writes: "anyone formed by anxiety is shaped by possibility" (CA, p.257). Anxiety seizes when one is confronted with possibility, at a moment of possible change and the endless possibilities of that possible change. Anxiety is undetermined (time), vague and unstilted (ambiguous). Kierkegaard describes anxiety as an ambiguous power, which both attracts and frightens us and demands each one of us to relate to it (CA, p. 94-96). The question is how one relates to it, how one positions itself in relation to it.

His concept of despair is mapped onto the self as a relational synthesis. Despair, he explains in SUD, is a mis-relationship between the relations that constitute the self, between finitude and necessity and infinitude and possibility. Despair happens when the relational synthe-

sis is skewed to one side. In such a mis-relationship, one side of the relation is emphasised over the other; one side is overdeveloped, the other underdeveloped. In SUD, Kierkegaard distinguishes different forms of despair by reflecting upon what each form of despair lacks. Thus, when an individual tends to infinitude, the despair they feel is caused by a lack of finitude. Similarly, the despair of finitude lacks infinitude; the despair of possibility lacks necessity, and the despair of necessity lacks possibility (SUD, p. 30-42). A person who grounds themselves merely in infinitude is a person who gets carried away by its daydreams and fantasies. What is missing in such a situation is "to submit to the necessity in one's life, to what may be called one's limitations" (SUD, p. 36). And the other way around: when focused merely on one's limitation, one can get lost in determinism, fatalism, nihilism. What is missing then is a sense of possibility. Despair is conditioned by a lack of balance between the finite and infinite, necessity and possibility.

Most adults, Kierkegaard writes, are good at keeping themselves in the dark or prefer not to relate to their despair (SUD, p. 48). And there are many ways to do so, Kierkegaard explains. Through diversions, through work and busyness, by latching on to certainties, conventions, convictions, traditions. Or by living ordinary lives, and by externalising discomfort, rationalising feelings of unrest (SUD, p.48). In PA, he argues that his time is an age of anticipators and the risk-averse, everyone is given rules and calculators to aid one's thinking (PA, p. 33-35). In an attempt to escape their despair, many people try to find safety and security in living by the numbers. This is futile, Kierkegaard argues,

> **This philistine-bourgeois mentality thinks that it controls possibility, that it has tricked this prodigious elasticity into the trap or madhouse of probability, thinks that it holds its**

prisoner; it leads possibility around imprisoned in the cage of probability, exhibits it, imagines itself to be the master, does not perceive that precisely thereby it has imprisoned itself in the thralldom of spiritlessness and is the most wretched of all (SUD, p. 41-42).

Those who claim never to be anxious are earthbound. Despite necessity, despite finitude, despite the delimitations around living as gendered bodies, of a particular ethnic and religious descent, within certain social-economic groups, within a specific nation and at a certain time, and despite all the precautions taken for safety and security, there remains the possible. I will return to Kierkegaard's understanding of the possible below.

In the next chapter, Chapter 2, I flesh out the concept of the relational self and how it manifests into artistic masks and camouflage wear. Algorithmic anxiety caused by facial recognition algorithms is about both the radical openness toward the unknown and about algorithmic regimes that attempt to ensnare this openness. The algorithmic capture of the face conditions despair in part because the desire for sovereignty, autonomy, and self-transparency is perceived as being tarnished and inhibited by the capacities with which facial recognition technology is associated. What is missing is a sense of possibility. However, a Kierkegaardian reframing of the meaning of the mask and camouflage might offer a response to what seems to be a lack of possibility.

FAITH AS THE LIMIT OF KNOWLEDGE

Another central concept of anxiety has to do with Kierkegaard's distinct understanding of the synthesis between faith and knowledge. Kierkegaard critiques a kind of philosophy that extends its limits. For philoso-

phy to be faithful to its aim requires it to be aware of its limits. In CA, Kierkegaard insists that a total system of knowledge is impossible; one has to live on the basis of faith (CA, p. 176). Philosophy can do no more than form conceptions of faith, but is not equipped to understand or explain it fully, Kierkegaard insists.

To start with Kierkegaard's take on knowledge: central to his argument is that we live our lives in relationship to things that we cannot ever be knowledgeable about. A prime villain in Kierkegaard's writings is all-embracing and all-explaining systems of thought and the arrogance of a way of thinking that presumes any topic can be "grasped" or "captured" or "covered" by knowledge. He rejects a kind of thinking that assumes knowledge is cumulative or universal or that one can throw a great book at any given problem or dilemma.[11] It is not for him to reject notions of objective knowledge wholesale. It may exist, but it is not within reach of mortals. "There is a knowledge in the external world", he writes, "that believes it is enough to know what is great—no other work is needed. But for this reason it does not get bread, it perishes while everything changes to gold" (FT, p. 27-28). According to Kierkegaard, knowledge is of limited use when it comes to existence. He insists that existence can-

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11 –   Kierkegaard argues in CUP: "Knowledge [of the historical] merely assists one into an illusion that is infatuated with the palpably material. What is that which I know historically? It is the palpably material. Ideality I know by myself, and if I do not know it by myself, then I do not know it at all, and all the historical knowledge does not help. Ideality is not a chattel that can be transferred from one person to another, or something thrown in to boot when the purchase is a large one. If I know that Caesar was great, then I know what the great is, and this is what I see—otherwise I do not know that Caesar was great. History's account—that reliable men assure us of it, that there is no risk involved in accepting this opinion since it must be obvious that he was a great man, that the outcome demonstrates it—does not help at all. To believe the ideality on the word of another is like laughing at a joke not because one has understood it but because someone else said that it was funny" (CUP, p. 706-707).

not be reduced to systematic explanations or rationalisations; it cannot be explained or explained away. He laments that people are enchanted by knowledge for the sake of knowledge. They are immersed by facts, engrossed in books, contemplating in abstraction, without relating this knowledge to themselves, to their relation to others, or to the spiritual world, the unknown.

One thing we cannot be knowledgeable about is God. As mentioned earlier, according to Kierkegaard we exist in relation to God. Kierkegaard's God is Christian. However, it is not some entity or bearded man somewhere up on a cloud, nor is it an all-seeing judge. In his work, Kierkegaard uses different terms to write about God, including (but not limited to) "absolute freedom", "possibility", "spirit", "the god", "faith", and "the unknown". One of his more devout Christian pseudonymous personas might be Vigilius Haufniensis in CA, or Anti-Climacus in SUD. While one of his most semi-religious pseudonymous personas might be Johannes Climacus, the author of Philosophical Fragments. In discussing the unknown he writes, "the ultimate paradox of thought: to want to discover something that thought itself cannot think" (PF, p. 106). This is similar to his writings on faith and the possible, to which I will return below. Kierkegaard continues:

> But what is this unknown against which the understanding in its paradoxical passion collides and which even disturbs man and his self-knowledge? It is the unknown. But it is not a human being, insofar as he knows man, or anything else that he knows. Therefore, let us call this unknown *the god.* It is only a name we give to it (PF, p. 107, italics in original).

It is clear that Kierkegaard's conception of the unknown, of the limits of knowledge, is different from a normative understanding of the un-

known as that which is "not known", a "known negative", a "known unknown" or a case of "insufficient knowledge". A.D.C. Cake explains that the unknown as Kierkegaard conceives it "cannot fall under the auspices of understanding" (Cake 2010). The unknown forms the incentive and torment of understanding as it forms the frontier, the boundary of human knowledge—of thought itself. The unknown, as Kierkegaard conceptualises it, cannot ever be known or grasped, as understanding cannot transcend itself. As Cake puts it:

> **[T]he understanding and the unknown are at odds in such a way that where the understanding advances, the unknown recedes; as the understanding seeks to subject the unknown to its established categories, the unknown remains indefinable. ...The understanding's paradoxical passion is thus the irresistible urge to subject the unknown to its own standard of truth, which is impossible (Cake 2010, n.p.).**

One cannot describe in human terms what transcends the earthly, Kierkegaard argues. Before continuing, I want to propose an agnostic reading of Kierkegaard's Christian god and interpret the unknown as unknowable abstractions to which we stand in relation but do not have access to or knowledge of. From an agnostic perspective, what we stand in relation to cannot fully be covered by knowledge. Sure, we are grounded in and limited by necessity, determined by all kinds of social forces, and yes there is causality, but there might be dimensions that defy determinism and causation and that nonetheless affect us, perhaps even fundamentally.

For Kierkegaard, the limits of knowledge are formed by what transcends the earthly, which is faith. To live with faith is to open up to the presence of things outside of the thinkable, a relating to what transcends the earthly and the self, but what is nonetheless fundamental to

human existence (SUD, p. 38). To live with faith requires to give up on the pretence that science can explain everything (SUD, p. 38). Faith is not a theoretical construct. It is not something that can be understood by intellectual pursuit. Importantly, neither is it the result of carefully followed Biblical instructions or saying grace on Sunday visits to some church. In FT, Kierkegaard writes about the relation between faith and knowledge. Faith, he argues, flourishes in the impasse of not-knowing. To have faith requires the ability to relate to that which the eye cannot see and reason and logic cannot fathom. In CA, Kierkegaard describes faith as that "which no science has explained and which no science can explain" (CA, p. 116). When it comes to understanding existence, we depend on faith, Kierkegaard argues. Importantly, faith conditions the possible, without faith no possibility. I will return this in the next section.

"What does this synthesis of faith and knowledge mean for Truth?", you may ask. It would be hyperbolic to say this comes down to relativism or subjectivism or scepticism. The truth may not be attainable, but what Kierkegaard offers in return is subjective truth, a truth that is true for you, or what he describes as "the truth of appropriation" (CUP, p. 41). Subjective truth is an idea or value you should be willing to commit your life to. Thus, subjective truth does not preclude strong, passionate convictions. However, subjective truth is haunted by its own limits, by uncertainty and the unknown. Subjective truth will always remain an "objective uncertainty" as it is never granted that status of a fact or Truth. Therefore, to choose to commit to a subjective truth is a risky business, giving rise to anxiety, and takes courage, perseverance, and imagination. Kierkegaard:

Without risk, no faith… If I am able to apprehend God

objectively, I do not have faith; but because I cannot do this, I must have faith. If I want to keep myself in faith, I must continually see to it that I hold fast the objective uncertainty, see to it that in the objective uncertainty I am "out on 70,000 fathoms of water" and still have faith (CUP, p. 435).

Chapter 3 zooms in on artistic representations of algorithmic trading on the financial markets. Engagements with trading algorithms, broadly speaking, fall into two categories. In the first, trading algorithms are imagined as ungraspable structures with divine-like foreknowledge and power, inaccessible to mortals and human understanding. Algorithmic anxiety in relation to such an understanding of trading algorithms is similar to fears of God's wrath. In the second, the emphasis is given to the limits of algorithmic knowledge production and focus shifts to that which cannot be calculated, predicted or anticipated. In chapter 3, I discuss different artworks that explore what may become possible when one lives in relationship to things that we cannot gain knowledge of.

Finally, Chapter 4 engages with algorithmic anxiety in relation to search engine algorithms. Anxieties of this kind are conditioned by an awareness of the limits of knowledge. The chapter primarily focuses on one artist whose work could be regarded as a contemporary response to living with faith, more generally; and to how the commitment to a subjective truth might take shape in relation to algorithmic knowledge production, more specifically.

THE POSSIBLE AS MOVEMENT, AS THE ANTIDOTE TO ANXIETY AND STAND-STILL

Perhaps the red thread in Kierkegaard's conception of anxiety and, by extension, in his conception of the self as a relational being and his con-

ception of faith, is a profound reflection on the conditions—and importantly *not the causes*—under which change becomes possible. That is the conditions under which the possible becomes possible. The concept of the possible—and other terms with which Kierkegaard refers to it, "absolute freedom", "God", "infinity"—is central to his conception of anxiety and is interlinked with his epistemology of the self and his ontology of knowledge. In CA, Kierkegaard describes the possible as an event, an unexpected moment, and he associates it in FT with the "absurd" (FT, p. 46) and in CA with "the suddenness of the enigmatic" (CA, p. 71).

However, although everything is possible in the possible, not everyone is aware of it. In SUD, Kierkegaard assumes that fatalists, determinists and those who he calls 'philistine-bourgeois' lack awareness of possibility. For these people everything has become necessary and trivial, which means they live in deeply sunk in finitude (SUD, p. 40). As mentioned earlier, the self, as a process of becoming, is a synthesis of possibility and necessity, the finite and the infinite (SUD p. 40). Kierkegaard likens this synthesis to breathing. You need to both inhale and exhale to stay alive. The fatalist, determinist, or the philistine, he argues, cannot breathe,

> **...for it is impossible to breathe necessity exclusively, because that would utterly suffocate a person's self. ...[P]ossibility is for the self what oxygen is for breathing (SUD p. 40).**

And just as inhaling alone or exhaling alone cannot be the condition for breathing, so too possibility alone or necessity alone can no more be the condition for existing. The possible needs to be grounded in necessity. The possible is about thinking possibility and necessity at the same time; it is about thinking and doing the actual and the virtual at once. This is not an easy task. It is a process of "continual movement on the

spot", to use Kierkegaard's phrase. The outcome of this process is uncertain, as the possible defies laws of calculation and causation. It is not something that can be produced, mobilised, or spoken into existence. In FT he writes:

> **From the external and visible work there comes as old adage: "Only one who works gets bread". Oddly enough, the adage does not fit the world in which it is most at home, for imperfection is the fundamental law of the external world, and here it happens again and again that he who does not work does get bread, and he who sleeps gets even more abundantly than he who works (p. 27).**

The idea that if you do good, the good of the possible will come to you is a falsity, according to Kierkegaard. Some people work their socks off, are exploited, and have no bread to eat. Others do not do a stroke of work and have their bellies full of bread. For the possible everything is equally possible, which is why the possible inspires anxiety. Anxiety concerns the possible of the possible.

To explain the possible, in FT Kierkegaard metaphorically stages a ballet dancer. He says:

> **[i]t is supposed to be the most difficult feat for a ballet dancer to leap into a specific posture in such a way that he never once strains for the posture but in the very leap assumes the posture (p. 41).**

By assuming the posture he never once strained for, the dancer makes "the movement of faith" (FT, p. 34). The idea is that one orients one's thinking, being and acting to an ideal, even though this ideal may very well be unreachable. To relate to the possible is a recognition of how

things are *and* a recognition that things could be and should be otherwise, even if they won't be otherwise. The ideal ought to be realisable, but may not be realisable; by assuming it, one resigns to its possibility. This happens "by virtue of the absurd, for human calculation is out of the question," Kierkegaard insists (FT, p. 46). By calling such an event absurd, he emphasises that it is qualitatively different from knowledge and that it is not identical with the improbable, the unexpected, or the unforeseen (FT, p. 47). It also stresses his point that there is *no causality* between really wanting something and working your fingers to your bones and achieving what you want. A similar logic can be found in his writings about the exception. The exception, Kierkegaard writes in *Repetition* (1843), cannot bypass the universal but "battles through it" (p. 226). It is an absurd and paradoxical simultaneity of the universal and the particular, of the immanent in the transcendent—a movement of infinity in a finite world.

Movement is central to Kierkegaard's conception of the possible and to his thinking in general. In Kierkegaard's work, movement is often expressed with notions such as "the leap of faith", the "movement of infinity", "battling through" and the "step into". It is not a linear or progressive movement he has in mind. Movement, as he understands it, does not have an address or destination. Movement at the spot, Kierkegaard explains, "neither moves from the place where it is nor arrives anywhere" (SUD, p. 36).

In CA, Kierkegaard describes this synthesis as follows:

> **The eternal is [...] the present. [The eternal] is a going on that** *never moves from the spot,* **since for our powers of representation, the eternal is the infinitely contentful present. In the eternal, there is again no division to be found into past and**

> **future, because the present is posited as the annulled succession (CA, p. 152, italics mine).**

His idiosyncratic conception of movement at the spot is not, of course, merely a theoretical construct. Moving, or walking to be more precise, was essential to the way he *lived* his philosophy, too, both as a tribute to his great inspiration, Socrates, and crucially as a way to avoid stagnation or paralysis in his thinking-as-being. In a letter to his deeply depressed sister-in-law he writes:

> **Above all, do not lose your desire to walk… Every day I walk myself into a state of well-being and walk away from every illness; I have walked myself into my best thoughts, and I know of no thought so burdensome that one cannot walk away from it (Kierkegaard quoted in Kirmmse 2018, p. xvii, xviii).**

Kierkegaard associates movement with passion, with becoming inspired, or with being motivated. With passion, with inspiration and elation, an opening may occur, an opening to the possible. To an extent, movement at the spot is a principle against succumbing to necessity—and for living with possibility. It is what keeps the endless human endeavour going on. In the final chapter of this dissertation, chapter 5, movement at the spot will be reframed as a creative and productive form of living through algorithmic anxiety. In that chapter, the central motifs and concepts of the artistic representations discussed in the previous chapters—masks and camouflage (chapter 2); hybrids and spectres (chapter 3); collectors and collections (chapter 4)—will be interpreted as figures of movement at the spot that represent a synthesis between possibility and necessity and that each in their own way

present different ways to relate to the possible in order to live through algorithmic anxiety.

TOWARDS A CONCEPTION OF ALGORITHMIC ANXIETY AS A RELATION TO THE POSSIBLE

We might be entangled with, but we are not tied to algorithms. Artistic engagements with algorithms have often been interpreted as expressions of concerns about algorithmic governance, algorithmic opacity, and algorithmic selves. In this dissertation, algorithmic anxiety is understood as a lack of movement, a dwelling in and an overemphasis of one side of the relation between the finite and the infinite and possibility and necessity. It is about the possible of algorithmic culture; what algorithms might do, what they might become, and the position the self occupies in relation. However, algorithmic anxiety is not a sentimental subjectivity, nor a personal pathology related to one's feelings regarding algorithms. It concerns the possible of the entanglement between the social and algorithmic technologies. Despair about the future possibilities of algorithmic culture arises predominantly when the narrow and converging aspects of algorithmic culture are over-emphasised, and this happens when the possible self is perceived to be circumscribed, bounded, and governed by algorithmic regimes. The finite aspects of algorithmic culture are then over-coded and the relations around which the self, the structures of actuality, and the production of knowledge cohere and are then imagined to be predominantly produced and constrained by the algorithmic. Despair about the future of the self in algorithmic culture may also be conditioned by the over-emphasising and over-coding of the infinite and the possible, up to the point that it has lost its footing in necessity. This happens, for example, with a type of

thinking in which the algorithmic technologies of advanced capitalism are mystified, depoliticised, and imagined as having infinite and God-like powers.

The starting point for the development of the concept of algorithmic anxiety in the course of this dissertation is the suggestion that anxiety about algorithms lacks grounding in possibility or necessity and requires imagination. Imagination is key here. Imagination does not preclude reason, logic, or the finite, but it may break open algorithmic determinism, fatalism, cynicism, and nihilism, opening up to possibility. Imagination, as Kierkegaard puts it, "is not a capacity, as are the others—if one wishes to speak in those terms, it is the capacity *instar omnium* [for all capacities]" (SUD, p. 30-31). As such, algorithmic anxiety also provides the opportunity to open up to alternative imaginations. And imagination can take many forms—such as faith, passion, and movement at the spot, which all condition the possible. It is not about *this* or *that* utopian vision of the future of algorithmic culture. Instead, it is about imagining the conditions for change, imagining movement in a situation of experienced stand-still and constriction. Imagination as the condition for movement at the spot is here understood as relying on a sense of possibility, beyond what is given in the algorithmic present. It is about extending the present[12].

Which is to say, the Achilles' heel of algorithmic anxiety is not "the algorithm" per se, but the "finitising" of the infinite. Algorithmic anxiety requires a response and this response signals one's relationship to the extending constituents of the self, actuality and knowledge—to the possible. This is the paradox of algorithmic anxiety: it is the *un*-algorithmic which conditions possibility within the algorithmic. The task

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12 –   Or, as Muhammad Ali once famously phrased it in a different context: "The man who has no imagination has no wings".

is to engage with what conditions the possible, but in relation to and grounded in necessity. The possible is conditioned by imagining "movement in that place," (SUD, p. 36) and "that place" is algorithmic culture.

A few intriguing contemporary artworks that underline the interrelation and overlap between the confining and extending aspects of the self, actuality and knowledge emblematise this kind of "movement" in algorithmic culture. In these artworks, an articulation of movement at the spot arises in the form of masks and camouflage (chapter 2), of spectres and deities (chapter 3), and collectors and collections (chapter 4). This articulation shows practices that are conducive to living with algorithmic anxiety. These works take different positions in relation, on the one hand, to the radical openness of the self, knowledge and actuality; *and,* on the other, to the rigid algorithmic regimes that attempt to circumscribe this openness in the interest of profit and control. These different stances are not fixed nor given, but dynamic, relational, uneven, interdependent and context-dependent, pointing to the many contradictory relations within algorithmic culture and opening it up to alternative imaginations that move towards algorithmic possibility.
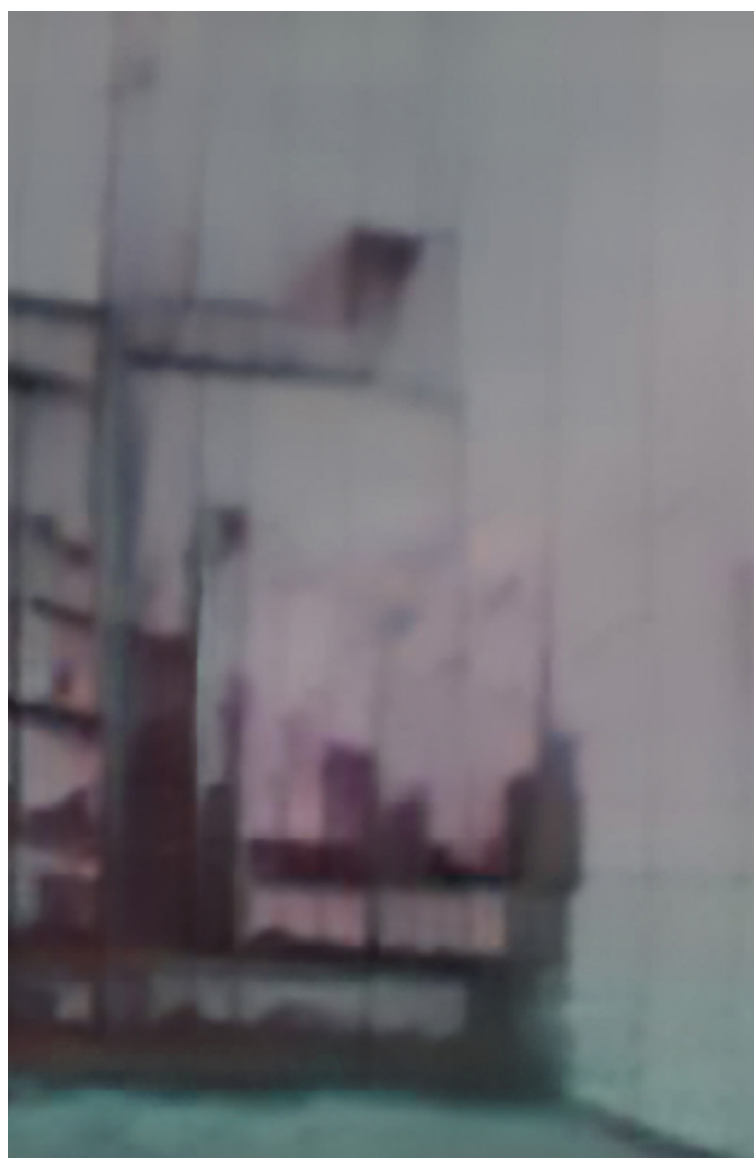
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Masked and Camouflaged: Thwarting Off Facial Recognition Algorithms, or The Possibility of Self

But, of course (…)
we do not "own" the facts of our lives at all.
This ownership passes out of our hands at birth,
at the moment we are first observed.

— **JANET MALCOLM**, *THE SILENT WOMAN*

INTRODUCTION

AN "ANTI-FACIAL RECOGNITION MOVEMENT IS ON THE RISE," WRITES JOSEPH COX for *The Kernel* (COX 2014). IT IS PERHAPS PREMATURE TO SPEAK OF A "MOVEMENT", BUT INDEED A NUMBER OF ARTISTS HAVE EXPRESSED ANXIETY ABOUT THE ALLEGED UBIQUITOUS IMPLEMENTATION AND DISSEMINATION OF FACIAL AND IDENTITY RECOGNITION TECHNOLOGIES. In particular, masks and camouflage wear have emerged as a response to facial recognition technology. They are exhibited in international art shows, both as art and design projects and as a socio-technical commentary. Some masks and camouflage wear are also commercially available as gear that provides access to potentially subversive modalities of being public; they are sold with the promise that they undercut or confuse facial recognition algorithms online and offline. In the following,[13] I explore the concept of algorithmic anxiety through artistic mask and camouflage design.

Masks and stealth wear are popular attempts to avoid algorithmic anxiety created by facial recognition systems. Masks, umbrellas, goggles, veils, and balaclavas are common occurrences in exhibitions on algorithmic culture. Within this imaginary, artists adopt a language and strategies of field exploration and couple individual rights claims with guerrilla and "reconquistador" approaches. In this chapter, I will focus on the ways in which the artists Zach Blas, Adam Harvey, and Sterling Crispin critique forms of algorithmic governance manifested by facial recognition technologies. The work of these three artists has been widely exhibited in museums, galleries, art institutions, and at festivals

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13 –   This chapter is lightly revised from de Vries, P., & Schinkel, W. (2019). Algorithmic anxiety: Masks and camouflage in artistic imaginaries of facial recognition algorithms. Big Data & Society. https://doi.org/10.1177/2053951719851532

and conferences in Europe, the U.S., and the U.K. and each of these projects have garnered a fair deal of media attention in the international press and by magazines and blogs that discuss digital media culture. Each of these projects is specifically aimed at facial recognition technology—which differs from mask projects that engage with online and offline anonymity, with privacy in relation to political activism, and/or with data-mining in general.[14] More often than not, the work of these artists is framed as an artistic response to surveillance—or, as counter-surveillance strategies.

As Alexander Galloway puts it:

...we are witnessing a rise in the politicisation of absence- and presence-oriented themes such as invisibility, opacity, and anonymity, or the relationship between identification and legibility, or the tactics of nonexistence and disappearance (Galloway, 2008, p. 224).

Galloway calls this politicisation of absence the "black-boxing of the self" (Galloway, 2008, p. 224). In this chapter, however, mask and camouflage projects are explored as different responses to algorithmic anxiety, exploring the future self in relation to the dissemination of the algorithmic facial recognition systems which have become characteristic of algorithmic culture. Why take the route of concealment strategies? What imperatives shape and underpin these designs? What forms of relating to facial recognition technology does this approach privilege? Algorithmic anxiety in relation to facial recognition technologies revolves around the position of the self in algorithmic culture and around

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14 – Such as the hackers collective Anonymous, and the work of artists such as Mark Shepherd, Martin Backes, Kiri Dalena, Peter Weibel, and Ingrid Burrington, to name but a few.

the face as understood as an index of humanity. Masks and camouflage art practices question the affordances of algorithmic governance by way of facial recognition technologies, focusing on a self who is immersed in a regime of visibility that itself remains mostly invisible. Questions concerning the understanding of the self in relation to this regime of visibility will be the focus of this analysis. I propose that a relational assessment of the concepts of masks and camouflage wear allows for a better understanding of the algorithmic anxieties around facial recognition systems.

CAPTURING THE FACE ANXIETY

Ever since the portrait photography of Ellis Island immigrants by Dorothea Lang, Walker Evans, Arthur Rothstein and Gordon Parks, the face has undeniably become a political landscape in the arts. In a way, the mask and camouflage projects that form the subject of this chapter constitute a reversal of the classic artistic tradition of portraiture and of the latest craze in the selfie culture. It also twists what Mark B.N. Hansen dubbed the "digital-facial-image" (DFI), with which he described a trend in contemporary art that focused on the digitally generated face. Leaning on the work of Félix Guattari and Gilles Deleuze and their concepts of faciality and the face machine, Hansen proposed his notion of DFI as "a new paradigm" in contemporary art (Hansen, 2003, p. 205). These days, it seems, artists and designers are more focused on attempts to derail the technologies that aim to capture the face by hiding faces, covering them up, or rendering them unrecognisable to facial recognition technology. Artists use low-tech, no-tech and various forms of technological engineering in developing face masks and camouflage wear both as forms of critique and as responses to the possible effects facial recog-

nition technologies may have on people and society when operated by the state or by tech giants. What these different art projects show is not just that the technology that underpins facial recognition algorithms is fallible. The different machinations of faciality outlined below—as a singular, unique, personal and identifiable security-check, as the imposition of a political norm, as collective empowerment, as a plural, multi-form, malleable and amendable canvas, as a means to play with identity, similarity and difference, and as a source of data extraction—indicate that supra-individual cultural narratives and concerns about policing and governance are braided around the algorithmic capture of the face.

Examples are numerous. The artist and designer Mark Shepherd (2010) developed *The Sentient City Survival Kit.* The artefacts of this kit include a CCD-Me-Not umbrella equipped with LED lights that defuses recognition technology used in CCTV cameras. Two years later, in 2012, researchers at the National Institute of Informatics in Tokyo presented what they named privacy goggles. The glasses are fitted out with infrared light sources that, when on, confuse CCTV cameras equipped with facial recognition software—reportedly without impairing your vision. Inspired by these privacy goggles, the artist Ewa Novak designed what she describes as face jewellery, which won her the Mazda Design Award in Łódź in 2019 (Studarus 2017). This jewellery is made of brass and looks like topsy-turvy glasses with brass ovals that hang below the eyes. In 2016, researchers from Carnegie Mellon University presented a pattern for spectacle frames meant to throw state-of-the-art facial recognition software off-trail.

Low-tech camouflage gadgets have been taken up too, with the specific aim of preventing face detection on the streets and online. With *PIXELHEAD* (2012), the German artist Martin Backes designed a balaclava in camouflage style. It "acts as media camouflage" and is meant to

offer "anonymity in the Internet era" by making facial recognition impossible (Backes 2012). On his website, Backes notes that he is worried about the social consequences of facial recognition technology and, in particular, that anonymity will lose its meaning on the internet (Backes 2012). *Realface Glamouflage* (2013) is a collection of T-shirts designed by Simone C. Niquille. The pattern on the shirts is composed of a collage of celebrity impersonators and pirated portraits used for fake social media accounts which reportedly confuse facial recognition technology. Adam Harvey's *CV Dazzle* (2012) uses camouflage makeup to obstruct face-detection technology. The term "dazzle" refers to a painting technique that was used on warships during World War I. The stripes and bold colours of this technique were designed to disrupt the outline of a ship. Dazzling made it difficult for an enemy ship to detect a ship's size, range, and direction at sea. Inspired by this technique, Harvey's *CV Dazzle* makeup design disrupts detection by facial recognition algorithms by dazzling facial features. The project is part of his larger project, *The Privacy Gift Shop* (2012), an e-commerce platform for counter-surveillance gadgets mainly aimed at subverting national security technology and meant to "minimise or degrade the useful information received by the observer" (Harvey, 2018, p. 130). He explains in an interview with the BBC that what motivated this work is that he feels that somebody is watching him in his day to day activities, "that you always have a chaperone," someone who looks over your shoulder (Harvey 2014). His project was featured in *The New York Times* (Harvey, 2013) and his dazzling makeup was applied to visitors of TransCyberian, Parisian hacker-run noise parties that would also teach visitors about online security (Doringer & Flederer, 2018, p. 12). A comparable anti-facial recognition makeup design was launched in 2017 by Grigory Bakunov, director of technology distribution at Yandex, a Russian tech giant.

In recent years, a variety of face masks have entered the exhibition space of museums. An often-exhibited anti-facial recognition mask is Zach Blas's *Face Cages* (2013-2016). In this work, Blas fabricated face masks that resemble iron muzzles based on the shape of biometric diagrams, evoking resonances with prison bars, the Scold's Bridle, and torture devices used during slavery in the U.S. and in the Medieval period in Europe. His *Face Cages* have been on display throughout Europe, for example in the two-part exhibition in Vienna and Amsterdam titled *FACELESS*—which also showed work of Adam Harvey. *FACELESS* focused on hidden faces in contemporary art since 9/11 and thematised issues such as "privacy, the burka, data-collection, terrorism, etc." (Doringer & Felderer, 2018, p. 8). Furthermore, the past decade witnessed protest movements whose signature is a face mask used both to avoid face detection technology and as a way to express collective belonging and togetherness. Prominent examples include the Guy Fawkes masks used by Anonymous and worn during public protests by the Occupy Wall Street movement; the colourful knitted balaclavas of the Russian punk protest group Pussy Riot; and the black balaclavas of the Zapatista Army of National Liberation.

That the face, masks and camouflage figure so prominently in exhibitions is likely because these projects illuminate the ways algorithmic technologies (re)configure identity and subjectivity. The face plays a central role in human interaction (Napier 1986; Ingold 2000). For this reason, communicative interaction in physical presence is often described as talking "face-to-face"—a concept extended by platforms such as Skype and FaceTime. Interaction, as Erving Goffman has famously said, is always also about avoiding being "in wrong face" or "being out of face" and about "saving face." What he calls maintenance of face is a condition of human interaction, and what he terms face work—namely

"the actions taken by a person to make whatever he is doing consistent with face"—is a key part of any interaction (Goffman, 1967, p. 12). Goffman thus uses "face" in a relational sense, defining it as

> **...the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact. Face is an image of self delineated in terms of approved social attributes (1967, p. 5).**

Because of this centrality of the face in interaction, it is at the same time an ambiguous phenomenon: it is both a screen that permits an assumed internal state to be seen and a cloak that conceals, as when secrets are hidden behind a straight face (Goffman, 1974, p. 216).[15]

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15 –   The face has been discussed thoroughly in philosophy, a history that I will not repeat here. Suffice to say perspectives vary greatly, ranging from the face understood as a repository of one's essence to an ever-changing infinite possibility. As central to the encounter with the other, the face has been granted a key role in ethics, most famously in the work of Emmanuel Levinas who, like Goffman, considers the face not as a part of the body nor even as mere physical appearance, but rather as "the way in which the other presents himself, exceeding *the idea of the other in me*" (Levinas 1969, p 50, italics in original). Judith Butler has called attention to the politics of what she calls radical effacement, whereby certain people never appear in a normative or political register because they have been effectively effaced either through occlusion or through representation, which means that their suffering and death therefore become ungrieveable (Butler 2004). And Gilles Deleuze and Félix Guattari argue that the face, in its normative understanding, is a codified and rigid landscape of power whose meaning and subject does not depend on the singular faciality traits co-opted by it. The face is the constant effort to over-code the uncodeable. (Deleuze & Guattari, 1987, p. 186).

THE SELF ENTANGLED WITH ALGORITHMS

The face is also vital in Kierkegaard's relational conception of the self. Kierkegaard's understanding of the face in relation to his notion of the self as a relational synthesis helps to better understand the constituents of the anxieties evoked by face recognition technology. In CA, he explains that in the experience of anxiety one becomes aware that one exists in relation: to our body, to our surroundings, our family, our past and future, the nation we inhabit, its culture, and the entire history of humankind (CA, 2014, p. 68). The self is a synthesis, Kierkegaard writes, and this synthesis is a relation (CA, 2014, p. 88). In SUD, Kierkegaard explains that the self as a relational synthesis is composed of contrasting elements: temporality and eternity, freedom and necessity and infinitude and finitude (SUD, p. 30). The task is to think these contrasting elements together, to actualise them together, in a never-ending process of becoming.

Importantly, what such a relational understanding implies is that the self is not autonomous. Kierkegaard writes,

> **...the self is a relation that relates itself to itself or is the relation's relating itself to itself in the relation; the self is not the relation but is the relation's relating itself to itself to and in relating itself to itself... The human self is such derived, established relation, a relation that relates itself to itself and in relating to itself it relates to another (SUD, p. 13-14).**

Again and again, Kierkegaard stresses the importance of the self's relation to itself, to its limitations and possibilities. As we are relational beings, we are not wholly transparent to ourselves, nor to others, neither are others to us. We always stand in relation to something "other." In

E/O he describes this 'something' as follows:

> **When you look long and attentively at a face, you sometimes discover that it is as if there were another face within the one you see. This is in general an unmistakable sign that the soul conceals an emigrant who has withdrawn from the outside world to watch over a hidden treasure, and the direction observation must take is intimated by the way one face lies as though inside the other...(E/O, p. 469).**

The face assumes here "an ambiguity" (E/O, p. 469). A face, as Kierkegaard describes it, carries another face. A face, understood this way, is always already masked.

Thus this "otherness within," this "hidden secret" to which we stand in relation and of which we have no knowledge, can condition anxiety. The question, for Kierkegaard, is how one relates to such ambiguities; that is, the question is how do we relate to being, in part, a stranger to ourselves. Algorithmic anxiety is more than an experience of uncertainty and a lack of control in the face of algorithms (as in Jhaver et al. 2018). It seems instead a more existential anxiety that pertains to the inability to fully understand or know the self. Algorithmic anxiety flares up when conceptions of subjectivity are perceived to be challenged by the capture of the face by facial recognition algorithms. This challenge, it seems, is posed by the access facial recognition systems are assumed to have to one's "hidden treasure." Which is to say, it is anxiety concerning the relations to whom and what subjects constitute themselves. It concerns who participate and to what extent in crafting observations, relations, and accounts of the self, and at what consequences, in terms of the affordances of technologies and the possibilities of subjectivity it might bring about.

ALGORITHMIC ANXIETY: ANTI-FACIAL RECOGNITION
MASKS & CAMOUFLAGE

Recognition algorithms are imagined to 'do' something with the 'self.' The question is *what* they are presumed to do and *how* they are imagined to do so. Three prominent and often-exhibited artistic portrayals of facial recognition algorithms provide a point of entry into the different ways the relation to facial recognition algorithms and the anxieties surrounding the possibilities of what these algorithms might do and what might become of the self are imagined. What is at stake is an ambiguous relation of the self in relation to itself and to facial recognition systems.

Artist and scholar Zach Blas's series of mask projects are designed to visualise how identity recognition technology analyses human faces whilst also resisting identity recognition technology by offering an undetectable face masks. His *Facial Weaponisation Suite* (2012-2014) comprises a series of amorphous collective masks designed and produced during community workshops by at LGBTI+ and minority groups. They are a form of resistance against facial recognition technologies and the inequalities these technologies normalise affecting minority groups disproportionately. These masks, by virtue of their shape and cryptographic material, will not be recognised as a face by identity recognition software. Identity recognition technology, as Blas sees it, "control[s] through an optical logic of making visible" to "police and criminalise populations all over the world" (Blas 2014). These technologies, he argues, produce standards "to account for human life" (Blas, 2016, p. 45). Data-mining algorithms require normalising techniques for indexing human activity and identity, which then operate as standard templates for regulation, management, and governance (Blas, 2016, p. 45). Models that account for what is "normal" and what defies "the normal."

Figure 1: An example of a face mask created by artist Zach Blas

His masks represent a resistance to what he calls "informatic visibili-ty", which he argues is reducing us to mere "aggregates of data" (Blas 2014). Informatic standardisations, in turn, produce a conception of the human "as that which is fully measurable, quantifiable, and knowable—that is, informatically visible—an enterprise that undoubtedly acceler-ates a neoliberal agenda" (Blas, 2016, p. 45). One mask in his suite, *Fag Face Mask* responds to scientific studies that claim to be able to deter-mine sexual orientation on the basis of facial recognition technologies (Blas 2014). Blas is worried about the development and implementation of facial recognition systems will exacerbate social inequalities, affect-ing minority groups in society in particular.

Technologist and artist Adam Harvey has a different approach. With *HyperFace* (2017), he designed camouflage couture which aims to confuse facial recognition systems. His couture does so by presenting these systems with countless false positives. *HyperFace* is a textile print that identity recognition technology detects as a face. The patterns are based on ideal-type models of algorithmic representations of a human face. *HyperFace*, he explains, is "a new kind of camouflage that aims to reduce the confidence score of facial detection and recognition by providing false faces that distract computer vision algorithms" (Harvey 2017). He continues:

> **[It] aims to alter the surrounding area… [and] offers a higher confidence score for a false face by exploiting a default in specific algorithmic systems for the highest confidence score (Harvey 2017).**

HyperFace reduces the confidence score of the real face by redirecting more attention to the nearby false face regions. Harvey states that his projects are motivated by concerns about how computer vision will

be used "to extract knowledge without the cooperation or consent of an individual" (Samuels 2017) and that facial recognition technology specifically

> **...poses a significant threat to privacy and liberty, but their vulnerabilities and imperfections also present a largely unexplored array of opportunities to reimagine appearance in the age of computer vision (Harvey, 2018, p.135).**

Figure 2: An example of a *HyperFace* pattern, created by artist Adam Harvey

The artist and technologist Sterling Crispin is concerned about the future effects recognition technology may have on humanity as a whole. He states: "I am concerned with the aggressive overdevelopment of surveillance technology and how this is changing human identity and how

human identity interacts with technology" (quoted in Doringer, 2018, p. 83). His *Data-Masks* (2013-2015) are 3-D printed face masks that visualise what robust, model-based recognition and detection algorithms recognise and detect as a face—or what passes as a face. They have been produced by reverse engineering facial recognition and detection algorithms. In his own words, "they show the machine what it's looking for"; they hold up a mirror to the machine (Crispin 2014). His *Data-Masks* are meant to make visible aspects of what Crispin understands as invisible power structures:

> *Data-masks* **are animistic deities, brought out of the algorithmic spirit-world of the machine and into our material world, ready to tell us their secrets or warn us of what's to come (Crispin 2013).**

Crispin writes about how we are "always already being seen, watched and analysed" by what he calls a "Technological Other, a global living super-organism" that is "peering into our bodies" (Crispin 2014).
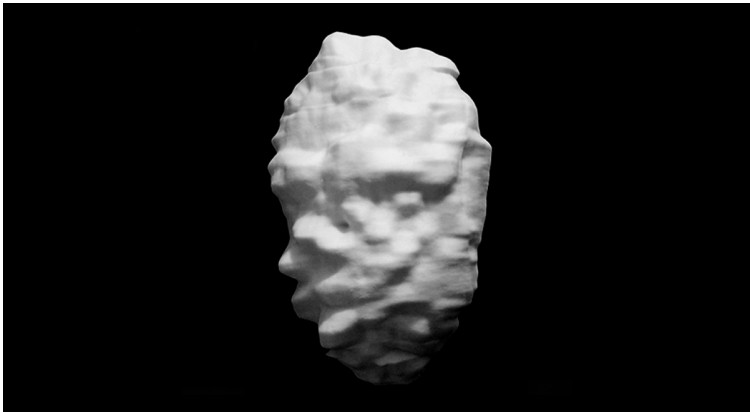
Figure 3: An example of a *Data-Mask* created by artist Sterling Crispin

For Blas, facial recognition propagates standardisation of behaviour and appearance, which he worries might single out minority and worsen the position of minority groups in society. Harvey is concerned mostly by the unknown ends to which recognition systems might be used in the near future and how this might impinge on hard-won liberties. And Crispin is anxious about the possible "Frankenstein-effect" he sees facial recognition systems to be a part of. The implications of facial recognition technology are by the account of the artists understood in relation to possible "ends" of privacy, liberty, and humanity. Facial recognition technology is given significance in relation to these supposed ends. It is these ends that give meaning to these technologies as a means in the present. Thinking in terms of ends provides orientation and direction, like a map: "We are here now, we came from there, and this is where we are going". This urge to locate, to position yourself in relation to a trajectory while simultaneously placing yourself outside of it or hovering above it, as if perusing a map, can be understood as the desire to look into the future to know what lies ahead and see where things are going to, perhaps in an attempt to deflect anxiety about the future. These masks and camouflage projects can *also* be used to re-think the self as a relational synthesis. These artworks bring the relationally of the self to the fore, and function as mediation in the relations between the self, the face, data algorithmically extracted from facial image and more abstract notions and preoccupations about the future of algorithmic culture for humankind.

<u>CAMOUFLAGE AND THE FACE MASK:</u>
<u>CONCEPTS OF RELATIONAL ENTANGLEMENT</u>

Anxiety about the future disposition of the self and humanity in relation to facial recognition technology is assuaged by becoming unrecognisable and by concealment, in becoming undetectable and unidentifiable to identity recognition technology by way of masking and camouflage. Blas, Harvey, and Crispin maintain that one can undermine being captured by recognition technology by becoming unrecognisable to it. This raises the question of what concept of relationality and entanglement is operative in the deployment of masks and camouflage by the artists discussed here. To answer that, it's necessary first to explore how camouflage and masks have historically been one of the primary media through which subjectivities have been cultivated.

Harvey's *HyperFace* plays with the concept of guerrilla-style camouflage. Camouflage is here not a form of invisibility; it is first and foremost a way of unrecognisability. Tactics of disappearing from algorithmic vision are mobilised as a countermeasure to the anxiety facial recognition algorithms induce. In *Hide and Seek: Camouflage, Photography, and the Media of Reconnaissance*, Hannah Rose Shell argues that camouflage is a way of "not showing up," to appear to disappear, to recede into the background, to become invisible (Shell, 2012, p. 10). The objective is to minimise the difference between figure and ground, object and environment. Camouflage involves both revealing and concealing (Leach, 2006, p. 244). It is thus a tactic of invisibility through visibility. This play between the visible and the invisible in camouflage displays its entanglement with both art and warfare, as both share the desire to explore the limits of vision and, importantly, the entanglement of a subject with its socio-technical environment. Shell recounts how different histori-

cal forms of camouflage were developed in tandem with artists, using different media from painting to film (Shell 2012). What all forms of camouflage have in common is the shared concern with the blurring of boundaries between self and environment. Likewise, contemporary army uniforms are camouflaged as to be "disruptive": their

> **...purpose is to make it difficult for the eye to discern the edges and contours of the wearer's form. They are designed not to look like bark, grass and leaves which is the paradigm of the old camouflage, but rather to dissolve into formless dapples of detritus, light and shadow (Swedberg, 2007, p. 72).**

Thus, both in traditional forms of camouflage and in the contemporary artistic camouflage forms described here, camouflage is aimed at blurring boundaries: the point of giving off bark and leaves was always to blur the boundary between self and environment, to escape from vision by an adversary or some medium of capture. Camouflage is as much a concept of entanglement as it is of concealment.

This, too, follows Roger Caillois's classic description of camouflage. Writing about mimicry and legendary psychasthenia, Caillois discussed camouflage as the loss of boundaries of the self in terms of natural phenomena of concealment, noting, in particular, a form of "depersonalisation" by assimilation to space (Caillois 1984). Camouflage always concerns a desire to escape from vision by something or someone, and a play with relations between self, environment and a medium of perception. At the same time, as Hannah Rose Shell notes, camouflage is "a form of cultivated subjectivity" (Shell, 2012, p. 19). Seen in this light, Harvey's *HyperFace* depersonalises the face while it simultaneously cultivates subjectivity.

Face masks too have historically been among the primary media

through which subjectivities have been cultivated. In fact, the concept of person comes from the Latin *persona*, denoting a theatrical mask. Less well known is that *persona* is a more complex concept altogether. It signifies *movement* and sound, a sounding through the face, literally a form of *per sonare*. The theatrical concept of the *persona* stands for both the mask and for the part played, but also for the face. Masks gain their connotations of ingenuity and antithetical to true, interior identities from later medieval, interpretations (Napier, 1986, p. 6-9). These connotations can still be found in the English language in expressions like "to show your true face", "put on a brave face", and in the verb "unmask". In Greek physical theatre, for example, masks symbolised a particular character, as masks transfix facial expressions, they divert attention from the face to the body, to its composure, how it moves around in space. In physical theatre, where the emphasis is laid on the embodiment of the narrative and on imagining narrative spaces through the body, the expressive face is seen as a possible distraction and obstacle to that end.

Japanese conceptions of masks, known for instance in *No* and *Kabuki* plays, have been discussed as much more complicated than simply the concealment of an interior self. Sakabe Megumi has for instance noted that in Yamato Japanese, the word for mask and for face was one and the same: *omote*. And, he argues, the related notion of *omo-zashi* (the features of the face) makes clear that this conception of the face is always already relational as it involves both that which is seen by the other and that which sees itself. According to Megumi,

> **...***omote* **is evidently the structure of the mask... but at the same time it is also the structure of the face. The reason is that the face also is what is seen by the other, what sees itself, and what sees itself as an other (Megumi, 1999, p. 245).**

Crucially, *omote* refers to the structure of a surface, but a surface without an original. Its relationality pertains not to hypostatized "personal" selves, but to a surface play of reflections. Discussing animal masks among Inuit and Yup'ik people of Alaska, Tim Ingold notes that "there is no face peering out from behind the mask. In effect, the identity of the human mask-bearer is not so much disguised as displaced by the mask he carries" (Ingold, 2000, p. 124). Here a synthesis comes into view: the self-as-other. This self-as-other becomes literal and concrete in Crispin's *Data-Masks* and Blas's *Facial Weaponization Suite*, as both their series of masks have been modelled from aggregated facial data. The pink amorphous blob of his *Facial Weaponisation* series, for instance, has been generated from the data of the faces of participants that attended the community workshops that Blas organised and who self-identified as gay; the black masks by the aggregated data of participants who self-identified as black. This presenting of the self-as-other(s) is here a tactic of unrecognisability. It raises the question: To what power do they desire to become unrecognisable?

BLACK BOXING THE SELF

Kathryn Schulz writes: "[T]he dream of invisibility is not about attaining power but escaping it" (Schulz 2015). According to the campaigns of many social movements of the past sixty years, visibility—in the form of recognition of identity—is a precondition for emancipation and thus representation and power. For these artists, however, invisibility is less of a condition to be overcome—of disempowerment—and more a precondition of the possibility of empowerment. Where identity and recognition politics are traditionally about becoming recognised and visible—as visibility and recognition is the privilege of the white male

and dominant class—here, unrecognisability is regarded as politically empowering. Obviously, the shapes and patterns that subvert algorithmic detection through masks and textile are hyper-visible, making you stand out in a crowd. It then seems ironic that these hyper-visible camouflage projects are designed by white, Western, tech-savvy, educated men: an already highly recognised and visible identity. Within these artworks, however, being visible and recognisable has to do with automated administration with technological detection, with being monitored, pinpointed, and identified in the interest of others. This time it is a strategy of personal control, an attempt to opt-out of a so-conceived regime of visibility. From what do these artists imagine to hide?

Algorithmic culture is associated with a police state, with classism and racism, with a dehumanising organism, and with being catalogued like a proprietary object. What evokes anxiety is the possibility of powerlessness, the possibility of being exposed, identified and characterised, being surpassed and overpowered by a Technological Other, being discriminated against and judged on the basis of numbers according to set standards. Whether it is capitalism, asymmetric power relations, or technological rationality, all three artists are anxious about possible future scenarios of algorithmic identity recognition technology and the disposition of the self therein and all three are interested in creating "spaces" of invisibility, opacity, or unrecognisability. With his *Facial Weaponisation* masks, Blas aims to avoid becoming visible to recognition technology, which he associates with the control and policing of in particular minority groups. This controlling and policing, he suggests, happens by way of data aggregation via recognition technology. Harvey's *HyperFace* garment aims to prevent the extraction of knowledge by means of recognition technology, which he associates with a threat to privacy. And Crispin's *Data-Masks* aim to visualise machine vision, a vision he asso-

ciates with being "seen through" by a Technological Other. According to Crispin, "we live under the shadow of a totalitarian police state…" (Crispin 2014). He claims we are "witnessing the rise of a Globally Networked Technological Organism" that will "exceed the human mind," and that the "human is lost in all this" (Crispin 2014). For Harvey, the problem is the "imbalance of power between the surveillant and the surveilled [sic]" (Harvey 2013). It is the "ubiquitous and unregulated profiling and cataloguing aspect" of these identification technologies that he considers a threat to privacy (Harvey 2013). Blas fears that "the global standards" recognition technology relies on "return us to the classist, racist, sexist scientific endeavours of the nineteenth century" and lead toward "Total Quantification", annihilating "alterity" (Blas 2014).

What do these zones of unrecognisability provide that otherwise is lost to facial recognition systems? Harvey's camouflage projects claim to provide "more control over your privacy" by "protecting your data" (Harvey 2013). Crispin caters to the supposed needs of protestors. His *Data-Masks* are "intended for use in acts of protest and civil disobedience" (Crispin 2014). They are themselves "an act of political protest" by means of "giving form to an otherwise invisible network of control" (Crispin 2014). Blas sees his masks as a tool in the tradition of collective protest movements like Anonymous, the Zapatistas and Pussy Riot: "[f]acelessness and becoming imperceptible are serious threats to the state and capitalism," Blas claims in a video Communiqué (Blas quoted in Cox 2014). He calls for "radical exits that open pathways to self-determination and autonomy" (Blas 2016, p. 47). It thus appears that, to these artists, to be 'seen' is to be recognised, to be recognised is to be analysed and to be analysed is to be reduced to information. This information is, in turn, used by states and corporations as the primary tool to gain and maintain power. This power is conceived as an influ-

ence over one's decisions and behaviour. Facial recognition technology operated by capitalist and state powers is associated with a form of mediated and remote influence on one's behaviour.[16] This technologically mediated influence is considered a form of direct interference in and infiltration into the core of what makes for a person: independent ownership of its decisions and behaviour, which have to be guarded and protected from this kind of meddling. It seems as if facial recognition technology operated by states and corporations is associated with having access to Kierkegaard's emigrant who hides in one's soul. These fears of "decision-intrusion" (Acland 2012), of being influenced in one's decision-making by outside forces that operate according to their own, and seemingly opposed, interests, suggests the susceptibility of the mind and its dwindling agency in the face of algorithmic capture of the face. This view is not far ahead of positions on algorithmic selves discussed in chapter 1.

Described in the above are anxieties about the effects of algorithmic biopolitics, or the disciplinary governing of people by way of an algorithmic logic of cost-reduction, calculations, measurements, comparison, and evaluation, which is indicative of a particular understanding of the self and a specific understanding of facial recognition algorithms. It is feared that employed in a certain way, the alleged power of algo-

....

16 –   The notion of dwindling agency as an effect of subliminal techniques used by mass media is a well-known trope in media and communication history (e.g. Acland 2012). The myth of an influencing machine, drug or technique perfected to implant and remove ideas and feelings operated by enemies as instruments of mind-control is a staple in histories of the Cold War, and specifically in the infamous history of the C.I.A.'s late 1940s and early 1950s mind-control program MK ULTRA (e.g. Acland 2012, Turner 2004, Kinzer 2019). The fear of being watched and judged when one assumes no one is watching is also a recurring theme in American blockbuster horror movies.

rithms may nudge people into amiable, docile tools for those in whose interests recognition technology systems operate. The biopower ascribed to facial recognition systems flows from its collecting and using of information to which the captured face gives access. The form of biopower that information collection exerts is imagined in different ways. Blas fears an algorithmic culture in which LGBTI+ minority groups are targeted, excluded, and treated with indifference. Harvey fears being itemised, listed, and valued only in relation to the data that can be extracted and collected from his walks of life in the interests of profit or power for others. Crispin's fears the loss of authority, being ineffectual and being objectified by another organism that has no concern for who he is. He argues that these networked systems "see human beings as abstract things, patterns, and numbers, not as individual people whose lives matter" (Crispin 2014).

Algorithmic anxiety in relation to facial recognition technology shares characteristics with dystopian technological narratives. As Wendy Chun observes,

> **…paranoid narratives of Big Brother's all-seeing and all-archiving eye are similarly agoraphobic. They too mark as ideal noninvasive, happy spaces … The info-paranoid respond to the current 'public' infrastructure …by creating private (that is, secret) spaces or cloaks, within which they hope to be invisible (Chun, 2006, p. 255).**

These artists seem to suggest that to safeguard the self from the all-seeing and all-archiving eye of algorithmic culture, what is needed is to thwart facial recognition technology. Indeed, such an imagination, as Hans Harbers argues in another context, echoes "the endemic Romantic narrative of despair of being overrun by a technological juggernaut,

which is guided only by instrumental values..." (Harbers 2005, p. 12). However, looking at these works through a Kierkegaardian lens, a different narrative emerges. It could be argued the despair of the artists lacks possibility, or that it lacks a sense of the infinite. A person who grounds itself in finitude, Kierkegaard explains, is overwhelmed by a daunting sense of constriction and limitation. He writes, "the determinist, the fatalist, is in despair ... because for him everything has become necessity" (SUD, p. 40). A balance needs to be found between a grounding in necessity and in the desire for self-transcendence, in possibility. Moreover, the imagination is what leads a person out into the infinite (SUD, p. 31). Algorithmic anxiety is about the position of the self towards the radical openness and unknowability of the future and towards the regimes that attempt to close in on, narrow, and delineate that future, which raises the question: How can we strike a different balance between necessity and possibility?

A RELATIONAL CHOREOGRAPHY OF SELVES

What is at stake for these artists? Or rather, where lies their despair? What does their despair lack? For Crispin and Harvey, algorithmic identification technologies provide an entry point to corrupt and inhibit what is considered to be a private and independent self, a self that by way of these technologies risks to become objectified as a means to unknown ends. Identity, understood as that part of the self where autonomy and independence reside, is at stake to facial recognition systems, Crispin and Harvey fear. Blas aims to provide "informatic invisibility" that aims to "open pathways to self-determination and autonomy" as "a means of resistance against the state and its identity politics" (Blas, 2016, p. 46-47). To resist the identity politics of the state is to defy its so-

cial normalising techniques for indexing, regulating and managing human behaviour that is "predetermined by a multifarious conglomerate of corporate, military, and state interests" (Blas, 2016, p. 45). Such a politics of rubrics and disembodiment, Blas states, "always enact a politics of reduction and exclusion" and "annihilates opacity" (Blas, 2016, p. 48).

Despair, Kierkegaard teaches us, is about lack and lack is about desire. As much as these projects are about thwarting facial recognition technology, they too allude to the desire of being included, valued, and acknowledged—in short, a longing to be recognised and seen by others. Algorithmic anxiety about the self is about the thin line between, the desire to be noticed, to be seen, and the fear to be exposed, judged, or to fall short. To be seen, as Audrey Lorde explains in a different context,

> **…is always fraught with danger… of contempt, of censure, or some judgment, or recognition, of challenge, of annihilation. But most of all, I think, we fear the visibility without which we cannot truly live (Lorde, 1984, p. 42).**

Lorde emphasises the inherent vulnerability of the relational self. Rather than an autonomous, independent, powerful individual, the self in relation to algorithmic culture is experienced as relational, dependent, vulnerable, malleable—at risk.

Considering these projects in more detail, tacitly but poignantly, brings complex connections between software, self and environment to the surface. These are connections that in a way, could be productively understood to *remind* liberal subjects, produced under conditions of the disavowal of their entangled being, of their relationality *and* what they desire and lack. Through the play with masks and the dissolving of self and environment, connections are made that mobilise a critical perception of human and machine relations, opening up an artistic space

which challenges dominant understandings of a self and allows for a different way of relating to algorithmic culture. Masks and camouflage, as I argued above, always already presuppose entanglement. Therefore, as Ingold notes, "the mask is not a disguise intended to hide the identity of the bearer" (Ingold, 2002, p. 123). Rather, practices of masking and camouflage intervene in the way the self becomes visible in relation to the self, others, and to its environment in the first place. To avoid being captured by recognition algorithms, camouflage provides a way to vanish in the background to non-identity. In the triad between self, environment and medium of capture, the self merges with its environment to the effect that it cannot be captured.

The pattern design of *HyperFace* performs this triad on the fabric it is printed on. The pattern keeps the face of its wearer unrecognisable by way of modifying the immediate surroundings of the wearer's face. The print designs flood or overwhelm recognition systems with false positives, with false faces. Harvey's *HyperFace* could be considered as a form of "depersonalization by assimilation to space", as we noted above, and as a way as to vanish in the crowd. Today, it has become increasingly difficult to hide within the crowd: cityscapes are dotted with state and corporate "gazes" in the form of CCTV and security cameras, recognition technologies, sensors, and monitors that assume constant observation and identification in public space. *HyperFace* provides its wearer with the condition of possibility to become a crowd. By sauntering in the city wearing *HyperFace* textiles, it could be argued Harvey "overturns the principle of being a citizen into a being hiding from itself and losing himself in the crowd" (Isin, 2002, p. 224). Or in the words of Brecht: "Man does not become man again by stepping forth from the masses but by sinking deeper into them," (quoted in Jonsson, 2013, p. 160). For Brecht, an individual belongs to several collectives and

is therefore divisible. This Brechtian divisibility is made explicit in the work of Harvey. The individual wearer of Harvey's *HyperFace* couture presents itself to recognition technologies as a crowd, representing an individual as a multitude. We are in constantly changing situations in our lives, Kierkegaard argues, but what does not change is the possibility to relate to the possible in every situation instead of organising one's life around a set of preconceived ideas, even when that situation is limited, and room to manoeuvre seems nil.

Let us turn to Blas's *Facial Weaponisation* series. The aim of Blas's masks is to provide "opacity," a concept he derived from the poet Édouard Glissant (Blas 2014). Glissant famously asserted "the right to opacity" (2010, p. 189). Here, opacity stands in contradistinction to the West's "old obsession" with "discovering what lies at the bottom of natures" and its "requirement for transparency" (Glissant, p. 190). Glissant contends that "opaqueness is to be opposed to any pseudo-humanist attempt to reduce us to the scale of some universal value, to any imposition of universal models on singularities" (Glissant, p. 191). Blas associates the "recognising" that algorithmic facial recognition systems do with imposed transparency. With his series of masks, Blas addresses who is made "informatically visible", pointing to the uneven rights and advantages enjoyed by some and lacked by minority groups in society. Some faces cannot disappear in a crowd; some faces are more vulnerable than others; some faces are feared, criminalised, and instrumentalised before they are recognised by algorithms. With this series, he attempts to "weaponise" against imposed transparency by offering the possibility to equip the face with a way of opting out and escaping from the logic of the visible.

Blas's face masks represent the desire to "let exist as such that which is immeasurable, unidentifiable nonidentifiable, and unintelligible in

things" (Blas, 2016, p. 48). This *laissez exister* is imagined as a possibility which is possible only in safe spaces that are free from intrusive technologies of informatic visibility, or what he calls "autonomous freezones": protected and closed-off areas. The "ideal of peace and quiet" is here produced by engaging masks as a weapon in combat against an imagined and externalised influencing machine (Colomina, 1991, p. 7). However, it is by virtue of this "free zone" between humans and their technological environment that the synthesis between the two is foregrounded. The possibility of individual alterity and singularity—externalised and imagined as a form of negative liberty—appears to stand in direct relation to, even depends on and is tied to, face capturing technologies of imagined capitalist and state-sanctioned standardisation and universalisation. Any sense of autonomy is here due to others, to the network of people and technologies we are part of and their dependencies. Kierkegaard argued that people tend to identify themselves with preconceived ideas about the self and others. He points to the dangers that lure when one identifies the self with the idea of the self. The prisons of the mind have been built by "what we think we know and what we think we are" and these prisons form an obstacle to freedom and possibility. Blas's despair lacks infinity; the relationship to infinity has to be repeated in the finite—by movement on the spot.

The problem of identifying the self with an ideal type of self is addressed by Kierkegaard in SUD. The self is not a substance, not a container of identity, Kierkegaard warns. He illustrates his point with a story of a young man who lived by the slogan "either Caesar or nothing". When the young man doesn't become Caesar, he is in deep despair. Kierkegaard explains that the boy is not in despair over the fact that he did not become Caesar. He is in despair over an idea he has over the self. He despairs himself understood as *not*-Caesar. Had he not

identified himself with this idea of the self—the self as Caesar—there would be room for other ways to relate to the self. In other words, the young man lacked necessity. In a similar vein, it could be argued Crispin's *Data-Masks* are not about despair over an encroaching Technological Other overriding humanity. Rather, he is in despair over a certain idea he has of humanity in relation to large abstractions conceived as not-Humanity, or outside of humanity. If he did not have this idea—of humanity as severed from technological others—there would be other ways to relate to the dissemination of Technological Others aside from black-boxing the self. In a different reading, his *Data-Masks* could be read as ways to 'actualise' the virtual. His "deities", as Crispin calls them, represent the (pan)optical logic as a belief in ghosts. The "belief" in recognition technology and the data it spits out might very well turn out to be the ghost of the twenty-first century. His *Data-Masks* conceal by way of mirroring; his masks reflect back and "hold a mirror up to the all-seeing eye of the digital-panopticon" (Crispin 2013). Invisibility understood as unrecognisability is here achieved by way of swapping one's real face with a model. What is reflected in the mirror Crispin holds up to identity recognition technology is not Reality, but the Model. The unbridgeable gap between is reminiscent of Kierkegaard's description of seeing "another face within the one you see."

These different takes on facial recognition technology cast doubt on the indexical relation between face capture and the self. Read along the lines of Kierkegaard's conception of despair; they point to the burden of identifying with and having fixed ideas about the self. In other words, they point to the burden of despair as an imbalance or mis-relation in the makeup of the self. In a Kierkegaardian sense, masks and camouflage provide a space for a relational play with the self between seeing and knowing and between knowledge and power; that space, however,

is not a vacuum, neither a free-zone, but a synthesis of possibility and necessity. If the task is to think and do necessity and possibility together, camouflage and masks design help to orient and heed one's behaviour towards possibility within a finite world. In Kierkegaardian sense, these masks and camouflage projects could be considered as a move towards possibility.

FACES OF POSSIBILITY

The images we have of facial recognition algorithms and of our relation to them show the importance of how we think of the self in relation to broader abstractions. How we imagine the future of algorithmic culture gives us an idea of how we think of the self. In "Subject Without a Face", Marcus Steinweg suggests:

We need to learn to do without identity. We need to muster the courage to exist with more than merely a thousand faces; by compre-hending that science is not everything. Life does not close in on itself. The circle is broken (Steinweg 2010).

Instead of understanding the face as a gate-way to identity and identity as something that we "are", "have", "posses", or "own", Steinweg argues that we need to

> **...understand the self as a scene of continual self-exceed-ence... The play with masks, the dance of faces that dissolve into and replace each other, it is the movement of life in its opening up to other subjects. The face mediated between the Other and me. An excessive variety of possibilities (Steinweg 2010).**

Steinweg proposes an alternative understanding of identity; however,

one that lacks grounding in necessity. The self is not an object for one's eyes, neither an excessive or fluid variety of limitless possibilities. It is not merely contingent and inconsistent; it is also defined, described, and limited. A relational understanding of the self allows for an understanding of the self neither as a being nor as some fixed substance. A relational understanding of the self asks not what the self is, but how it comes to be and what it can do in different contexts and settings.

Masks and camouflage may be understood as subverting the "tyranny" of a normative understanding of the self (Pearl, 2018, p. 160). They offer a subversive play with relations between the public manifestation of the self, the viewing of the self by the self and by an assumed (algorithmic) Other—including the power relations in that space—and a relation to the possible. Each individual self also affects the collective. Power relations are key here. Although never absolute, the possibilities of some faces seem limitless while those of others are strictly limited. As Deleuze and Guattari argued, the face of power absorbs all real faces and rejects the ones which it cannot assimilate, ordering them by degrees of difference from the pure, ideal template of the face of Christ in Western culture. As such, the face is not neutral, nor is it the representation of the average white man; rather, it is the white man himself (Deleuze & Guattari, 1987, p. 176). In this context, it includes the white woman, too. One does not exist in a vacuum but in entanglement with others. Taken together, Harvey's strategy of the collectivisation of the individual, Blas's facial weaponry which operate as a demonstration of entanglement with facial recognition technologies, and Crispin's ghost-busting all de-emphasise the individual symbolised by the face including the assumptions of origin and instead foreground individuation and our relational entanglement and alignment with others, our environment, and with that which established and transcends the self and its environ-

ment. Through these works, the self appears as a dynamic relation in the synthesis between the virtual and the actual, the social and the material, possibility and necessity.

Seen this way, the desire to isolate the self, for singularity and insularity, and to be sealed off from one's surroundings is co-constituted and inseparable from dependency and existential uncertainty, it is inseparable from the desire to belong and be recognised. To state it another way, algorithmic anxiety is a lack of balance between a desire for autonomy, singularity and controlled isolation, and a longing for a sense of belonging and existential certainty, or to immerse oneself in a collective. It is the experience of entanglement and the simultaneous experience of limited control over one's future position in relation to algorithmic culture that triggers anxiety and the desire for a closed-off space, a safe haven, a demarcated line between "inside" and "outside". Algorithmic anxiety triggers the desire for "an island unto himself; a place where he controls his own world—a world of ... security, safety and privacy" (Colomina, 1991, p. 7).

However, emphasising one side of the synthesis over the other, emphasising autonomy, independence and privacy, gives room to algorithmic anxiety to rise like a wall. Facial recognition anxiety is partly about stressing one's self as an individual, separate, and therefore vulnerable entity. A relational understanding brings to the fore that the self is not something one "has" or "possesses", nor the sum of its rational decisions. Subjectivity takes place in a larger whole of relations, immanent and transcendent. And by extension, the self is not something that can be captured by facial recognition technologies. The self is a relation of that which establishes relations of self-relating, over which we and others have no control, but that affect us nonetheless. The Kierkegaardian task is to think and actualise together the contrasting elements around

which the self coheres. Each individual is tasked with a balancing act between these opposites, a continual striving that is subject to constant change. The desire to overpower facial recognition often conceals the desire to overpower the self. It often masks the desire to be in possession of oneself and overemphasises the relation of the self towards facial recognition technologies.

Any attempt to ostracise, deny or attempt to "plug" one side of the opposites that co-constitute the self is bound to end up in despair. In fact, it is a lack of contingency, randomness, disorder, and blurred borders that induces despair. Kierkegaard's subject is situated, aware of its finitude and limited perspective, aware of its task to constantly manoeuvre between the opposites that constitute the self, and aware of the dangers both of uncritically situating itself complacently in a normative society *and* of speaking above it, of assuming autonomy and of avoiding responsibility. It is precisely indeterminacy and uncertainty that allows for possibility, because that what is ungraspable cannot be grasped or captured or quantified; nevertheless, we stand in relation to it.

Designed to symbolise protection against and a critique of the perceived intrusion, policing, and controlling powers of recognition technology, masks and camouflage wear could be considered as offering an interventionist play with the desire for a controlled environment, a transparent space where the individual is in possession of itself and has the final authority in the situations it is in in a context where individuals are always already embedded and entangled in relations with their socio-technical environment. What masks and camouflage wear offer are an intervention in the form of a kind of re-balancing between practices that circumscribe, pin down, enclose, and encircle the self and those that move, open up, change and make fluid. They are about offering possibilities to rebalance and struggle through the experience of anxiety invoked

by the vulnerability of "being seen", when this is understood as being seen for what you think you are, a self within the self or the idea one has of the self, *and* by the notion of the self as the scene of limitless self-exceeding. The ember of algorithmic anxiety is stoked when we latch on to the idea that the individual is "the creator of its own fortune, yes, the creator of itself" (E/O, p. 393). Such dwelling in finitude is what causes the self to be in despair, according to Kierkegaard.

Kierkegaard saw the most significant threat and Achilles' heel in a society of individuals which has lost the awareness of the limits of the mind, in a society that declared the unknown dead and put reason on its throne. Instead of assuming the underside of a dualism, instead of defending the modernist abstraction of the Autonomous Subject, camouflage and masking gesture to relations of mutual dependence, embeddedness, situatedness, and entanglement. It is these inherent contradictions and instability that gives way to possibility, of relating otherwise, and of the multiplication of relations. The mask of anonymity was traditionally used as a criticism of the self or in order to liberate itself from the idea of the self. However, as Kierkegaard reminds us, the self exceeds *the idea* of the self. It is by de-emphasising autonomy, identity, independence and transparency—and in extension assumptions of originality—that possibilities of relationality, collectivity, and collective belonging come into view that could multiply avenues to work through algorithmic anxiety. The full potential of the mask as a relational play between self and environment would allow moving beyond hypostasising conceptions of self and technological others towards a "stylised repetition of acts" (Butler, 1999, p. 197). Repetition, as Kierkegaard conceives it,

> **...is an indestructible garment that fits closely and tenderly, neither binds nor sags...But whoever fails to comprehend**

that life is a repetition, and that this constitutes its beauty, condemns himself (*Repetition*, 1983, p. 132).

Masks and camouflage may free us from algorithmic anxiety conditioned by living one-sidedly as they allow for the positing of the self as a synthesis in relation, offering a diffusion of subjectivity that opens up ways of being, belonging, and aligning in algorithmic culture that is not wedded to human-machine dualism, to the autonomous subject, or to the uncritical acceptance of the logic of algorithmic regimes of visibility. An opening to the possible arises from the realisation that one way to overcome facial recognition anxiety is to merge with others and to let go of the dearly held notion of the individual.

This chapter discussed artistic strategies of invisibility viz-a-viz facial recognition technology. The next chapter discusses the popular artistic imaginary of representing trading algorithms as an invisible black box and the algorithmic anxieties and concomitant artistic responses this evokes. It then moves to the spectral portrayals of trading algorithms exemplified by Emma Charles's experimental video artwork, *Fragments on Machines* (2013), and Femke Herregraven's, *Pull everything, pull everything* (2018). In different ways, Charles and Herregraven focus on the entanglement of the material and the immaterial and of past and present in their engagements with trading algorithms. Doing so, they draw attention to the larger systemic context of risk exploitation and financialisation in which trading algorithms are embedded and point to possible and unconventional interventions.

3

A Spectre, a Deity and a Flood in the Black Box of Finance, or The Possible in the Actual

The whole terrible fight occurred in the area of imagination. That is the precise location of our battlefield. It is there that we experience our victories and our defeats.

—**HARUKI MURAKAMI,** *AFTER THE QUAKE*

INTRODUCTION

Remember the trading floor of the new york and other major stock exchanges of the 1990s? Today, the stock exchanges look little like the days of yore. Gone is the noise and smell coming from rowdy men dressed in suits with the occasional colour-coded overcoats, milling around stock booths, tensely looking at screens with graphs and numbers on them, while shouting into telephones, gesticulating and making hand signs. Robots took their jobs. Or rather, today, an estimated 75% of the buying and selling of stock is done by high-frequency trading[17] (HFT) algorithms that automatically issue orders, in milliseconds, and respond to one another and to shifting market conditions. These developments in automated labour, combined with the rise of trades in rather complex financial instruments and the global financial crisis that started in 2008, strengthened the image of the financial mar-

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17 –   Time is money on the stock exchange. Where for the stock market trader of yesteryear every second counted, nowadays a split-second makes the difference. In order to benefit from short-term price differences at various exchanges, traders use trading algorithms. Trading firms use high-frequency trading algorithms (HFT) to monitor market data and submit large numbers of orders to the markets, and to maximise the speed of their market access and different trading strategies. HFT algorithms can execute millions of trades in fractions of seconds and are deployed to analyse terabytes of data from many data sources, such as unfolding news reports, market index trackers, live feeds of financial exchanges, newspapers, blogs and social media posts. With various data sources a picture of the markets is formed, traders look for movements on the markets, hedge bets on how world events might affect prices on the markets, upon which decisions to trade are based, and in a split second trades in funds, bonds, equities, currencies, commodities and futures are made. Such speculative trading is, to an extent, future prediction: predicting the movement on the markets a fraction of a second from now. The performance of algorithms is constantly monitored, honed and tweaked to changed market conditions and in an attempt to stay ahead of competitors.

kets as unpredictable and turbulent (Cooper, 2010, p. 167).

The Flash Crash of May 2010 showed what possible effects this unpredictability and turbulence could have. On Thursday, May 6, 2010, at 3.42 PM, something extraordinary happened on the New York Stock Exchange. The stock market index tracker of the United States, the Dow Jones Industrial Average, which comprises 30 of the biggest U.S. corporations and is regarded as representative of the performance of U.S. financial markets, made the deepest plunge in its 114-year-old existence. In a few minutes, the Index dropped nearly a thousand points and $700 billion evaporated. Shortly after the market bounced back, Lazarus-like, and after 36 minutes, prices returned to normal, as if nothing had happened. On May 6, 2010, the Flash Crash, as this event had been coined, became world news and became a concept.

There are different explanations as to what caused the Flash Crash. Some claim it was due to glitches (Patterson, 2012, p. 4) It has also been suggested that a system-wide failure occurred when certain HFT algorithms interacted in unexpected and frantic ways (Buchanan 2015). Others blame a little-known rogue trader, operating with the firm name Milking Markets from his parents' house in the suburbs of London, who allegedly used an illegal algorithmic trading strategy—spoofing—that created what is called "order unbalance" on the markets (Popper & Anderson, 2015). An independent committee of American regulators, the SEC, in collaboration with the Commodity Futures Trading Commission (CFTC), published a report, the result of their joint investigation into the causes of the Crash, that warned of serious future harm and mischief caused by algorithmic trading when not monitored, regulated, and scrutinised with parameters and procedures (SEC, p. 7). Their report further emphasises "the importance of data in today's world of fully-auto-

mated trading strategies and systems" (SEC, p. 79). The SEC wrote that it would work closely with market centres "to help ensure the integrity and reliability of data processing" (SEC, p. 79). The report states that the behaviour or a specific sell algorithm from a "large fundamental trader," later identified as American asset management company Waddell & Reed, was a major cause in the chain of events of May 6, 2010 (SEC, p. 17). Another report, published by Nanex,[18] a U.S. based financial market data analyst company disputes this view. Nanex states that without access to the data accounts of specific traders and brokers, to which neither Nanex nor the SEC has access, no final answer as to what the leading causes of the crash can be given (NANEX). Since 2010, at least five such Flash Crashes have occurred. In addition, according to a report of a group of researchers from the University of Florida from 2011, nearly 19,000 mini flash crashes took place between 2006 and 2011.

There seems to be a correlation between a series of events in the financial markets and the growing number of contemporary artists critically engaging with algorithmic trading. These events start in 2008 and include the Flash Crash of 2010, and worldwide stock market plunges, inter-bank market freezing, nationalisation of international banks by nation-

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18 –   This report points to four events that led up to the Flash Crash. First, news coverage of riots happening in Athens in response to the Greek Parliament's approval of austerity measures further destabilised an already unstable market. Second, the sudden and rapid algorithmic buying of $125 million worth of so-called eMini Futures, plus the sale of $100 million worth of so-called EFTs at very low bid prices, in less than 20 minutes. These events triggered a chain-reaction and additional rapid and aggressive sell-offs on an already shaky market. Third, a sudden quote saturation 400 milliseconds before the eMini sale, and, last but not least, delays in the Dow Jones Indexes caused by a first delay in the input data and by the computing system the Index uses.

al governments, the bankruptcy of Lehman Brothers, the near-collapse and bailout of the American International Group, and a subprime mortgage crisis followed by foreclosures. As these events unfolded in the context of a global recession, the notion of financial markets as a cybernetic, self-correcting, and mathematical machine eroded. As the recession placed the biggest burden on people with lower incomes and didn't leave middle-income earners unscathed, many people lost their sense of security and trust in banks, the housing market, retirement funds, job security, and in governments' abilities to manage the financial markets. With the aid of bailouts and backstops by governments, quantitative easing by central banks, and regressive risk transfer in the form of austerity programs, repressed wages, mortgage bearing, debt loading, precarious employment, and rising asset prices, the financial markets keep on keeping on. For some, however, cracks were exposed in the financial markets' foundations. Once seen, these cracks could not be unseen. These events brought to view the ostensible blurry line between financial operators and governance, where the failure of a financial institution creates ripple effects and takes down wider financial structures, bringing to its knees not just 'the financial markets' but also the savings of many. This has played into major anxieties entwined around algorithmic high-frequency trading.

This chapter looks at how artists grapple with the algorithmic automation of the financial markets. More specifically, it looks at how artists imagine and represent algorithmic high-frequency trading on financial markets to trace the outlines of the major anxieties braided around algorithmic high-frequency trading and gestures towards ways around them. The chapter is divided into four sections. The first section, "Black Box Anxiety", explains the concept and the common reference point of the "black box" as it developed from a cybernetic concept to how it is

used in present-day academic discourse in relation to the inner workings of and the dynamic between trading algorithms and social reality. The second section, "Imagining the Black Box of Finance: Digging Down and Standing Back", sketches dominant modes of representation of trading algorithms by conducting a close reading of prominent artworks that have been exhibited in Europe, the Americas and China in renowned galleries, museums and art institutions. In this section, I distinguish between two predominant ways of representing algorithmic trading by building on what Rita Felski describes in *The Limits of Critique* (2015) as "digging down" and "standing back". The primary aim of digging down is to probe below the surface and to enter and penetrate meanings hidden from sight (Felski, p. 56). Artists that "dig down" visualise supposedly invisible aspects of algorithmic trading. This approach indicates that what largely remains out of sight and un-accessed forms a fundamental part of algorithmic trading (Felski, p. 56).

Standing back, as a second popular approach, aims to demystify algorithmic trading. By demystifying it attempts to "denaturalise—to show there is nothing self-evident about its form or content. Whatever is the case is radically contingent and could be otherwise" (Felski, p. 70). It is "weaned to Foucault" and offers a view "of systems of discourse and grids of power" (Felski, p. 70). The section "Re-Imagining the Black Box of Finance" explores a relational view on algorithmic trading conveyed in the works of two artists: Emma Charles and Femke Herregraven. In their work algorithmic trading appears not as a substance but as a relation. Both artists conjure up invisible powers to which algorithmic trading stands in relation. Combined, their works can be considered as artistic reminders of what Kierkegaard had in mind with his conception of the possible. In the last section of this chapter, "Spectral Interventions in the Black Box of Finance," describes what this spectral relation entails.

BLACK BOX ANXIETY

One of the major anxieties braided around high-frequency trading has to do with a persistent idea, both in contemporary art and in academia, that suggests that algorithmic trading is like a black box whose operations are increasingly invisible, unimaginable and unmanageable, yet can have catastrophic effects. The concept originates from the discipline of cybernetics. Ross Ashby described black boxes in his *Introduction to Cybernetics*:

> **The child who tries to open a door has to manipulate the handle (the input) so as to produce the desired movement at the latch (the output), and he has to learn how to control the one by the other without being able to see the internal mechanism that links them (1956, p. 86).**

According to this cybernetic view, all self-regulating systems are such a black box. They are systems in which the input (the stimulus) differs from the output (the response). A relationship between the two is assumed whereby the stimulus is adjusted on the basis of the response—a control system. Broadly understood, the concept of the black box refers to systems that involve a largely controllable input and a verifiable output, but the internal process that effects the transformation of input to output is opaque and mostly unknown—enclosed in a black box.

The concept has travelled. Within cybernetics, it was developed as a model to study systems whose internal mechanisms are not open to inspection. Later, in the nineties, the concept of the black box became a central term in science and technology studies (Latour 1999; Winner 1993; Pinch 1992), as it was changed into a verb by Bruno Latour to describe "[t]he way scientific and technical work is made invisible by

its own success" (Latour, 1999, p. 304). That is, when technology runs smoothly, its internal complexity is often no longer a matter of concern. "Thus, paradoxically, the more science and technology succeed, the more opaque and obscure they become," Latour argued (Latour, 1999, p. 304).

These days, publications such as Basil J. Moore's "Unpacking the Post Keynesian Black Box" (2015), Frank Pasquale's *The Black Box Society: The Secret Algorithms that Control Money and Information* (2012), and Donald MacKenzie's "Opening the Black Boxes of Global Finance" (2005) demonstrate that the black box is a customarily-referenced concept in theories of finance. In the context of trade on the financial markets, the black box symbolises an obstacle to an understanding of and control of finance. The black box often evokes mystic metaphors to articulate obscure, opaque and incomprehensible market dynamics, both to artists and academics. In *Making Money: The Philosophy of Crisis Capitalism,* Ole Berg (2014) describes trading algorithms as "dirty" philosophical objects that are "fundamentally unknowable" (Berg, 2014, p. 149). Adrian MacKenzie (2006) claims trading algorithms as "characterised by unpredictable slippages" that cannot be isolated as an object (p. 96). Arne de Boever (2018) observes in *Finance Fictions: Realism and Psychosis in Time of Economic Crisis* that on today's financial market algorithms trade at frequencies "too high for human beings or even computers to observe" (p. 8). And in *The Black Box Society: The Secret Algorithms that Control Money and Information* (2015), Frank Pasquale quotes Alan Greenspan to argue that today's markets are "unredeemably opaque" and "no one (including regulators) can ever get more than a glimpse at the internal workings of modern financial systems"(Pasquale, 2015, p. 2).

Pasquale contends that the opacity of the black box is due to proprietary algorithms that analyse and process data and make criti-

cal decisions, yet remain inaccessible to outsiders and immune from scrutiny. The proprietary algorithms used in finance are based on complex and secret calculations and those models are in turn based on at times faulty, incomplete, or fraudulent data, with instability as a result (Pasquale, 2015, p. 103). What makes the black box "black", according to Pasquale, is "obfuscation in the service of illegality, and opacity resulting from complexity (2015, p. 103). Understanding algorithms is limited by their black-box nature, Pasquale argues. He is concerned about algorithms that might "take on a life of their own" (2015, p. 131). Algorithmic trading, he warns, can cause extraordinary instability and frozen markets when algorithms interact in unexpected ways, which may result in "dangerous feedback loops." (2015, p. 132). The contemporary world, Pasquale argues, resembles a one-way mirror; public powers and corporate actors have unparalleled knowledge of our daily lives, while we know next to nothing about how this knowledge is used to influence our decisions (2015, p. 9).

Yuk Hui is also concerned about the possible havoc algorithms may wreck by virtue of their unknowability. In "Algorithmic Catastrophe — The Revenge of Contingency" (2015), Hui relates the black box to catastrophe. Algorithms, Hui argues, aim to overcome contingency but also generate contingency. He distinguishes between two forms of algorithmic contingency. The first, contingency as necessity, results from the internal dynamics of automation as a probability within itself and can be reasoned, determined and anticipated by thought—think of bugs, error reports, flaws in a model, miscalculations, 404s, and the like. The second, contingency as possibility, cannot be predicted, determined by reason, nor anticipated and happens outside the probable. The first type is generated and anticipated by the machine's operations—a necessity from within. The second is generated by the machine's own

unanticipated and unknowable operations —a possibility from within or outside (Hui, 2015, p. 132). Hui claims that with the increasing implementation of algorithmic automation we are witnessing the emergence of algorithmic catastrophe of the latter type, "the control of which is increasingly beyond the capacity of human beings" (Hui, p. 139). Confronted with such unexpected events that we don't even know we should know about, "the unknown and the black box become the sole explanations" (Hui, p. 140).

The black box has become a metaphor for the unknown, the hidden, and for the conviction that what is unseen and unknown is more dangerous, powerful and profound than what is manifest and visible. In artistic portrayals of algorithmic trading, the black box is a common source of anxiety. The anxieties it evokes are often laid onto trading algorithms, specifically, and on the perceived invisibility of the infrastructural and technical components of algorithmic trading more generally.

IMAGINING THE BLACK BOX OF FINANCE:
DIGGING DOWN AND STANDING BACK

In the following section, I discuss two major artistic approaches to representing the black box of finance: digging down and standing back. The difficulties of imagining and expressing what is considered to be an abstract and immaterial market that appears to "happen" inside a black box, and out of sight of human inspection, is a recurring theme in digging down representations of algorithmic trading. The second approach, standing back, is characterised by artists that reenact or mimic the inner workings of algorithmic trading. These works often foreground their political agenda and take an often performative, satir-

ical approach. Both approaches tend to focus on and add emphasis to a limited set of infrastructural aspects of algorithmic trading.

THE AESTHETICS OF THE OUTSIDE OF THE BLACK BOX:
DIGGING DOWN

There is a shared urge among artists to probe algorithmic high-frequency trading from the outside, focusing on the inputs and outputs. Similar to masking and camouflage strategies discussed in chapter 2, this approach gives shape to representations of what is considered to be an intangible, invisible and immaterial infrastructure. Yet, different from masking and camouflage practices, which aim to recede into the background and become unrecognisable from the background, these artworks presuppose an artistic subject as a kind of field guide cum documentarist, present in space as a point of reference, and posit the black box of finance as an invisible object that, in turn, is made visible and materialised by virtue of the artist 's position as field guide cum documentarist.

Take, for instance, Mark Curran's *The Market* (2010 - ongoing), an artistic research project that covers specific sites in Dublin, London, Frankfurt, Addis Abeba and Amsterdam. Curran:

> **I became aware of the central role of technology, specifically what we may define as algorithmic machinery... within a decade there will be no human traders, having been largely replaced by these systems. ...And this is where it can become rather dystopian (Curran quoted in Bush 2016).**

Visitors of an exhibition view of *The Market* are shown a quote written on a wall of the exhibition space and ascribed to an anonymous trader

from London City. It is a snippet from a phone conversation the artists had with the trader in 2013:

> *…what people don't understand is that what happens in the market is pivotal to their lives… not on the periphery …but slap, bang, in the middle*

In his work, Curran turns to the institutional infrastructures of algorithmic high-frequency trading and the people working within them.[19] *The Market* consists of photographs portraying the office buildings of financial institutions, housed at one of the five financial capitals; portrait photography of individuals working on the financial markets at said locations; transcripts of interviews conducted with traders and bankers working at these sites; research documents; and a soundscape.

The photographs form a central part of *The Market.* Their aesthetics mode might be described as documentary, given their somewhat "straight up" style and their neutral, descriptive caption that reinforces a feeling of time and space. Exemplary is his photograph of a trader in The City. A young white man in a suit looks directly and deliberately at the camera, while he stands in front of corporate architecture gated by a contemporary London-style metal fence. The caption reads: "Antony, Analyst, The City, London England, May 2013." Another documentary-style photo is focused on the trunk of a tree standing on a well-kept lawn, on what appears to be a drab winter day. In the background, behind the tree and out of focus, we see an office building. The caption reads: "JP Morgan (formerly Lehman Brothers), Canary Wharf, Lon-

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19 –	Curran was inspired by Laura Nader's "Perspectives Gained From Studying Up,"(1972) in which she coins the concept of "studying up" with which she tasked social scientists in the 1970s not to ask why some people are poor, but instead to ask why other people are so affluent.

don, February 2013." Another shows a beige-greyish stone staircase, the straight and square lines seem indicative of a postmodernist style. The light fall indicates the picture was taken outside. The caption reads: "Credit Suisse (Access Denied), Canary Wharf, London England, March 2013." Another image-document, framed and on the wall, is a print out of an email sent by Curran to the Deutsche Börse. The redacted mail is a response from Curran to the bank's negative reply to his request to access to record audio and visual material from its office in Ireland. A sense of reveal arises out of the interplay between the captions the documents and images on display. By emphasising the sites and institutions he has not been granted access to, such as Credit Suisse, Deutsche Börse, and J.P. Morgan, institutions that he describes on his blog as "where literally and metaphorically, futures are speculated upon...", *The Market* seems to foreground the inaccessibility and impenetrability of the black box of finance while simultaneously creating a sense of secrecy (Curran, 2010).

Another example of digging down comes from Eline Benjaminsen's *Where Money Is Made: Surfaces of Algorithmic Capital* (2017- ongoing), which won her the Steenbergen Stipend and the second prize in the Canon Zilveren Camera Competition in 2017. *Where Money is Made* "aims to bring this invisible and obscure economic power to light by tracing lines of algorithmic capital to the places where some of the greatest profits are made today" (Benjaminsen, 2017). She attempts to do so by way of a series of documentary photographs, a short publication designed as a miniature *Financial Times* newspaper on the research done for this project, and a drone-video depicting from bird's-eye perspective parts of a German landscape where the trade routes of high-frequency trading, laid below the surface by fibre optic cable lines on the straightest path allowed by law, connect major stock exchanges.

In the words of Benjaminsen, the drone video shows "the physical land-scapes of an immaterial market" (Benjaminsen 2017). Where *The Market* focuses on the brick and mortar of financial institutions and the people working inside them, *Where Money Is Made* centres on the lines of con-nection by fibre optic cable between financial institutions.

Yet others attempt to probe below the surface in an attempt to find objects of meaning hidden from sight. Take, for example, *75.000 Fu-tures* (2013), a 240-page picture book of colourful charts and graphs on a white background made by the artists Gunnar Green and Bernhard Hopfengärtner. The 75,000 futures of the title is a reference to the Flash Crash of May 2010. It refers to the rapid and unexpected algorith-mic sale of 75.000 eMini Futures that, reportedly, contributed to the crash. The "world of trade algorithms," in the words of Green and Hop-fengärtner, is both inaccessible and incomprehensible (Green & Hop-fengärtner 2013). On the left of each page in this picture book is a noun or word combination, on each right page a set of colourful geometric shapes that show the familiar contours of a graph. Examples, like The Bird, Low Tide, Broken Sky, The Monster, The Blue Pig and Red Sky at Night, The Flood, When the Levee Breaks, and Good Luck Human, use words that clash with the thin, clean lines, the sharp angles, and the colourful diagrams. The collection of 240 diagrams consisting of rectangles, prisms, squares, and triangles with sharp edges work as rep-resentations of split-second moments in financial trade history. Each graph outlines a snippet of the calculation and decision sequence of a trading algorithm.

In addition to the graphs, the name of each of these algorithms is mentioned. With these graphs, the Flash Crash appears as a collection of strictly framed and ordered collection of figures, that, lacking in ex-planation and context, are just that: a collection of colourful rectan-

gles, squares, straight lines, triangles with sharp edges, and rectangular prisms. The graphs "are just a product of our perception and our desire to understand", Green and Hopfengärtner write (2013). With what seems to be a mixture of fear and fascination, the artists state:

> **We look at the graphs and don't understand them. ...What they show will trigger more events. But we cannot know how they will occur, what or whom they will befall, where or when they will take place (Green & Hopfengärtner 2013).**

What is striking is the focus in particular on high-frequency trading algorithms as causing unpredictable movements and sudden collapses. High-frequency trading is associated with sublime power, unpredictability, and a form of automated yet animated life. Anxiety is laid onto the unknowability of trading algorithms, on its whims and loopholes. Although the causes of the Flash Crash are manifold and difficult to pin down, the behaviour of trading algorithms is referenced as a significant cause of future concern.

The recurrence of black-box-related aspects—such as opacity and unknowability—in these portrayals of algorithmic trading is striking. In these thematically different approaches, algorithmic trading is associated with immateriality, opacity, and secrecy, which are considered to be caused due to a lack of access, transparency, and a lack of—tangible—information and documentation. The artists aim to engage with the immaterial, hidden, and obscure spaces of the black box of finance, which results in documentation of what is considered to be immaterial, invisible, and obscure, at least from the outside. The practices begin with the notion of the black box of finance as an obscure, impenetrable, and inaccessible space and end, metaphorically, with a black box as an impenetrable enclosed space. Nothing happens

where it supposedly happens: the black box is imagined, represented, and narrativised as an incomprehensible, bounded, and impenetrable space. The urge to dig down to "where finance happens", to localise "finance", to grasp it, is a recurring feature of algorithmic trading portrayals and has been picked up by numerous artists.[20] Such digging down practices represent algorithmic trading as a series of images, objects, and documents that form part of an otherwise obscure, invisible, and evasive realm. The desire to collect, to locate, map, objectify, and document these locations could be understood as an attempt to grasp and relate to algorithmic trading as an object and seems to come from a place of discomfort in relation to the markets perceived subjectivity whose effects are "slap, bang, in the middle".

Features of digging down include images of transmission towers, documentary images of data-centers and data-farms, visualisations of the "swoosh" and speed of data traffic represented as colorful light strokes and bolts, major and minor data transmission cables and towers, and the strict framing of facades of buildings in which financial institutions are housed—a visual language of exploration and transparency. In a sense, these artworks position themselves as a source of visual knowledge, a witness to the hidden-from-view and difficult to access locations where algorithmic trading "happens". Artists locate and enter a hard-to-perceive world and grapple with this invisibility by way of placing it in a specific light, which is characterised by making its vast terrain and secluded locations visible and known in a predominantly materialist and documentary style. This approach runs the risk of creating a skewed picture of the black box of finance, skewed to reproduce and perform its per-

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20 –   Such as Alexandre Laumonier, Ingrid Burrington, Suzanne Treister, Timo Arnall, Serge Onnen, Zachary Formwalt, the artist-duo Beate Geissler and Oliver San, as well as Ryoji Ikeda, Simon Denny, to name but a few.

ceived opacity, invisibility, and unknowability. It suggests that by col-
lecting, documenting, and visualising parts of the hidden socio-techni-
cal and architectural infrastructures, we could obtain a better grasp of
algorithmic trading. Algorithmic anxiety is here triggered by algorithms
that are perceived to defy the limits of vision. It is this invisibility that
triggers anxiety, as this lack is associated with the unknown and the
uncontrollable. Digging down assumes that when rendered visible, the
black box of finance can become known and reigned in. To make visi-
ble is to know, and to know is to control. "Axiomatic value is given to
increased information. ...[A]s if there were a kernel of truth just waiting
to be revealed" (Bucher, 2018, p. 43-44), which is to say, digging down
associates visibility with intelligibility and control. It assumes that only
under conditions of transparency, visibility, and access can the black
box of finance come within our grasp.

This too suggests that what is latent or what cannot be perceived is
of greater importance than what is manifest. Digging down is skewed
to the Enlightenment conviction that what is obscured by vision forms
a problem of knowledge, and hence an issue of control. It suggests that
the black box requires to be accessed, to be opened, so that what is hid-
den in the dark inside can be brought to light, explored, known and, ul-
timately, controlled, which also conjures up the spirits of truth-bearing
institutions that were involved in unveiling, discovering and exploring
assumed "dark continents."[21] At the same time, digging down creates a
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21 – The concept of transparency has travelled across space and time, from its
Latin roots (*transparere*), via the French Revolution and Rousseau, the American Law-
yer Louis Brandeis, and the German art historian Benjamin Buchloh, to the Austra-
lian director of WikiLeaks, Julian Assange. There is a wealth of critical literature on
'transparency thinking' challenging what Susan H. Williams dubbed Enlightenment
Vision, addressing the colonial history of its usage and deconstructing the so-called
power-knowledge nexus (e.g. Dean 2002; Sedgwick 2003; Lessig 2009; Birchall 2011;

sense of revelation by its failure to reveal; it delivers by failing to deliver. The question remains what the long corridors with server racks, the architecture of databases, the documentary photographs, the trajectory of cables, the ominous sounds, the graphs, the charts, and bricks and mortar are meant to help reveal about algorithmic trading.

THE AESTHETICS OF THE INSIDE OF THE BOX: STANDING BACK

Another dominant imaginary of algorithmic trading takes a different tack: it stands back. Standing back consists of practices that put the knowledge of the "innards" of algorithms to use. For example, aspects of the technical inner-workings of financial trading technology are enacted, mimicked, or mocked. Or, artists develop these technologies proper and design prototypes of speculative designs of algorithmic trading.

Artists taking up this approach aim to deconstruct conventional views on algorithmic trading by imagining trading algorithms as a means to altogether different socio-political ends.[22] They "stand back" from algorithmic trading in order to "position them within larger structures of power" (Felski, p. 83). Attention shifts to the discursive and epistemic conditions of algorithmic trading and whose interest it serves. As such,

Han 2012; Fenster, 2015; de Vries 2018; Bucher 2018).

22 – Another example is *Terraeconomics* (2016-2017), a speculative value system tied to the earth's resources. With this installation piece, speculative designer Monique Grimord critiques the neoliberal agenda behind the Bloomberg trading system. She did so by building a supercomputer that logs bio-data of minerals, oils, metals, and other natural resources collected from oceans, forests, and the atmosphere. The computer reads the data it receives, and algorithms measure how the "health of the earth" is doing. Here, trading algorithms are imagined as technologies deployed to serve the financial interests of their "owners" and are reimagined to do similar work, but then in the interest of the agenda of the artist involved.

the operations of the black box of finance are imagined as historically-contingent and changeable, suggesting that the financial systems of today could be different when the operations of the black box of finance are relayed and stamped by different power relations. Standing back as an approach imagines algorithmic trading as a dynamic of speculation, valorization, and distribution geared to and steered by major players on the market. Artists who employ this strategy find the heart of the problem to be with the power relations in which they are embedded.

Three canonical artworks illustrate standing back as an approach to algorithmic trading: *The Parasite* (2014), a project of Robin Hood Minor Asset Management (RHMAM); RYBN's *The Algorithmic Trading Freak Show* (2013)*;* and *Black Shoals; Dark Matter* (2003) by the artist duo Lisa Autogena and Joshua Portway. With *The Parasite* project, RHMAM—a Deleuzian hedge fund—designed an algorithm and named it Parasite.[23]

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23 –   Trading algorithms are named for marketing purposes. The names given to them are meant to persuade investors to make use of a specific algorithm. Their names are also an indication of the kind of trading strategy an algorithm is programmed to execute. Some trading algorithms are programmed to monitor and detect movement on the market. For example, when an order of shares is placed by an algorithm programmed to do so, rival algorithms, when programmed to do so, can buy or sell those same shares to either drive prices up or down (Patterson, 2012, p. 5). Other algorithms work to create and profit from movement by a strategy that is called layering. Layering is a tactic in which trading algorithms are programmed to place and then cancel a vast majority of the orders they make. These algorithmic orders-and-cancellations help traders to sell above the bid price in much less than a second. Others are programmed to monitor competitors without being noticed. The performance of these algorithms is constantly monitored, honed, and tweaked to changed market conditions and in an attempt to stay ahead of competitors. These developments automated the financial markets, fired up the speed of trade deals from minutes, to seconds, to milliseconds, down to microseconds. What is more, names such as Landmine, Power Tower, From Above, To the Moon, Blast This, City Under Siege, and Ambush are not only inherently aggressive, combative, predatory,

The algorithm analyses and tracked transactions in U.S. stock markets and mimics the behaviour of successful traders. Like a parasite, it feeds off its host; in this context, it feeds off trading strategies. Yet, like Robin Hood and unlike a parasite, it redistributes the surplus profits it generates. The RHMAM invests its received profits in its own 'activist hedge fund' and donates it to activist groups in society. *The Parasite*, RHMAM claims, bends the financialization of the economy for the benefit of those who are not the financial elite (Robin Hood Cooperative, 2017). *The Parasite* cultivates ambiguity: it seems like a fraudulent scheme; it could be a hoax, a start-up investment fund created by socially engaged traders, just another art project, or none or all of the above. And that is, in part, the point: *The Parasite* project raises ethical and technological questions about what algorithmic trading is, what it does, and who benefits. It intervenes in the black box of finance by way of piggy-backing inside the box and employs and re-directs the benefits of high-frequency trading algorithms to different beneficiaries and political agendas.

Another form of standing back is exemplified by *The Algorithmic Trading Freak Show*, a project by the art collective RYBN. Displayed as a cabinet of curiosities of algorithmic financial practices, the *Freak Show* offers a collection of financial trading algorithms. RYBN researched the history of trading algorithms from the early 70's up to today and plowed through hundreds of scientific research papers, press reports, graphs, and documentation on automated trading. The resulting *Freak Show* is a trove of information about the inner workings of speculative trading algorithms whose pre-programmed instructions proved to be unprofitable, obsolete, and inoperable. Numerous algorithmic experiments have been documented by RYBN, ranging from experiments to

and war-like, they also suggest a semblance of control—and confer phallocentric and anthropomorphic tendencies in the name-givers of trading algorithms.

explore the esoteric correlation of price variation with astrology, me-teorology, numerology, and zoology. One such experiment, conducted in 1998 by journalists of *The Wall Street Journal*, involved a blindfolded monkey throwing darts at pages of *The Wall Street Journal*. The *Freak Show* aims to

> **unveil the esoteric side of finance, to unravel the myths from the facts and the constant competition leading to algorith-mic warfare which in turn causes instability, on the markets and in our societies (RYBN 2015).**

The various documents, research papers, and graphs on display in the exhibition view of *The Algorithmic Trading Freak Show* mimic a *Wun-derkammer*, in the style of cabinets of wondrous specimens found by natural scientists or part of a natural history museum's collection of whimsical and extinct species. Seen in this light, *The Freak Show* could be considered an archeological taxonomic project *avant la lettre* that belongs to a history of technology museum that exhibits obsolete and failed future-predicting practices of the twenty-first century.

A last canonical example of standing back is *Black Shoals; Dark Mat-ter* by the artist duo Lisa Autogena and Joshua Portway. This work emu-lates the effects of financial market abstractions and mystifications and ties algorithmic trading models to astrology, which is framed as another model with which humans aim to transcend time and space but have failed to do so. Their installation piece is a visualisation of the stock markets that takes the form of a planetarium. The installation, commis-sioned for Tate Britain in the same year of the dot com bust, consists of a 5-metre-diameter domed ceiling onto which a computer display is projected showing tiny blinking and glimmering stars. Each star rep-resents a trading company and each blink a trade in shares, resulting in

a dreamy, twinkling night sky. And when a stock crashes, the stars fall from the sky and disappear from view, leaving black holes.

The "Black Shoals" of the title is a reference to the mathematical Black-Scholes model, a formula based on the work of, amongst others, mathematicians Fischer Black and Myron Scholes. This formula attempts to calculate the value of a share option in order to lower the risk involved in investing. Two of its developers set up a hedge fund, Long Term Capital Management, which made impressive profits and became a major player on the financial market—until it wasn't. Suddenly, over the course of a few turbulent days on the market in the year 1998, the company nearly collapsed when an unexpected and unprecedented crash occurred, losing an estimated couple of billion dollars in two days. What is more, to stall a domino-effect, sixteen financial institutions agreed to a back-stop to bail out Capital Management under the auspices of the Federal Reserve. The title of the artwork tacitly but poignantly points to both to large-scale epistemic failures of trading algorithms as well as to the messy power relations operative in algorithmic trading: regulators and Central Banks are deeply involved in the very same operations they are tasked to regulate and manage. The artists understand the sudden collapse of Long Term Capital Management, a company that seemed too big to fail until it failed, also "as a kind of Icarus parable for those attempting to control complex systems" (Autogena & Portway 2011). "*Black Shoals* was designed as a kind of parody of the trading desk of the übermensch—the Mount Olympus from which they would survey their creation"(Autogena & Portway 2011). Seen in this light, the dome is a jab at human attempts to reach a view from nowhere and have bearing on the cosmos—on prediction as divination. By enacting these metaphors and, hence, the world called into being with these metaphors, *Black Shoals; Dark Matter* emulates what a

certain mode of thought *does,* whilst subtly nodding to the politics that result from it. It critiques by mimicking, replicating, and emulating finance as a depoliticised divine force of nature which is therefore out of human's reach or control; a materialized, critical and yet ironic version of the financial sublime.[24]

While each of these projects come with its own strategies, they share a focus on and a use knowledge of how trading algorithms operate—on the inside of the black box. This leads to works that either visualise this knowledge, or tinker and toy with these technologies, or mimic and mock in order to reconsider the rationality behind trading algorithms, inviting their viewers to rethink the uses and implementations of algorithmic trading—the output of the black box. Both digging down and standing back aim to illuminate aspects of the black box of finance: digging down offers the revelation of hidden mysteries; standing back offers the pleasure of outfoxing—the pleasure of mystification; the hope of last-shall-be-first. As both strategies are pitted against their own perceptions and representations of algorithmic trading, change is sought by both in engagements within the bounded of and enclosed space of the black box of finance.[25] The question remains: After the

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24 –   Through hand drawn maps and charts, Suzanne Treister's *HFT The Gardener* tells the story of the fictional figure Hillel Fischer Traumberg. Traumberg is an algorithmic high frequency trader who experiments with psychoactive drugs and studies the ethno-pharmacology psychoactive plants. He uses Hebrew numerology to merge the numerological equivalents of the botanical names of his psychoactive plants with companies listed in the *Financial Times*' Global 500 Index. And in the work of Fibbe's live performance art *Diva's Live,* trained classical singers vocalise the fluctuations of real time market data. Ben Thorp Brown's *After Outcry* investigates the complex and absurd gestures that were once a primary mode of communication between commodities traders.

25 –   They rely on an understanding of the black box that is also found in the

mapping and documenting and after tinkering with and mimicking the finite aspects of algorithmic trading, what is the road to the possible?

RE-IMAGINING THE BLACK BOX OF FINANCE

Over the past few years, artistic engagements with the financial markets have emerged which do not stand back or dig down, but position algorithmic trading within layered and interrelated historical, technological, and environmental developments. In these works, trading algorithms are imagined as "entangled, mediated, connected, interdependent, intertwined" and different sensibilities, a mix of influences, and orientations give shape to imaginative horizons that serve as guides to alternative imaginaries of the future of automated capitalism (Felski, p. 146). The following section analyses this imaginary by conducting close readings of the work of Emma Charles and Femke Heregraven. The artworks of these two artists offer constellations that reach beyond and above the black box of finance, mixing the spiritual and the material, broadening the field of relations to algorithmic trading, and opening it up to the possible and to spectral interventions.

cybernetic theories of B. F. Skinner, for example. Akin to this, in "Technological Determinism is Dead: Long Live Technological Determinism" (2008), Sally Wyatt provides a typology of what she observes to be a continued and persistent technological determinism in Society and Technology Studies. Elements of the persistence of what she calls soft technological determinism can be found, amongst others, in the tendency to classify historical epochs and societies by their dominant technological artefacts—the "Black Box Society" or the "Age of Algorithms", for instance (Wyatt, 2008, p. 168).

CONJURING SPIRITS IN THE BLACK BOX OF FINANCE

We see these themes at work in Emma Charles' *Fragments on Machines* (2013), a 17-minute experimental piece of docufiction. Something burrows beneath or beyond the predominantly cyber-utopian and cyber-dystopian accounts of algorithmic trading. This film evokes the mythical figures of a hybrid, a spectre, and the metaphor of a flood to represent algorithmic trading. Charles' much-accoladed video essay has been included in numerous exhibitions on information technology,[26] and has garnered both popular and critical attention. In the spirit of Marx's 'The Fragment on Machines', Charles' video essay focuses on human–machine relations. The title of the film is a reference to Karl Marx's *Outlines of the Critique of Political Economy*, in which he discusses the evolution of the production of labour and capital, from the division of labour to the increasing integration of machines in labour, and to the ever-increasing automation of labour.

In Charles' video essay, the opening scene of the first chapter—titled "Metropolis"—portrays Manhattan's Financial District from the vantage point of a train crossing the Manhattan Bridge. The camera captures the skyline of Lower Manhattan which, with its square blocks of skyscrapers and cube-like façades of Art Deco buildings, provides an association with the black box of finance. By portraying the architecture of New York's Financial District from a distance and from the outside, Charles alludes to inaccessibility. The camera then cuts to medium

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26 – See, for example, *Nervous Systems* (2016) at Haus der Kulturen der Welt in Berlin, Germany; *Globale: Global Control and Censorship* (2015/2016) ZKM, Karlsruhe, Germany; *Infosphere* (2017) at CENART in Mexico City, Mexico; *Mediated Architecture*, Swiss Architecture Museum, HeK (House of Electronic Arts Basel), Switzerland; *New Mythologies,* POSTmatter/Second Home, London, UK; and *I stood before the source*, The Blackwood Gallery, University of Toronto, Canada.

close ups of the façades of the skyscrapers and of some of the main Art Deco buildings. In doing so, "Metropolis" sets the scene for *Fragments on Machines* smack in the middle of Manhattan's Financial District with its iconic and idiosyncratic plate-glassed skyscrapers, mixed with Art Deco architecture dating back to the days of heavy manufacturing for which these buildings were used in the early 20th century.

In a poetic tone, a male voice-over narrates:

I was once lost in the city; now, I don't know where to disappear anymore. I exist in two states. I remove the animal from myself as animals are removed from the city. Undetected and unnoticed, they disappear. Slowly, the natural becomes unnatural. Slowly, the city evolves.

The streets of New York's Financial District are almost empty, with just a few people in sight. The voice-over continues:

The spread of intelligence across Europe can be mapped, like an incurable epidemic of knowledge. In the place of public readings, came reading in private, in silence. The secrets of what never happened, in the end, cannot be burned, they multiply and imprint in every corner… I live through the structures and on the structures that have been planned by architects, designed by vibration, washed through with information… I stood before the source, an empty tomb. To be closer to the source is all I needed. The trucks could roll from their momentum, even with the brakes on. Their housings were dockside palaces. Treasure would travel hundreds of miles over days… A new king lives here…

A series of shots of fibre markings, manhole covers, street-level signs of underground utility ducts, and an industrial air ventilation system in-

dicate that we are milling around the financial markets, located within the edifices of the depicted institutions and corporations.

The video's next chapter, titled "Servers", takes the viewer beyond the façade of an edifice in the Financial District and into the building's empty hallways where "the new king" allegedly resides. The sepia-colored, dimly-lit architecture of the building's foyer contrasts sharply with the bright white, tungsten-lit server room that the camera enters. The cut between the shot of the hallway and that of the server room hints at the film moving from the outside to the inside of the black box of finance. Inside, behind the walls of the lavish but decaying Art Deco architecture, we find what looks like a data center. A door opens, and then another, and another. The room entered is filled to the brim with mainframe computers and server racks.

Figure 4 and 5:
Production still *Fragments on Machines* by the artist Emma Charles

The supposed new king of Wall Street is personified by an *acousmêtre* (a first-person, disembodied voice-over) and given a semblance of embodiment through a series of shots of aspects of the infrastructure of algorithmic trading. Numerous Art Deco buildings in the Financial District now house parts of the infrastructure of post-industrialist financial capitalism's new king. Data centres are dotted around the Financial District, and their physical location is important. The closer a high-frequency trading company, brokerage, or bank is located to the servers (that is, the closer it is to the source), the faster its algorithms can respond. What appears to exist in an ether as an immaterial, invisible, and omnipresent structure is represented as connected, strap-attached to,

and kept on leash by rubber, fibre, copper cables, and brick.

The dialectic relationship between the words of the narrator and the images in *Fragments on Machines* associates the computational infrastructure of the financial markets with, in the words of the narrator, an "incurable epidemic of knowledge". The narrator metaphorically connects this "incurable epidemic" to "trucks rolling with brakes on". The imagery of an epidemic and of moving trucks suggests prevalence, development, spread, movement, *and* inevitability with regards to the new forms of productivity that have come about—the algorithmic automatization of the financial markets. At the same time, the cause of this seemingly inevitable development could also be taken as a reference to a primary mover, or even to a force of nature, or the preternatural.

The voice-over continues:

My muscle has been replaced by flex and copper; my brain a server. Ones and zeros, my voice. I exist as a phantom under iridescent color. I speak in shimmering tones to the hidden construction of the form. I desire to become data. I will be mobile, moving to provide. I will become the information flow. I am your personal relationship to the source. I become more and more. I move in and out of position several times a day. I adjust by fractions to adapt to my surroundings.

Rooms filled with copper and fibre-optic cables, computer servers, air ventilation, and cooling systems that facilitate algorithmic exchange have to an extent replaced a form of labour time and productivity which previously involved the body. The embodiment with which Charles represents algorithmic trading is given the form of a disembodied, conscious voice, a phantom-like hybrid organism existing in "two states", human and machine, natural and unnatural, residing in New York's corporate Financial District.

Hybrids are charged with meaning, which raises the question: What is the meaning of the hybrid figure of algorithmic trading? In the history of science, hybrids were part of a larger cluster of prodigies, as Lorraine Daston and Katharine Park explain in *Wonders and the Order of Nature,* an exhaustive chronicle of wonder that covers more than a thousand years of "wonders of nature": strange, rare, and extraordinary phenomena which "straddled categories" (Daston & Park, 1998, p. 10). Wonders had to be rare, mysterious, and real to be considered wonders, Daston and Park explain (1998, p. 24). Over time, some objects lost their status as wonders for various reasons—for instance, the basilisk was debunked, comets explained, and unicorn horns became too common (Daston & Park, 1998, p. 19). At the same time, new objects joined the canon of wonders, such as monstrous births or snow in summer (Daston & Park, 1998, p. 20). Some such anomalies were considered as "enhancing the beauty and diversity of the world," while other singular anomalies were considered prodigies, "divine messages and signs of things (usually undesirable) to come" (p. 54). The category of the prodigious included earthquakes, eclipses, conjoined twins, unseasonable thunderstorms, examples of peculiar animal behaviour, and other phenomena that were seen as "outside the order, movement and operations of nature" (Daston & Park, 1998, p. 181). Daston and Park note that by the last quarter of the sixteenth century in Europe, a specialized, canonical body of medical study on the causes of monsters was well established. Monsters, according to this literature, were caused by the violation of moral norms. Daston and Park point out that the category of the "monstrous" did not spring from the blurring or exceeding of categories per se—which anthropologists such as Mary Douglas (1966) later placed at the heart of ideas of pollution. Rather, only when such blurring of categories was taken to be caused by the vi-

olation of moral norms was it considered monstrous (p. 181). Hybrids, however, were the exception.

Hybrids were seen as caused by "abhorrent" behaviour and therefore generally considered a sign of sin (Daston & Park, 1998, p. 192). Images of demons, which served as a reminder of sins to be avoided, were frequently represented as hybrid figures, further emphasising their association with sin and punishment (Daston & Park, 1998, p. 186). Prodigies, Daston and Park chronicle, were taken to be the precursors of dramatic, local, and usually catastrophic events: epidemics, floods, famines, fires, and wars. Featuring a hybrid figure as the *acousmêtre* of *Fragments on Machines* and associating a hybrid being with algorithmic trading brings to bear moral transgression, if not a premonition of God's wrath. This leads one to ask, what moral transgression brought the hybrid into being?

Charles alludes to the automatization of labour as a possible cause. On the floors and in the offices that *Fragments on Machines* depicts, we don't find white-collar workers sat in cubicles. The camera pans along the lines and grids of server rooms, cables and wires in all colours, air ventilation systems, computer buttons, rubber tubes, and along endless, brightly lit corridors and aisles full of whirring machines where the activities of algorithmic trading are supposed to "happen". The film shows an abundance of images with no human in sight. Here, Charles seems to allude to the *Grundrisse*, in which Marx contends that machines become an abstract, dominant power in the production of capital, enveloping humans and leaving workers scattered. According to Marx, this increasing reliance on machinery takes two forms. One is the development of machinery in which the mass of labour and the entire production process that enabled it has vanished from view, consumed by the machine. The second is the integration of these machines as a

means of production for capital in a global market. Taken together, the development of human-labour-replacing machines as a means of production for capital in the world markets indicates the extent to which general intellect has become a tool for the ruling class (Marx, 1993). In Charles' *Fragments on Machines*, workers seem to have been replaced by machines. Humans have no function other than to keep the machines of automated financial capitalism up and running. The desolate and quiet images of Wall Street depicted in the previous chapter of the film are contrasted with the whirring and zooming sounds of server rooms, cable rooms, and generators that now occupy entire floors in buildings. Where once humans congregated, vents, server racks, loops of cables, and countless pipes and tubes have taken their place. The film's images show empty chairs, empty halls, and empty cubicles. Further emphasis is placed on water, from images of clogged cooling systems to rusty and leaky pipelines to images of cesspools. In *Fragments on Machine*s, the workers that still exist are maintenance workers, such as technicians, cleaners, and doormen. The heart of financial capitalism has largely been emptied of human traces; manual labour has been replaced by machine labour and a ghost-like figure remains.

Depicting New York's Financial District as an eerie space, emptied of most human labour but where a ghost-like agency lingers, also invokes the spectre of communism, from the famous line from Marx and Engels' "Manifesto of the Communist Party" (1848): "A spectre is haunting Europe—the spectre of Communism". In the Manifesto, the spectre indicates the persistent presence of the communist spirit in the fragmentized and incoherent activities of the proletariat scattered all over Europe. Conjoined and unified, their spirited activities may at some point in time incite a revolutionary struggle. Felski writes,

[N]ew actors jolt alongside those with thousand-year histories; inventions and innovations feed off the very traditions they excoriate; the past is not surpassed but revisited, repeated, surrounded, protected, recombined, reinterpreted, and reshuffled (Felski, p. 158).

In *Fragments on Machines*, Charles ascribes a certain kind of spectral agency to algorithmic trading; it is thus given the power to act, wittingly and consciously yet invisibly, as well as the ability to cut through time past and present. *We* might see no-body or nothing, yet *it* sees everything.

Charles' use of a spectre-like figure is metaphorically and conceptually equivocal. In *The Spectral Metaphor: Living Ghosts and the Agency of Invisibility*, Esther Peeren explains that spectres in contemporary culture and theory "are methodologically distinct and vary in the characteristics, functions and effects they assign" (Peeren, 2014, p. 10). However, she distinguishes between three interrelated emphases within their usage in contemporary culture. Firstly, there is the ghost as the figure of return, expressing the persistence of the past in the present. Secondly, the ghost as a figure of presence-absence, ephemeral yet present in space as a matter that needs to be accounted for. And lastly, the ghost as a figure of mixed and hybrid phenomena, a conceptual figure of critique of the "unmixed" and "pure" (Peeren, 2014, p. 10). Ghosts indicate an agency that is present yet invisible and intangible, an eerie, hybrid entity. Described by Mara del Pilar Blanco and Esther Peeren as an "unruly" and ambiguous figure, a "non-present present", a "being-there of an absent or departed one", they "signify precisely that which escapes full cognition or comprehension… what is placed outside, excluded from perception" (del Pilar Blanco & Peeren, 2013, p. 9). Ghosts have

a penchant for lingering and haunting, often demand a response, and are associated with the preternatural and with simultaneous and mixed temporalities and categories (del Pilar Blanco & Peeren, p. 8). Spectres are unruly and ambiguous in the sense that they represent the bodiless presence of things that are conventionally conceived as disparate or even opposed: past and present, materiality and immateriality, the real and the imaginary, immanence and transcendence, and primary and secondary causes (del Pilar Blanco & Peeren, p.8). To state it in a more accurate way, they cut through the limits and walk through barriers of the order of things. "The specter stands for that what never simply is and thus escapes the totalizing logic of conventional cognitive and hermeneutic operations," Peeren writes (2014, p. 10).

Finance and money in general and algorithmic high-frequency trading in particular have a track record for being associated with mystifying, spectral, and gothic qualities (e.g. Vogl 2014). The *acousmêtre*, combined with images of vacuous office buildings and the haunting and ominous soundtrack that accompanies the film's images, invoke the spectral dynamics of capital described by Mark Fisher (2016) in *The Weird and The Eerie* as "at every level an eerie entity" (p. 11). Capital, he argues, is "conjured out of nothing", yet exerts palpable influence (p. 11). Fisher describes the eerie as "tied up with questions of agency" (p. 11). It can be found in places "where the forces that govern mundane reality are obscured," where an unknown agent seems to be acting with fate and foresight (p. 13). Eerie places, as Fisher phrases it, are "landscapes partially emptied of the human... where there is nothing but should be something" (p. 11). The 'something' that is missing in *Fragments on Machines* might be the human.

The soundtrack foments the eerie suspense of the images of desolated offices, with its continued sounds of running and dripping water

mixed with the sounds of a fire alarm, cut through with images of pools of water, rusty pipes, and broken cables These sounds and images stress both the entropic nature and the excessive use of energy of these parts of algorithmic trading. Repeatedly, Charles shows images of bodies of water, eroding copper wire, cesspools, and clogged cooling systems, and then cuts to images of the currents of the Hudson River. Further, a disembodied voice that now lives where humans used to dwell mentions daily activities and its desire to become an information *flow* with a direct link to "the source." The textual and visual emphasis on liquidity and fluidity in each chapter of *Fragments on Machines*— "flows of data", "washed through"—is combined with the repeated images of water pools and dripping and leaking tubes and becomes increasingly pronounced throughout the film. The final scene of "Servers" depicts the Hudson River seen from a window inside the data center and inside the home of the "new king, hinting that it is the new king that looks out on the Hudson. A sound bridge reinforces this view. It consists of the sound of streaming water, which is carried to the final chapter, titled "Flood". In doing so, the sound bridge connects the perspective of the "new king" to the first scene of "Flood" which depicts the current of the Hudson. Visually and sonically, Charles links algorithmic trading to the Hudson and to approaching danger.

Meanwhile, the ambient and ominous musical score is foregrounded and becomes ever louder throughout the final chapter. Tracked by the haunting sound of an alarm creating suspenseful tension, the camera moves outward, from the edifice of the data center and out of the Financial District onto a ferry on the Hudson River heading in the direction of New Jersey. The voice-over narrates:

The river flows and undulates underneath. Underground, organized

Figure 6:
Production still *Fragments on Machines* by the artist Emma Charles

tributaries completing the feedback loop. I was drawn in by the trickle of the stream, the meagre beginnings. The undulated notes that cascade on top of one another, collecting and forming to lead me on... A million pounds will roll into the sea, dissolve, burn, blow away. You will never breathe the ashes, nor will you drink the pulp.

A seemingly prodigious teleological event awaits the viewer in the final scene. *Fragments on Machines* ends with images of the flooded Verizon data centre building in the Financial District. Several floors of the building, a key switching facility for interconnecting and storing communications, sustained severe damage from flooding during Hurricane Sandy in 2012. According to the voice-over, it took weeks and a million pounds to replace and repair. The damage done by Sandy was a reminder that, despite the concept of the cloud, data travels through software and hardware and through urban environments in which a flood can

grind all traffic and operations to a halt for weeks on end. The communication technology on which algorithmic trading depends is "prone to weather disruption" and sensitive to rain, fog, snow, and water (Buchanan 2015). The seeming otherworldliness of algorithmic trading is framed and grounded in concrete matter, Charles seems to suggest.

The next and final scenes of *Fragments on Machines* show men dressed in green and white coveralls mopping and sweeping a flooded floor. With this ending, Charles connects algorithmic high-frequency trading to the damage sustained by an extreme weather event and to a flood. A flood is an ambiguous and versatile metaphor, too. Flood stories are numerous, stretch over epochs, and cross and cover all continents. In European mythologies, amongst others, a flood or deluge is more often than not sent by some kind of deity as a result of a conflict between deities or as the fallout of god's wrath. Charles leaves the signification of the flood in *Fragments on Machines* open to interpretation. When understood as a metaphor for the "new king" of algorithmic high-frequency trading, wrath is upon us. In another reading, the apparatuses of financial markets that use up so much energy are linked to the natural catastrophes global warming engenders. And interpreting the flood in biblical terms, yet another narrative arises.

In "Noah and the Flood"—the flood narrative in the Book of Genesis—God sends his judgment of the wickedness and corruption of the world he created in the form of a flood, as a means to wash the world completely clean. The flood wipes all creatures off the face of the earth save for Noah and those with him in his Ark, turning the earth into a massive pool of water. After the flood, God asks Noah to remake and repopulate the earth. Interpreted in these terms, the flood connects algorithmic trading with a sphere or realm outside the seemingly all-encompassing black box of finance and points to the influence this "out-

side" can have on the vulnerable infrastructure of algorithmic trading. It points to that which cannot be predicted or financialised, to that which cannot be protected by risk management or insurance companies, and to the possible consequences that exceed the expected.

Can we relate to this ambiguity without mystifying it? Can we engage with this mystical and teleological metaphor without depoliticising algorithmic trading? The answer is yes. Floods and other natural catastrophes have become a financial product, a speculative object. Financial markets quantify and price possible natural disasters in so-called "catastrophe bonds"; that is to say, probable future scenarios involving natural catastrophes happening at a specific time and location have become a financial instrument. If such catastrophic events actually occur, they don't merely affect those involved but also entail profits for the investors of the said catastrophe bond. Melinda Cooper explains that,

> **while weather-related risk had once been covered through indirect means, such as property insurance, the contingencies of the weather could now be directly hedged and traded in the capital markets. The curious effect is that climate change—and the critical or singular events it may engender—has become a speculative opportunity like any other in a market hungry for critical events (Cooper, 2010, p. 175).**

These bonds turn disruptive events where a great deal of uncertainty and risk are involved into financial opportunities for investors. In other words: catastrophe derivatives. The result has been "financial instruments designed to price and trade both in the uncertainties of the weather and our own uncertainties about the future of climate change" (Cooper, p. 176). Further, the irony of Hurricane Sandy is hard to ignore: the flooding of much of the Financial District caused the New

York Stock Exchange to close for the first time in almost three decades and, tellingly, algorithmic trading was closed for two full days. A flood seems to be an equalizer, devastating all that it comes to pass and making everything an unrecognisable pool of muddy water.

Ambiguous and quasi-religious metaphors recur in *Fragments on Machines*. In addition to a flood, algorithmic trading is associated with an eerie urban landscape connected to a hybrid, conscious, ghost-like, and possibly prodigious figure, and it seems to presage the coming of a catastrophic force. Each of these metaphors elude clear theorisations and that seems to be the point. *Fragments on Machines* shapes an imaginary of algorithmic trading as a phenomenon as ambiguous as spectres, hybrids, and floods. What does *Fragments on Machines* reveal when it imagines trading algorithms this way? It hints at factors of influence that, though outside the brightly lit, squarely bounded, and straight-lined space of the black box of finance, nonetheless affect contemporary economics. In this process, the mechanical, boxed, linear infrastructure and the urban grid of algorithmic trading are imagined as mutually constituted by a re-pastoralized landscape which includes a transformative encounter with a force of nature. To conceive of algorithmic trading by way of associating it with the figure of the spectre—with an eerie and prodigious space that is, save for a few maintenance workers, devoid of human presence—and to tie it to a flood is to conflate and recombine that which is usually considered categorically distinct. Algorithmic trading is imagined here as internally related to, and mutually constituted by, financial and natural history, economy, and theology, and to exist between the probable and the possible. Instead of swapping one dualism for another and instead of furnishing algorithmic trading with all-capturing power relations, or imagining the black box of finance as mystical or otherworldly, Charles connects the porous,

entropic matter of algorithmic trading technologies with the constant manual labour and maintenance work it necessitates and adds to this a Marxist revolutionary trope and biblical imagery of sin, punishment, and new beginnings.

Many phenomena that represent algorithmic trading as an open system come together in *Fragments on Machines*. The constant maintenance work cannot prevent trading catastrophes*, Fragments on Machines* seems to suggest, as the black box of finance is not a closed system. This maintenance work happens on all levels, from the tweaking of algorithms by programmers, to the work done by cable guys, to the interventions by central banks and governments, none of whom are able to predict the future or transcend time and space. Giving constitutional significance to myriad metaphors and symbols charged with ambiguity invalidates dualisms and provides algorithmic trading with many ties to the world. Similar to water, a recurring visual trope in the film, algorithmic trading runs in every direction, affects everything it comes across, and is affected by what it encounters on its course, but not in equal measure*.*

Fragments on Machines suggests that illuminating the conceived obscurity, immateriality, or intangibility of the black box of finance would not give way to more democratised, less obscure, or manageable financial markets. Rather, it imagines the black box of finance as part of a far larger, open, and ambiguous constellation that connects the present-day hardware and software of algorithmic trading to the dock palaces of yesteryear, to an extreme weather event, and to a possible new testament.

DEUS EX BLACK BOX

Where Charles represents the black box of finance as an open system that's open to movers and shakers, Femke Herregraven, points to where such movers and shakers may sneak in: in the spaces between model and reality. In her video installation *Pull everything, pull everything* (2018), Herregraven engages with the Flash Crash of 2010 and also conjures up the figure of a ghost. Further, she explores the connections between algorithmic trading and loss of faith in relation to the classic tragic notion of catastrophe and the theatrical device of the Deus ex Machina.

Pull everything, pull everything is a 5'35" loop shown on a two-channel video installation. One monitor of the two-channel installation depicts a configuration of trading desks in an office setting. The setup of each trading desk is the same: a chair, a desk with a landline phone on it, a configuration of three black monitors, here and there a drawer cabinet, and against the office wall stands a set of black server racks. When in operation the three screens atop each desk provide a trader with all necessary and desired information to trade. The desk, chair and the three monitors are set up in tune to the trader's eye movement. Allegedly, the composition of the information provided on the screens is presented in order of importance and attuned to the brain-eye coordination to process information as fast as possible. The second monitor of shows a black screen. At the bottom of which one can read the existential reflections of a former, anonymous trader on the events of May 2010. The two screens are suspended from the ceiling by a monitor arm.

Figure 7:

Exhibition view of *Pull everything, pull everything* by artist Femke Herregraven

The loop of *Pull everything, pull everythi*ng begins by depicting the under-
side of the trading desks and then moves smoothly and swiftly around
the desks in circular movements. The camera rotates around the desks
in the trading room for the first few minutes of the loop. A line of text
appears at the bottom of the second screen in white lettering against a
pitch-black background. The black screen provides a visual association
with the black box. Line by line the following text can be read:

> *May 6, 2010, 2:32 p.m. EDT*
> *The flash crash was an event for me,*
> *that… well,*
> *it was a defining event*
> *There was no way for me to ignore that*
> *Everyone was on the high-frequency trading floor*
> *Things were going pretty normal*
> *as normal it can be*
> *The market was down 2.5 percent*
> *There were riots on TV, in Greece*
> *and every time they showed the Greek riots*
> *the market would drop a little*
> *and*
> *I remember looking up*
> *and, like on every trading floor, CNBC is on*
> *And I saw the Dow Jones dropped another 100 points*
> *A minute later I look up*
> *and then dropped another 100 points*
> *I got up from my desk and walked over to the futures traders,*
> *and they are scrambling all over the place*
> *They don't know what's going on*

They had huge amounts of orders in the market
Everything is going crazy
The market starts dropping another 100 points
And the CEO of the firm comes running out to the floor,
And he's just screaming: "pull everything, pull everything"
And so they're just hitting it
Hitting buttons, turning everything off, everything off
And so we are all huddled around these two screens,
and the one screen we're looking at the book,
It's the futures market:
you have a set of people willing to buy,
and a set of people willing to sell.
That is the market.

At this point, on the first channel, the landlines on each desk are suddenly and simultaneously lifted from their desks, followed by the monitors, and then the chairs are lifted from the ground, followed by the trading desks and the server racks, and lastly the walls of the trading room let loose and all are elevated up in the air and all start to swirl around. In medium shot, a configuration of trading screens rotates in the middle of the screen.

The text on the second monitor reads*:*

And as we are watching the screen,
the orders just started drifting,
The orders were being cancelled
And then they started drifting more
and then they started to go off the screen.
And then they were gone.
There was nothing.

There was no market.
For moments,
for seconds,
there was no market.
And we are all just sitting there and staring into oblivion.
You have no idea what's about to happen.
Something indescribably horrible must have happened.
The market was gone.
You don't know if the world is coming to an end
What is happening?
Even 9/11 didn't have that kind of impact

On the first channel, the swirling of the trading office its furniture and equipment slows its pace. And slowly, all the furniture and equipment lands smoothly and softly back on the floor and comes to rest in its designated place, as if nothing happened. The camera continues to pan around the trading room.

The text on the second monitor reads:

So then, things just started to return to normal
The market recovered and bounced back
And everyone just kept going
For me,
it just changed me
Looking back on that day,
I lost faith in capitalism
Or at least in what we had built
And I didn't trust it anymore,
I lost trust

After the screens fade to black for a second, the looped video chan-

nels restart. *Pull everything, pull everything* engages with the speed and the absurdity of the Flash Crash when algorithms, meant to calculate and manage risk, went haywire due to a mix of causes. The events of the Flash Crash point to a tragic structure within algorithmic trading. Using algorithms, traders attempt to predict regularities and exploit the uncertainty, volatility, and contingency of the financial markets. In an attempt to outpace and surpass their algorithmic competitors, traders design more and more algorithms and develop more and more mathematical models and strategies. This dynamic algorithmic meshwork of high-speed interactions produces its own volatility and contingency. The machines invented to disclose uncertainty and unpredictability sometimes create it. What is more, the trader of *Pull everything, pull everything* gives a first-hand, insiders' perspective on the Flash Crash, and yet he, an insider of the black box of finance, claims to remain in the dark as to what happened that day. He merely describes what happened on the screens of a cybernetic economy; he is watching the outputs of the black box of finance from moment to moment, from the outside. "We are watching the screen," he says, as if traders are observing "the market" from the outside, although arguably they are partisan players of state-protected automated trading.[27] In the absence of conclusive causality and the unprecedented impact that it had, the Flash Crash had become a mystical experience to this trader and his account of that day becomes a conversion story. The existential pondering and the re-telling of the event of that day is not merely an attempt to re-capture,

....

27 –   Traders between 10-15 different algorithms working to exploit and produce information asymmetries, including bots that monitor the market. On their screens, traders look at visualisation of indications of movement on the market, reduced and simplified to fit a set of screens filled with graphs, charts, and flows. The market becomes a non-spatial abstraction on a screen.

narrativize, and give meaning to the Flash Crash in human-time in the age-old form of the first-hand eyewitness account. The story of the trader in Pull Everything, pull everything is a story of shaken beliefs, of life-changing moments, and of losing trust in a certain idea and image of the world as a market. This is a moment in which the spectral and prodigious qualities of the black box of finance appear.

Figure 8:
Exhibition view of Pull everything, pull everything by artist Femke Herregraven

Prodigious moments draw their appeal "from their rarity and the mysteriousness of the forces and mechanisms that made them work," Daston and Park write (1998, p. 90). Partly because prodigies were "unique phenomena fascinating precisely because of their unknown causes and their violation of expectation about type" (p.114), partly because of their "occult qualities" that "could only be determined by experience rather than reasoning" (Daston and Park, 1998, p. 114), and largely because God sent prodigies to warn of approaching evil. In a sense, the flash crash appears as contemporary prodigy: a normative break, a "rupture" in the order of things associated with apocalyptic catastrophes (Daston and Park, 1998, p. 57). The category of the prodigious draws from instability and the unknown, which involves concerns about the future disposition of the self and which seizes you, in the words of Kierkegaard, "with the suddenness of the enigmatic" (CA, p. 71). As the trader of *Pull everything, pull everything* phrases it: "You don't know if the world is coming to an end. What's happening? Something indescribable horrible must have happened." For the trader the Flash Crash was prodigious. A singular event of unknown causes, that defied causal mechanisms, challenged his firmly held assumptions and triggered intense anxiety. In other words, a system aligned to the finite and the probable was disrupted by the possible.

An ambiguous agency occurs in *Pull everything, pull everything*, reinforcing mystification around the Flash Crash. An unknown source or force elevates the traders' desks from the ground and rotates them in the air. *Pull everything, pull everything* inserts a mysterious, invisible, omnipotent agent that seems to pull the strings in the trading room. High-frequency trading is associated with a form of invisible, automated, yet animated life. The occurrence of black box related aspects, such as invisible and unknown causes, further adds to a quasi-religious and

prodigious sphere. The trader's conversion story, laden with apocalyptic and Christian tropes, also foments the mystique surrounding the Flash Crash event; an event that put order, rationality, and probability—the models with which traders approach the world and the reality of that world—in doubt. To "crash" is to move beyond what is considered to be the normal, the expected, the predicted, and the anticipated. In *Pull everything, pull everything,* it entails a move into the realm of the mystical and the unknown. The Flash Crash is associated with the indeterminate, the unsettling, the unprecedented, the deviant; with situations in which one does not know what comes next; and with situations in which calculations and rationalisations are unhelpful. The text on the monitor continues:

> and then they started to go off the screen.
> And then they were gone.
> There was nothing.
> There was no market.
> For moments,
> for seconds,
> there was no market.
> And we are all just sitting there and staring into oblivion.
> You have no idea what's about to happen.
> Something indescribable horrible must have happened.
> The market was gone.
> You don't know if the world is coming to an end

The trader's screen, a (black) rectangle, a historical signifier of order, had become a space of chaos, unpredictability, and uncertainty. A seemingly enclosed black box turned topsy-turvy. This event challenged the central assumption of capitalist risk exploitation, resulting in a break

with the regular, the familiar and the known. The Flash Crash was for the trader the moment when what was previously considered as identical, split apart: model and reality.

Models, Jess Bier and Willem Schinkel write,

> **...perform particular conceptions of the economy, and by extension the world. These conceptions include both implicit and explicit claims about what the economy is, what it's for, and what it should be (Bier & Schinkel, 2016, p. 285).**

Writing about the Black-Scholes model and relying on the work of Michel Callon, MacKenzie makes a similar argument in *An Engine Not A Camera: How Financial Models Shape Markets* (2006): models trump reality—or, theory trumps practice. In a self-referring and self-confirming loop, MacKenzie argues that economic theories and trading models perform and hence shape the operations and processes of financial markets. Model-makers, he states, imagine the financial market as predictable and controllable. The models built on this assumption subsequently perform it. He writes: "[t]he effects of the use of the Black-Scholes-Merton model in arbitrage thus seem to have formed a direct performative loop between "theory" and "reality" (MacKenzie, 2006, p. 166). The model, and the practice it sustained helped to create a reality on the market that confirmed the theory of the model (MacKenzie, p. 166).

Steven Levy makes a similar point in "A Spreadsheet Way of Knowledge" (1984). Models, he claims, are both a tool and a world view, a belief that the way the markets work in turn shapes the operations in the markets. Until they don't. For the trader, the economy and by extension the world is a market where people buy and sell. If the world as a market is a given, the buying and selling on that market is a given too—the mar-

ket is space and trading is time. However, when model and reality split apart, the absence of buying or selling is the end of time. Within this view, a crash of the markets is an incomprehensible and all-encompassing event like "the world coming to an end." The nose dive of the Dow Jones and the subsequent cancellations of orders on the market had the trader of *Pull everything, pull everything* losing his ersatz religion. If what makes the world spin is imagined as a market, then activities on it amount to either buying or selling. Consequently, the absence of buyers and sellers is the end of the world, a be-all-and-end-all experience. The Flash Crash could not be absorbed into a logic of buying or selling and therefore was considered by the trader as a threat to the order of the market and, by extension, the world. When there is no market, there is no movement; hence, the world stands still. The market is conceived as spanning the globe and defining meaning in relation to it. In *Pull everything, pull everything,* the black box of finance is not a separate realm nor a bounded space, but an overcoding of and overemphasis on the idea of the market. The idea of the financial market does not determine what happens in it.

The focus in *Pull everything, pull everything* is on the futures market and on how high-frequency trading algorithms caused a sudden collapse. As such, the black box of algorithmic trading comes to be associated with vulnerability, fragility, and the threat of possible collapse. *Pull everything, pull everything* could be considered as a contemporary version of the modernist obsession with dualisms. Such a dualist understanding of Human versus Technology, of the visible versus the invisible, and so on assumes the primacy of one over the other. Seen in this light, the story of the trader becomes a metonymic reference to the often-used Romantic humanist "rhetorical device of the reversal" (Fox 2018): the machines of reason have gone crazy; the tower of Babel has

collapsed; Icarus has crashed down; we have birthed a monstrous child; the very systems built to transcend the present and secure the future—for a split second—unexpectedly punch you in the face. Or in this case: the tragicomic scene of traders feverishly hitting buttons and the desperation they exude as they try to hold on to the illusion of control. A world mired in necessity and probability is slapped to its senses by the possible. Revenge of the machine?

The exhibition view of *Pull everything, pull everything* also points to a very different lineage and constellation in which algorithmic trading is embedded. The work was first exhibited as part of Herregraven's first solo show, *A reversal of what is expected*, at the Westfälischer Kunstverein in Munster. With *A reversal of what is expected,* Herregraven investigates the concept of catastrophe in relation to international finance and algorithmic trading. The exhibition text, written by Kristina Scepanski, states:

> **Derived from the Greek, this term [catastrophe] was initially not negatively connoted in any explicit sense, but meant instead a reversal, an unexpected change or (quite literally) a movement from a higher to a lower position. In this context... catastrophe is not really a sudden, singular event, but rather a continual unfolding process, which undermines existing systems and leads to regulation of one kind or another (Scepanski 2018).**

Upon entering the exhibition space of *Pull everything, pull everything* visitors would see two black screens suspended from the ceiling by a monitor arm, alluding to the screens on the traders' desks. To be able to watch the loop on the suspended two-channel installation, Herregraven lets the visitors tilt their heads,, bend their knees, or sit down on the

floor below the screens. With this construction, Herregraven staged a contemporary version of a plot device used in classic theatre: the *deus ex machina*. This device is the sudden, unexpected appearance of an omnipotent and omniscient agent who intervened in a plot situation too complicated, intricate, or too hopeless to be able to be resolved by humans. The deity in question would appear out of nowhere, usually from above, and decide on the final outcome of the drama. The Latin phrase *deus ex machina* refers to the crane used in Greek (and Roman) theatre to stage this divine intervention. In Greek theatre, often one of the twelve Olympian Gods would appear to resolve the situation at hand. Arguably, this staging conjures up the notion of the necessity of an omnipotent non-human agent to reverse an algorithmic catastrophe. However, the reference to the device of the *deus ex machina* does more than facilitate a critique of algorithmic trading as a hopeless drama of our own making which requires divine potency to be resolved. Seen in light of Kierkegaard's conception of faith, which holds that one must first fall to the ground in order to come out with a leap of faith, a different understanding emerges.

To live with faith is to believe in the possible when nothing seems possible. Living with faith involves being open to the absurd. Faith rests on the absurd, Kierkegaard explains in FT. It is absurd as it requires believing in the possible against a backdrop of all the good reasons to doubt it. This tension can only be worked through by assuming possibility, and this happens by embracing the absurd. The absurd battles through doubt and reason. With his notion of having faith as being open to the absurd, Kierkegaard argues against the idea that the external world is subject to logic; not all that happens in the world can be explained by rationalisations and causal laws. With the staging of the *deus ex machina*, Herregraven alludes to a possibly absurd turn of events

Figure 9:
Exhibition view of *Pull everything, pull everything* by artist Femke Herregraven

not determined by logic and reason which could never happen or follow from rational principles, but only by *suspending* one's rational faculties. Doing so, she forges links between things that were previously unconnected: a *deus ex machina* and algorithmic trading. The *deus ex machina* points to a form of virtual presence *within* the actual, the regular, and the ordinary: a divine presence with the forceful and palpable powers to cause volatility and whirlwind beyond the ability of humans to manage and exploit stands in relation to algorithmic trading. The *deus ex machina* keeps the plot open to unexpected twists and turns—movement at the spot. It is about imagining openings in a seemingly closed system, to move beyond the financial sublime and open up to possibilities that exceed the expected and the probable, and that defy the seeming rectangle, rational and the causal spaces of algorithmic trading.

THE POSSIBLE IN THE ACTUAL: SPECTRAL INTERVENTIONS IN THE BLACK BOX OF FINANCE

Where does this imaginary of spectres and deities take us? *Fragments on Machines* and *Pull everything, pull everything* no longer believe that mapping, visualising, or tinkering with algorithms might result in better managed, regulated, or stable financial markets. Instead, these works allude to possible endings and collapse of the state-backed algorithmic trading on the financial markets as the way forward. Combined, the spectre of *Fragments on Machines* and the *deus ex machina* of *Pull everything, pull everything*, can be considered as artistic reminders of what Kierkegaard had in mind with his conception of the possible. Believing in the possible means believing all things are possible in actual and concrete existence, which happens "by virtue of the absurd" (FT, p. 46). Actual and concrete existence is not the sum of its parts, but is accessi-

ble to possibility. Believing in the possible is to think transcendence *and* immanence at once. For Kierkegaard, possibility, actuality, and necessity cannot be reduced to one another and are not opposed to one another. Those who argue "everything is neoliberalism" have been fooled by necessity—and those who argue capitalism is an ephemeral fluidity have been fooled by possibility. By drawing correlations between trading software and the catastrophes of nature and between hardware and the divine, more conventional assumptions about algorithmic trading are challenged. On the one hand, there is the finite, represented as the brick and mortar and technical infrastructure of algorithmic trading. On the other hand, there is infinite possibility.

It could be argued the spectral and phantom-like portrayals of *Fragments on Machines*, and *Pull everything, pull everything* is not so different from the aesthetic practices of digging down and standing back. Indeed, similar visual tropes are depicted. However, a significant difference is that algorithmic trading is not reduced to its finite infrastructures. Neither is the opacity of the infrastructure framed as both the problem and solution to black-box anxiety. Instead, their spectral imaginaries embed algorithmic trading in the larger context of risk culture and in the social and environmental aspects of that culture. It is situated between the broader context of a neoliberal culture of risks with its systemic logic of growth and accumulation *and* the possibility of spirited, radical, and absurd interventions in this culture. This possibility is indicated in *Fragments on Machines* by the flood, a spectral presence and by the suggestion of new beginnings. In *Pull everything, pull everything,* the *deus ex machina* refers to the possibility a sudden, forceful yet absurd plot twist. Possibility in the form of spectres and deities and in the form of floods and catastrophes are an answer to black-box anxiety, to technological determinism, and neoliberal fatalism. They are an antidote to hopeless-

ness. The figures of the spectre and the *deus ex machina* open anxiety up to possibility. The spectre and the *deus ex machina* are a form of artistic tactical resistance against a way of imagining automated capitalism and the algorithmic trading happening on its markets as an all-encompassing totality, as a regime that knows no "end", no "alternatives" and no "exits" nor an "outside", against a kind of thinking that asserts that everything that happens can have meaning only in relation to this totalising frame (Kal, 1999, p. 153).

The spectral imaginary expands the concept of the black box of finance by showing how it is temporal, vulnerable, malleable, and can be transformed by encounters. It is neither the algorithms nor the infrastructures that cause anxiety, but the experience of a lack of possibility. The possible, according to Kierkegaard, happens by virtue of the absurd. An absurdity marks the synthesis between faith and reason; it is an event that cannot be grasped by reason. Here, the prodigious flood, the hybrid and the spectres in the back box of finance mark the gap between the human attempt to rule over the world *and* the unruliness of that world. The flood, the hybrid, and the spectral whirlwind in the trading room are reminders that algorithmic trading is subject to all possible forces in and of and beyond the world; its systems will run down, can break and be broken. With their critical reflections, Charles and Herregraven veer away from determinism and fatalism, away from totalising frames. Their spectral interventions may help to imagine different openings, futures, endings, and new beginnings of automated capitalism. After all, and to refer to Murakami, imagination is the place for defeats and victories.

The next chapter explores the anxieties around web searches evoked by Google's monopolist position of its search engine and the financialisation of its search results. It discusses a series of promi-

nent artworks that critically engage with Google's search engine. One striking motif within these prominent artistic representations is the reframing of web searches as an act of collecting or the formation of a collection. Camille Henrot's experimental film *Grosse Fatigue* (2013) will be analysed in this regard. By reading *Grosse Fatigue* in tandem with Walter Benjamin's concept of the collector and Kierkegaard's conception of the possible as a passionate activity, this analysis brings passionate acts of possibility into view.

4
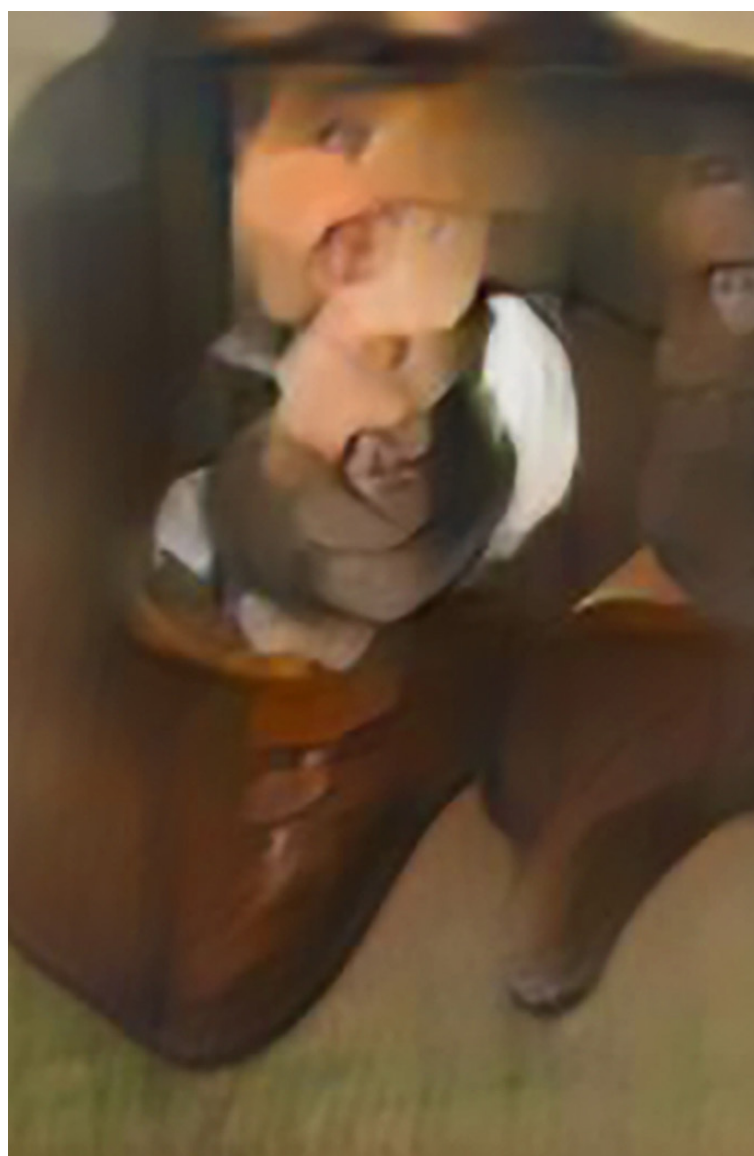
Walking in Circles in the Search Engine, or Collecting the Possible

We will wander, improvise, fall short and move in circles

— **J. HALBERSTAM,** *THE QUEER ART OF FAILURE*

INTRODUCTION

THIRTY YEARS AGO, SOME HOPED THAT THE INTERNET WOULD WEAKEN INFORMATION MONOPOLIES BY OFFERING INCLUSIVE ACCESS TO INFORMATION ON THE WEB. Things turned out differently. Elizabeth Kolbert observes: "Thirty years ago, almost no one used the internet for anything. Today, just about everybody [in the West] uses it for everything" (Kolbert 2017). Managing the complex information infrastructures of the internet has come with user reliance on search engines. Search engines form a key part of the infrastructure of online information. Or rather and more to the point, "surfing the web" in the West has come with reliance on Google's search engine. In popular perception, and absent strong competition, Google is perceived as the archive of the web, and even as the web—and "googling" has become close to synonymous with a web search. Its engine is assumed to comprise all existing information available on the internet and offers many other related information products through services such as: Youtube, Google Library, Google Scholar, Google Earth, Google Drive, Google Calendar, Google Phone, Google Maps, Google Video, Google Image, Google Analytics, Google Docs, Google Chat, Waze, DropCam, Nightcorn, AppBridge, Senosis, Polar, Cronologics, and Google Home, to name but a few. All you need to do is type in your query and Google's engine will find it for you and deliver it in a neatly ranked list on your screen. The company is also one of the largest computer manufacturers in the world. To service its users, it makes use of massive storage and computing power it manufactures itself. Google's competitive advantage is further reflected in the Oxford English Dictionary. "To google" was added as a verb to the OED in 2006, meaning to "search for information about (someone or something) on the internet using the search engine Google" (Google).

The verb's common currency reflects Google's stable market share of over 90%[28], and its commercially- and technically-centralised position. How is this reliance on Google's information infrastructure perceived and what anxieties are braided around Google's centralised position?

I begin this chapter with a more general discussion of the nexus of concerns revolving around Google's search engine and web search. Google's monopoly position is a cause of anxiety for both artists and academics. Considering the work done in academia and the arts, a number of issues emerge. Much academic work is dedicated to showing how web search mediated by Google is imbricated in a system that thinks merely in terms of profits and what the implications are thereof. Here, issues arise that have to do with the use of personal data, the for-profit logic behind search algorithms, and the power imbalance therein, whilst artistic strategies tend to focus on specific algorithmic features that are part of the infrastructure of a web search. The use of Google's search engines and algorithms in art comes in many guises. From iconic fictional browser narratives (Olia Lialina), a live stream of an artist's personal browser in real-time (Jonas Lund), a play with bots used to identify pornography on the internet (Jake Elwes), epistolary art about the influence of the internet on people's lives (Jeroen van Loon), subversive play in the form of Google browser extensions (RedNoise), tinkering with Google's ad algorithms (Alessandro Ludovico), with its image search algorithms (Rebecca Lieberman), or with Google Chrome plug-ins (Rafaël Roozendaal), to a physical theatrical performance piece in which a group of people enact

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28 –   In Europe, the market of search engine technology and database infrastructures is dominated by Google. See, for example, StatCounter: http://gs.stat-counter.com/search-engine-market-share

a search engine (Christophe Bruno). In addition, a variety of artists[29] engage with "digging down" practices and aim to expose the hidden materiality and centralisation of search engine infrastructure by focusing on internet cables, data centers, servers, and stacks of hard drives (Timo Arnall, Jeroen van Loon, Ingrid Burrington).

This chapter focuses on a concept only a few artists have engaged with, but that nonetheless helps in understanding the anxieties around web search: collecting. Take, for instance, the conceptual documentary photography of Philippe Braquenier. With *Palimpsest* (2012-present), he presents a series of photographs of major libraries, archives, and data centres in Western Europe and the East Coast of the United States. In Braquenier's own words, his project "bears witness to the infrastructures of information repositories…" (Braquenier, 2012). These repositories include images of databases, amongst which Google's Data Center in Belgium, which is hidden from view by artificial dunes. His work points to ……………..

29 –   In various ways artists such as Femke Herrengraven, Jeroen van Loon, Timo Arnall, Emma Charles, James Bridle, Jan Robert Leegte, Barrett Lyon, Adam Harvey, Ingrid Burrington, Clement Valla, Jonas Lund, Paolo Cirio, and Evan Roth, visualize the seeming 'immateriality' of aspects of the web search and search infrastructures in their work. With *Internet Landscapes* (2016) Evan Roth presents a series of landscape photography. For this series he travelled to parts of the world where submarine internet cables arrive on land. The work *Internet Machine* (2014) by Timo Arnall, aims to reveal the hidden materiality of the data that makes up the internet. Using a wide-angle lens and slow-motion his multi-screen film installation depicts the inside and outside of one of the largest data centres in the world. And in her multi-screen film installation *White Mountain* (2016)*,* Emma Charles draws in on the Pionen Data Center, buried under granite in Stockholm. The data centre is embedded in a former Cold War-era nuclear defence bunker, buried 30 meters underground beneath a rocky granite mountain of the Vita Bergen Park in Stockholm. By focusing on the spatial-architectural features of search engines, Charles develops conceptual associations between a web search and the vast and remote data centre, as well as, its server stacks.

different times and scales of collection: the time of library and archival collections and the time and scale of data centres. In a different vein, Richard Vijgen created *Deleted Cities* (2011), a work that could be described as a digital excavation site. It plays with the notion of GeoCities as an excavated conglomerate of cities in relation to which *Deleted Cities* could be seen as a collection of relics taken from the excavation site. GeoCities was a free web-hosting service that ran from 1995-2009. It was used by many early internet users to build their homepages, which were modelled after a user's city of choice, including neighbourhoods, streets and squares. At its peak, in 1999, GeoCities hosted over 1 million websites. After the arrival of Web 2.0. and with the growing popularity of Facebook and Twitter, the announcement came in 2009 that GeoCities would be taken offline and deleted. Archive Team, a collective of digital archivists, then decided to make a back-up of "approximately 650 gigabytes worth of digital, cultural heritage created by the Web's earliest citizens, or "netizens" (Counter Map Collection, 2019). The cities, neighbourhoods, and their inhabitants (called homesteaders) of GeoCities are no longer on the web, but there are numerous fan-fiction websites dedicated to GeoCities as well as web archive projects that give access to a part of the GeoCities webpages that have been recovered and archived. Vijgen's *Deleted Cities* is an interactive visualisation of parts of the back-up made by the Archive Team in 2009 *and* an attempt to collect and preserve a part of the web's cultural heritage.

The most intriguing artwork on search anxiety and its relation to collecting has been conducted by Camille Henrot. In her experimental video *Grosse Fatigue* (2013), the emphasis goes to searching as an act of collecting and it addresses the question of what constitutes a web

search and why this is a cause of anxiety.[30] In an attempt to answer this question, the artist explores a long tradition of philosophical reflections on the will to know, zooming in on collecting as an activity that gives form to this desire. The second half of this chapter focuses on how *Grosse Fatigue* imagines search anxiety and how searching as collecting and the searcher as collector open out onto the dimension of the possible in relation to the will to know. What anxieties underlie web search? What is the connection between collecting and search anxiety? I will argue that *Grosse Fatigue* tacitly links Kierkegaard's conception of objective uncertainty to Walter Benjamin's notion of the collector. Doing so, the film hints to the *possible* as part of the act of collecting and links the act of collecting to a web search. By connecting the work of Kierkegaard and Henrot to that of Benjamin, the latter's conception of the collector offers a way of living with and through search anxiety. I will demonstrate how Henrot's notions of searching as collecting and the searcher as collector open out onto possible alternative spaces on and off the World Wide Web. I start this chapter by introducing the subject of search anxiety as it is discussed in the academic literature from media studies, sociology, Science and Technology Studies, and communication and computing studies, before moving on to explain how search anxiety is imagined in contemporary art.

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30 –   For *Grosse Fatigue*, Henrot was awarded the Silver Lion at the 55th Venice Biennale. Her work has been shown at numerous museums, art institutions and biennale, including at Chisenhale Gallery, London; Kunsthal Charlottenburg, Copenhagen; Bétonsalon, Paris; Westfällischer Kunstverein, Munster; Palais de Tokyo, Paris; Hammer Museum, Los Angeles; Fondazione Memmo, Rome; the New Museum, New York; Schinkel Pavillon, Berlin; New Orleans Museum of Art, New Orleans; Musée du Jeu de Paume, Paris; MoMA, New York; Centre Pompidou, Paris; Astrup Fearnley Museet, Oslo; Stedelijk Museum, Amsterdam; SculptureCenter, New York; as well as the 2015 Lyon Biennial and the 2016 Berlin Biennial.

SEARCH ANXIETY: GOOGLE SLAVES, BIAS,
FOR PROFIT INDEXES, AND THE POLITICS OF WEB SEARCH

Various scholars from a variety of disciplines have expressed concern in particular about the monopolisation of Google search (e.g. Jordan 2015; Couldry 2012; Fuchs 2012; Gehl 2014; Epstein 2019) and on the capitalist rationality behind Google's search engine (e.g. Mager 2012; Lewandowski 2014; Campanelli 2014; Jarrett 2014; Jordan 2015). Astrid Mager, for example, has written about how the algorithms behind search engines are shaped by their for-profit target-advertising business-models and advance a capitalist logic and ideology (Mager, 2012). Wendy Chun argues that software and hardware are "ideology machines" (Chun, 2006, p. 19). Further, issues pertaining to globalization and localization of web browser used in different fields and geo-locations have flourished31 too (e.g. Min Jiang 2012; Jobin & Glassey 2014; Vaidhyanathan 2011; Petzold 2011; Pariser 2011), as well as reflections on past and present search technologies and their implementations (e.g. Knight & Mercer 2015; Ørmen 2014, 2016). Significant work has been done on the political and cultural bias reflected in search results (e.g. Dutton et. al. 2017; Epstein and Robertson 2015; Hoffman 2019). Safiya Umoja Noble shows in *Algorithms of Oppression*: *How Search Engines Reinforce Racism* (2018) how Google's search engine "reflects the political, social, and cultural values of the society that search engines operate within", including the racist and sexist beliefs of the society (p. 148). Research on the legal implications of search engines

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31 –   Min Jiang (2013) conducted a comparative study of Baidu's and Google's search results in China. Based on the search results of 316 popular Chinese news events Min Jiang found in the top 10 search results of Baidu and Google an overlap of less than 7%.

has grown too (e.g. Becker & Stalder 2010).

Google's search engine provides vital access points to the world wide web, as one of its core functions is the algorithmic channelling of information by inclusion, exclusion, localisation, personalization, and hierarchisation. Importantly, the algorithms operating Google's search engine are part of its business model. The majority of Google's profits comes from targeted ads. Which is to say, some companies benefit financially from other people's search queries in Google's search bar. Features like localisation and personalisation—also known as averaging—have effects on the list of search results and so do matching and ranking algorithms (e.g. Pariser 2011; Borra and König 2013). Your search keys are linked to and across all the devices on which you use Google search and its other applications. Google stores that information to target you with personalised ads, one of its main sources of income. Together they are used to analyse patterns in people's queries and churn out lists of results based on, amongst other things, popularity. Up to this day, Google tracks the geolocations of millions of phones worldwide, and all Android devices come with ad viewing behaviour trackers such as scripts and cookies. As a consequence of Google's high search volume and market share, an industry of marketeers continually tries to manipulate Google's algorithms to improve their ranking in Google's search engine. These factors amount to the self-referential, recursive, for-profit, financialised, proprietary monopolisation of web access. Google is self-referential, as it brings you what it has already found and indexed. Moreover, its search results are ranked according to popularity as measured by its own algorithms, and it has incentives to direct searchers to its content. Google's search engine is also recursive. It takes input from its users and continually reuses

that data to refine search results for its users and for the delivery of ads. Google's for-profit and proprietary search engine is integrated into browser extensions, GPS systems and numerous web applications on tablets such as smartphones and iPads.

Google's self-referential, recursive, financialised, and proprietary monopolisation of web access shapes what information we come across online. Search algorithms, Taina Bucher states, "hint at the fundamental question of who or what has the power to set the conditions for what can be seen and known with whatever possible effects" (Bucher, 2018, p. 3-4). This power derives in part from its index. When one uses Google's web browser, one does not search the world wide web. When we search, Google's algorithms select, sort and rank documents that it has saved in its search engine index, a local copy of web documents that it has indexed. In "Why We Need an Independent Index of the Web" (2014), Dirk Lewandowski explains how Google's web search functions. On the one hand, there is the worldwide web, which contains billions of documents. On the other, there are for-profit web indexers, such as Google, whose web crawlers attain a small portion of the available data on the web that is then held on a local unit of storage. Finally, this local copy of the web is indexed by Google so as to make it searchable. This indexed part of the web is called the surface web and contains web documents that can be found through Google's search engine.

According to Lewandowski, the search engine index is therefore the foundation of the search engine (Lewandowski, 2014, p. 49). Users type a query into Google's search bar and get a list of ranked pages in return. Meanwhile, the broader web comprises billions of documents that change all the time: new pages are added, others deleted, and changes are made on existing pages. This requires the constant updating of the local copy of the surface web and its index. Yet, as Lewandowski ex-

plains, "It is impossible to maintain a perfectly complete and current index" (Lewandowski, 2014, p. 50). He goes on:

> **The pool of data changes thousands of times each second.**
> **No search engine can keep up with this rapid pace of change.**
> **The local copy of the web can thus be viewed as the Holy**
> **Grail of web indexing at best... (p. 50).**

This Grail, the copy of a website in the index, can lag behind for days. Not to mention, search engines do not merely capture and store documents they find on the web; instead, Lewandowski explains that they generate replicas of documents (p. 50-51). These replicas contain information extracted from the document (source, title, length, date of creation, keywords and the like), information on the popularity of the document (measured by the number of times it was accessed and how many links to the document exist on the web, among other measures), and an alternative, text-based version of the document comprising the anchor texts from other documents (p. 50-51). Different types of algorithms decide what parts of the web one sees—this can be a single page on a blog that has not been indexed, content on Facebook, information behind paywalls, or any other content that is not indexed or cannot be found through a standard search engine. Considering the market share of Google's search engine in Europe—a solid 90%—users rely on Google's method of indexing and ordering results. They are "confined by the limitations of Google's collection of data. If Google has not seen it—and indexed it—or kept it up-to-date, it can't be found with a search query" (p. 51). Seen this way, Google's search results form a collection within a collection.

In light of this, to search the web is political "in the sense that it is ordered, governed, shaped" (Bucher, 2018, p. 8). Indeed, search anxiety

stretches beyond Google's search engine. In her popular and widely cir-
culated polemic piece "Google as a Fortune Teller: The Secrets of Sur-
veillance Capitalism", Shoshanna Zuboff (2016) even warns of a possible
assault by Google (Zuboff, 2016). With the data we feed it, Google is
selling "access to the real-time flow of your daily life—your reality—in
order to directly influence and modify your behavior for profit," she ar-
gues (Zuboff, 2016). This, she explains, threatens "the existential and
political canon of the modern liberal order" (Zuboff, 2016). Zuboff fears
a future in which we all become "information slaves" of Google. "We are
the native people now," she writes (Zuboff, 2016).

The consequences of the web's centralisation and monetisation
are a concern for artists, who provide us with means of grappling with
these processes by taking position in relation to the centralisation and
monetisation of web search. A number of artists express concern about
the use of aggregated and interconnected search data. One canonical
work is *I LOVE ALASKA* (2009), a 50-minute documentary video by
Lernert Engelberts and Sander Plug. On August 4, 2006, the person-
al—and, it can be assumed, private—search queries of close to 650.000
America Online (AOL) users, the then-largest internet provider in the
U.S., were accidentally published as a text file on AOL's public website.
The file consisted of three months' worth of users' search keywords.
AOL pulled the data from public access on August 7, 2006. However,
by then it had been copied and disseminated on the internet—the file
can still be found on mirror sites accessible through the internet archive
Wayback Machine. *I LOVE ALASKA* consists of a selection of the search
queries of AOL user #711391. The queries are read aloud as a voiceover
by a female with a southern drawl and in chronological order, as indi-
cated by the insert of a timestamp in the left corner of the screen pre-
ceding each query. The narration of the search queries is accompanied

by static shots of different, barren, presumably Alaskan, landscapes, such as a snow-capped mountain range, a sunset, a log cabin, windy dunes and a highway.

A selection from the search queries read:

cannot sleep with snoring husband;
Jackie zeman nude;
reverend harry meyers;
How to kill mockingbirds;
how to kill annoying birds in your yards;
God will fulfil your hearts desires;
online friendships can be very special;
People are not always how they seem over the internet;
can liver problems cause you to lose your hair;
gay churches in Houston tx;
are growths on the face always cancer;
cooking channel;
how can I tell if spouses spy on me while I'm online;
married but in love with an other;
back pain;
Is George Clooney gay;
how to make good impression first time meeting an online friend;
Ticketservice;
How can I be a good example to an unsaved friend;
I love Alaska;
treating computer addiction...

A sense of voyeurism and secrecy arises in the interplay between the voiceover, the time stamps and the images, which I LOVE ALASKA presents from the search queries of user #711391. The queries invite the

viewer to make up a story, to fill in the gaps. Nate Anderson describes I LOVE ALASKA as

> **...real pain, stripped of a human face... Puzzling out the person presented eventually gives way to thinking about our own search and browser histories, the trail of cybercrumbs leading through the forests of the internet on paths that our own friends and even spouses may not know we tread (Anderson, 2009).**

User #711391 seems to be a woman of faith from Houston, Texas, in a relationship with a snoring husband, apparently has met someone online, has anxiety about diseases, shows an interest in Alaska and in same-sex.

Anxiety about the possible future use of individual and aggregated search data is a recurring topic of concern both in art and in academia. Anja Groten developed the *Machina Recordatio* (2013)*,* an alternative search engine where you can browse for specific topics and keywords relating to existential issues and romantic problems you may not want to share with Google. The search "results" have the form of voice recordings of elderly people giving life advice to searchers who want to keep their private lives somewhat private. Relatedly, Harlo Holmes and Camille Henrot created an offline *I Ching*-like search application named *Desktopmance* (2015), which algorithmically answers a user's personal questions about life decisions and the future with a poetic response based on a selection of poems liked by Holmes and Henrot, combined with images randomly selected from the files stored on the user's desktop.

As a form of artistic resistance to Google's monopoly position, the financialisation of its search results, and the anxieties about the possible use of aggregated search data, artists such as Anja Groten, Taryn Si-

mon and Aaron Swartz, Phil Jones, and Aharon Amir have created alternative search engines. With their alternative search engines, they each tackle different aspects of search anxiety. *Image Atlas* (2012), made by Taryn Simon in collaboration with Aaron Swartz, responds to anxiety about filter bubbles. The two developed a search engine that compares the top image results for search terms across localised engine settings of 57 countries around the world. Users of the *Image Atlas* can play with these settings and refine or expand location settings to compare the given image results. *Image Atlas*, in the artists' own words, "questions the supposed innocence and neutrality of the algorithms upon which search engines rely" (Simon, 2012).

Relatedly, Renée Ridgway's *Re:Search* (2016) also offers a view of the powerful forces at play in the back-end of the web search. Her works focus on the centralization of power in the political economy of search engines. Through data visualizations and an interactive touch screen, *Re:Search* shows the value of key words as measured through the lens of "personalized" and "anonymized" search results. The work consists of two tablets that show two interactive data visualizations of the search queries and results. One shows the results of Google Search in a Firefox browser on a personalized Apple (signed in to Gmail account, no ad-blocking plug-ins). The other shows the results of a "hacker-approved" clean Lenovo PC with a Tor browser. In the exhibition view, the two tablets were complemented with a paper print out with long lists of the different URLs of the search results of both engines. *Re:Search* is an investigation into the "personalization" feature of the Google search and alternative methods of querying the web, such as with the onion browser on Tor. To counter the self-referentiality of Google's search results, Phil Jones and Aharon Amir created the *Narcissus Search Engine for N.E.W.S.* (2009). Like Google's engine, *Narcissus* searches a database

of documents for matching keywords, keeping tabs on when searchers click through to see the results. Contrary to Google's engine, however, it favours the less popular or unpopular over the popular. It does so by downplaying popular sites by pushing a popular result site down in its ranking. If a popular site continues to be clicked on despite these efforts, it will no longer appear in the list of results.

Other artists have engaged with the recursive aspects of Google's engine and the use and financialisation of user data. Erica Scourti's *Life in AdWords* (2012–2013) stages a personal interaction with Google's AdWords algorithm. At least until 2017, AdWords algorithms would sift through user's Gmail accounts and chat history, analyse topics of possible interest and use this data to target its users with personalised ads that would appear in their inbox and on the result pages of Google search. Google claims that since 2017, it scans Gmail data only with the consent of its user. Starting in 2012, for nearly a year, Scourti logged into her Google email account and emailed her diary to herself. In *Life in AdWords* she performs, to a webcam, the list of keywords that turned up in her inbox as a result.

Of course, the revenue model and data exploitation of Google's search engine is not the only issues with web search—though they seem the more pronounced causes of anxiety both in academia and in the arts. While artistic and academic projects pick up on different issues, a shared focus is to expound on the conditions of centralisation, localization, and financialization of Google's search engine in order to critically rethink the "results" of the search engine. That is, most academics and artists tend to "stand back" and focus on Google's search algorithms and results, reflecting upon its revenue model and the power dynamic between searchers and the profit-driven corporate mediators that administer Google's engine and aggregate its data. Web search, however, is

not a matter of political economy alone. It is also a matter of collecting. It is this act of collecting and the relation between the collector and the collected, which forms the central concern of Camille Henrot's experiential video work *Grosse Fatigue* to which I turn in the following section.

THE SEARCHING CONDITION IN *GROSSE FATIGUE*

Henrot's *Grosse Fatigue* can be described as a Kierkegaardian reflection on a web search. The film could, to an extent, be read as performing a synthesis between faith and knowledge as it loosely links religion and science and world-building to Google's search engine. Moreover, the artistic enactment of the act of collecting presented in *Grosse Fatigue* shows a way to work with and through the self-referentiality and recursiveness of Google's search engine. *Grosse Fatigue* carries its viewers through the realms of epistemology, taxonomy, theology, and technology, offering reflections on the act of collecting on the one hand and an artistic imaginary of the underlying moods and shapes of the quest for knowledge on the other.

Set entirely on a desktop computer, *Grosse Fatigue* begins with a window popping up on a desktop with the query "the history of the universe" being typed into the Google search bar. From there, the film takes its viewers on an audiovisual tour de force along with numerous creation stories, down the rabbit hole of Google's web browser, and through the collections of the Smithsonian Institute in Washington, D.C. In 13 minutes, the film covers millions of years in the history of the universe, crossing numerous disciplines, methods of research, and fields of expertise. *Grosse Fatigue* was made during Henrot's stint as a research fellow at the Smithsonian Institute in Washington D.C.—the world's largest conglomerate of museums and research centres, which

is administered by the US government and holds over 137 million artworks, objects, and specimens in its collection. Her book, *Elephant Child* (2016), expands on some of the formative ideas for *Grosse Fatigue*. *Elephant Child* is in part a collection of the research material and thinking that informed *Grosse Fatigue* and offers images of the artworks and quotes of thinkers that have shaped Henrot's ideas.

Furthermore, Henrot connects the quotidian practice of web browsing to the eternal question of life on earth and the moods and shapes underlying the mystery of life on planet earth. Spirals and rectangles, hands, turtles, and globes reappear throughout the film as it draws in on the concepts of recursion and self-similarity. To trace the connection between these concepts is to discern Henrot's understanding of what it is we do when we search.

Grosse Fatigue invites viewers to rethink the idea of a web search as broadly situated in the history of how knowledge is conceived, narrativised, preserved, distributed, and, importantly, *collected*. The footage of *Grosse Fatigue* consists of film images taken at the Smithsonian Institution combined with images and clips taken from Google Image and Google search results. The Smithsonian Institution is not modest about its ambitions. Its mission is to "unlock the mysteries of the universe" and to continue to take the

> **...lead in the quest to understand the fundamental nature of the cosmos, using next-generation technologies to explore our own solar system, meteorites, the Earth's geological past and present, and the paleontological record of our planet (Smithsonian Institution).**

Google has parallel ambitions in the digital realm by, as one example, allowing its users to navigate the earth. Through Google Earth, one can

traverse oceans and mountains or zoom in and zoom out of cities. With Google Books, one can leaf through any of the books it has digitised, while Google Scholar provides access to the digital archives of museums and institutions, amongst other things. With its combined services and products, the company aims to "…organize the world's information and make it universally accessible and useful" (Google Mission). In this sense, the Smithsonian Institute and the Google search engine would seem to be good places for starting a query on the history of the universe. That said, queries into Google's vast database or the Smithsonian collection are mediated and governed queries. What Google's search algorithms and the Smithsonian have in common are their attempts to organise disorder.

The opening scene of *Grosse Fatigue* starts with an image of a laptop screen with a desktop image of the milky way. A *Final Cut Pro* file is opened, and two windows pop onto the desktop. Each shows what appears to be the same art catalogue against a yellow background. In one window, the book opens on a page with a centrefold portrait picture of native tribespeople. In the other window, the art catalogue is leafed through by a woman's carefully manicured hands. The two windows cut to superimposed clips of a young woman opening a locker in the sterile grey corridor of what seems to be an archive. These images are then paired with another window in the top right of the screen showing a Google search bar. The words "the history of the universe" are being typed in the bar. What follows is a torrent of quickly-paced edited shots of Google's search images mixed with short video clips of quotidian moments as well as images and clips of artefacts, taxidermic flora and fauna, and a plethora of objects that form part of the vast collection of the Smithsonian Institution.

Grosse Fatigue enacts the phenomenon of the web search by way

of overtaxing its viewers with sound and images taken from different internet sources, archival research and personal files of the artist. Different file systems and internet interfaces fill the screen—the desktop, the screensaver, folders, windows opening and closing. These are visually linked with images of files, cabinets, boxes, and drawers in which the Smithsonian Institution preserves its collections. The rhythm and movement of the film's montage is synched to the punches of a kick-drum. A deep and warm voiceover begins to read a poem:

> *In the beginning there was no earth, no water – nothing.*
> *There was a single hill called Nunne Chaha.*
> *In the beginning everything was dead.*
> *In the beginning there was nothing, nothing at all.*
> *No light, no life, no movement, no breath.*
> *In the beginning there was an immense unit of energy.*
> *In the beginning there was nothing but shadow and only*
> *darkness and water and the great god of Bumba.*
> *In the beginning there were quantum fluctuations.*
> *In the beginning, the universe was a black egg where*
> *heaven and earth were mixed together.*
> *In the beginning there was an explosion.*
> *In the beginning, a dark ocean waged on the shores*
> *of nothingness and licked the edges of Night.*
> *In the beginning was the eternal night Han.*
> *In the beginning, before all things, there was*
> *Amma, and he rested upon nothing.*
> *In the beginning, Ptah the demiurge born from the essential ocean.*
> *In the beginning, the fabric of space-time unfurled, it inflated.*
> *In the beginning, atoms were formed.*

In the beginning a giant cobra floated on the waters.
In the beginning everything was still, there was no beginning.
In the beginning, and in the Void, the Oldest of Old
Gods was formed, the world had no time, no shape,
and no life, except in the mind of the Creator.
In the beginning the Word already was (Henrot, 2013).

The editing and the drum rhythm are seamlessly synched with the flow of the spoken word poem that forms the backbone of *Grosse Fatigue*.

Henrot mentions in her book *Elephant Child* that the poem lines mix creation stories from various religious traditions (Hindu, Buddhist, Jewish, Christian, Islamic), hermetic traditions (kabbalah, freemasonry) and oral traditions (Dogon, Sioux, Shinto, Inuit, Navajo). In poetic recital, we hear:

Then the Gods split humans in two, making them each search for their
lost half
Then some degree of sperm competition took place
Then Eve of the rib was adorned in jewellery
Then a brother and sister were locked in a yellow wooden drum
Then the milky way took form
Then there was no need for light on Dzambu Ling,
For the god emitted a pure light from their own bodies,
Then the creator was in the form of a man without bones,
Then the gravity of galaxies slowed the expansion of the universe,
Then there were units of matter,
Then Ogo introduced disorder into the world by
committing incest with his Mother Earth,
There was no world then, only the white, yellow, blue,
black, silver and red mist floating in the air.

In the beginning was only the sky above,
And water and marshland below.
In the beginning was nucleosynthesis (Henrot, 2013).

Henrot has a knack for image matching and juxtaposition, sound-image choreography and color composition. Using these techniques, she forms a mesmerizing dance of spoken word, drums, images, colors and movements. With this dance she attempts to tell the story of the universe's history.
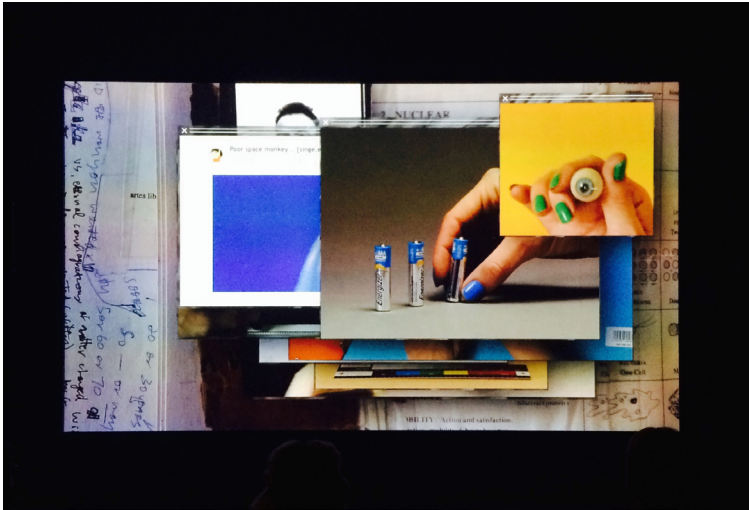

Figure 10:
Exhibition view *Grosse Fatigue* by artist Camille Henrot

Kierkegaard would have argued that *Grosse Fatigue*'s searcher knowingly sets itself up for failure. He would have dismissed the suggestion that reconstructing the history of the universe helps to understand the meaning of existence. As existence is not a mere object or question of

knowledge, it cannot be answered by scientific pursuit. Kierkegaard further explains this by way of dancing:

> **If someone who wanted to learn to dance were to say: For centuries, one generation after the other has learned the positions, and it is high time that I take advantage of this and promptly begin with the quadrille—people would presumably laugh a little at him... (FT, p. 46).**

Just like a dancer has to learn, retrace and rehearse the basic positions, again and again and again, the meaning of existence lies in existing, as a verb. It requires commitment and constant and often thankless effort. Which does not mean that nothing is edifying about reading about dance or watching others dance; it is to say, rather, that questions regarding the meaning of existence cannot be answered by science alone.[32]

However, the searcher of Grosse Fatigue does not search for answers within the walls of the Smithsonian Institution alone. Superimposed pop-up windows open to short video clips, web texts, and web images taken from a variety of digital platforms and sources. The viewer encounters: drawers full of dead tropical birds; YouTube videos; a clip of a woman masturbating; Wikipedia lemmas; home videos; marbles; a SkyMall magazine; a toned male torso showering; a world map visualizing occurrences of bipolar disorder; an orange rolling; a soaped naked female torso; turtles eating; a turtle hedging eggs; a frog sitting on a

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32 –   In FT, Kierkegaard uses the example of love. All of us have to learn what it means, experientially, to love. Sure, poetry, films, novels, and songs, as well as stories from experienced people, can help us form a conception of what love is. However, each one of us needs to struggle with it ourselves and to proceed to understand it experientially. There are no short-cuts or substitutes for that. We cannot learn what love is by merely listening to love songs nor reading all the books that have been written about it.

smartphone; flora and fauna from across cultures; as well as numerous other objects that first fill, and then flood, the screen. Henrot weaves together objects and aesthetics of oral and digital culture, natural science and theology, mixing the seemingly trivial and personal with the monumental collections of the Smithsonian Institute. Meanwhile, the spoken word poem recited in the voiceover jumbles various creation myths, moving chronologically from the beginning of creation to the end. The voiceover's tone tightens, he sounds anxious, and his breathing becomes more and more pronounced while he's heard saying:

The Creating Power then took many animals and birds from
His great pipe bag and spread them across the earth.
First came self-promoting chemicals and then fat formed membranes
And then came the green algae colonies in the sea,
And then the oxygen, oxygen.
Eight faced air, air to make winds and breezes,
Air filled with sounds, air carrying oceans
And then came the vertebrates, the jawless fish
And then came the nautiloids in the Devonian ages of fishes,
And then came amphibians from the coelacanth,
And then came the birds from the coelacanth,
And after the flowering plants came the bees,
And after the bees came the snakes,
And after the snakes came the ants,
And after the creodonts came the primates,
And after the primates came the song birds,
The parrots, the loons, the swifts
And then came the butterflies and moths,
And came the grasses

> *And came the marsupials*
> *And came the pigs and cats from the coelacanth,*
> *and came the deer,*
> *After the deer came the zebras, elephants and then the dogs*
> *And came the hyenas, the bears, the giraffes,*
> *And came the three sloths, the hippopotami,*
> *the zebras, the elephants, the lions, the dogs,*
> *And then came the mammoths from which came nothing at all*
> (Henrot, 2013).

At the end, the narrator gasps for air.

Grosse Fatigue hurries through aeon and aeon. In 13 minutes, art and culture, science, extinction, Jackson Pollock, Charles Darwin, Pantone colours are all there, as are drawings, notes, and numerous browser windows. Henrot draws no boundaries between one category and another, mashing up science, myth and the creation stories of the world; making associative leaps of imagination between objects and images of eggs, planets, marbles, a fox, and flexing biceps, spume and turtles. In doing so, she synthesises disciplines and values: science and religion, words and images, epistemology and ontology. *Grosse Fatigue* seems to refuse to dualisms. Who says *this* is spirituality and *that* philosophy? Who says this is *subjective* and that is *objective*? Henrot explains in an interview: "It was my aim for the film to reflect the anxiety generated by the open nature of the world and its excessive dimension" (Henrot quoted in Picard, 2013). Referring to anxiety like that which underwrites the search for knowledge—be that through quests within an archive or queries on the web—Henrot echoes Kierkegaard. In *Elephant Child,* one can read another Kierkegaardian echo. Henrot writes,

…when you try to grasp universal questions, or questions

that are too big, you need to draw into yourself, to use intimacy and subjectivity as a means of accessing something beyond the self (Henrot, 2016, p. 184).

In Kierkegaardian fashion, Henrot synthesises faith and knowledge.

FRAMES, WINDOWS, BOXES & OTHER RECTANGULAR ENCOUNTERS

As noted earlier, what Google's search engine, the Smithsonian collections, and creation stories have in common are their attempts to organise disorder. They attempt to organise the Great Chain of Being and the World Wide Web. Every part gets its allotted position in the whole of the natural/digital world. *Grosse Fatigue* could be seen as an enactment of the operations and mechanisms of search algorithms.

In the voiceover we hear:

And language was used to praise Heart-of-Sky rightly
And mankind discovered the knowledge of history and nature
Of minerals and vegetables, animals and elements
The knowledge of logic and the art of thinking
The sciences of gratification and those of utility,
The art of remembering and pure mathematics,
The science of physics, the science of medicine,
The science of botany, the science of chemistry,
The knowledge of politics, the knowledge of alphabets,
The knowledge of magic and the science of God,
The knowledge of virtue and the mechanics of poetry,
The science of laws and the science of commerce,
The metaphysics of bodies and the transcendental geometry,
The dynamics, the hydraulics, the optics, the dioptrics,

> *The acoustics and grammar, music, cosmology, geography,*
> *Orthography, chronology, zoology, physiology,*
> *arthology, astrology, aerology, and more.*
> *Then there was promiscuity, monogamy and polygamy…*
> (Henrot, 2013).

When the narrator says, "first there was nothing, and then, an explosion," we see footage of marbles spreading out and rolling on a tabletop. When he says, "primates", a YouTube clip of the meme "poor space monkey" pops up. When he says, "[t]hen the Gods split humans in two, making them each search for their lost half", we see hands placing two small and identical figurines on a blue surface. When we hear, "[w]ho can understand the loneliness of Gods?", we see a tidy row of taxidermy birds in a Smithsonian file drawer. With the pronunciation of each *logos,* a window pops up that is superimposed by the next window popping open, forming a sequence of ever-smaller rectangles within rectangles. When the narrator says "music", we are shown an image of a cassette-deck player. When he says "cosmology", we see a turtle crawling through sand. We hear "geography" and see images of a typewriter's text. "Orthography" is linked to a nest of turtle eggs in the sand. "Chronology" is linked to a picture of an analogue calculator. "Zoology" is connected to a blue bucket full of tiny turtles; "physiology" to a laptop keyboard; "pathology" to a short clip of a large number of turtles crawling over sand; "astrology" to a clip of text displayed on a light-box and turtles running on sand. "Polygamy" is linked to a clip of a chameleon being stroked by a female hand with brightly coloured polished nails. The rhythmic popping open of windows presents a succession of images shot at the Smithsonian: corridors with file cabinets and drawers full of neatly ordered macaws, toucans, penguins,

and insects are visually linked to a collection of ancient fertility statues, to X-rays of fish and seahorses. These are combined with video clips of turtles burrowing into sand, ostrich eggs being peeled, a man looking at the inside of what appears to be a nuclear bomb, a photograph of the universe, a glass eye, eyedrops falling onto a blinking eyeball, seashells, dried tree leaves, an iguana, the back of a bald head, a zebra, a boulder, pictures of bees, paintings of fish, a collection of insects, a drawer filled with taxidermied flamingos, a clip of a mosquito hovering over a glass plate, an inflatable globe, a woman sitting on the subway, and framed insects. The viewer is never informed about what kind or sort of animals, objects or rituals they are looking at, where the snippets of the footage come from or what the structure of image forms and associative ideas is supposed to convey.

Figure 11: Exhibition view *Grosse Fatigue* by artist Camille Henrot

Each image or clip is framed by a file window. Taken together, the different fields of study and concepts listed by the narrator are visually represented as part of a larger whole made up of other disciplines that are similar to it. In *Grosse Fatigue,* all the different parts are represented by rectangles. Henrot calls these "reciprocal inclusions", and they are formally represented on screen as a stack of superimposed windows diminishing in size (Henrot, 2016, p. 28). Like envelops like envelopes like envelopes like. This visual play with patterns of rectangles is repeated throughout the film, like a Fibonacci sequence. In doing so, *Grosse Fatigue* stages a mesmerizing audio and visual *mise en abyme* of the "different systems of belief—the different strategies used by humankind—used to synthesise human history which is also kind of a history of the universe" (Henrot, 2016, p. 182). That is, Henrot imagines the styles and forms of what humans consider forms of knowledge and ideas as an endless recursion of squares within squares. The search engine is yet another square within a square within another square—in an infinitely recurring sequence of squares within squares.

Figure 12: Video still *Grosse Fatigue* by artist Camille Henrot
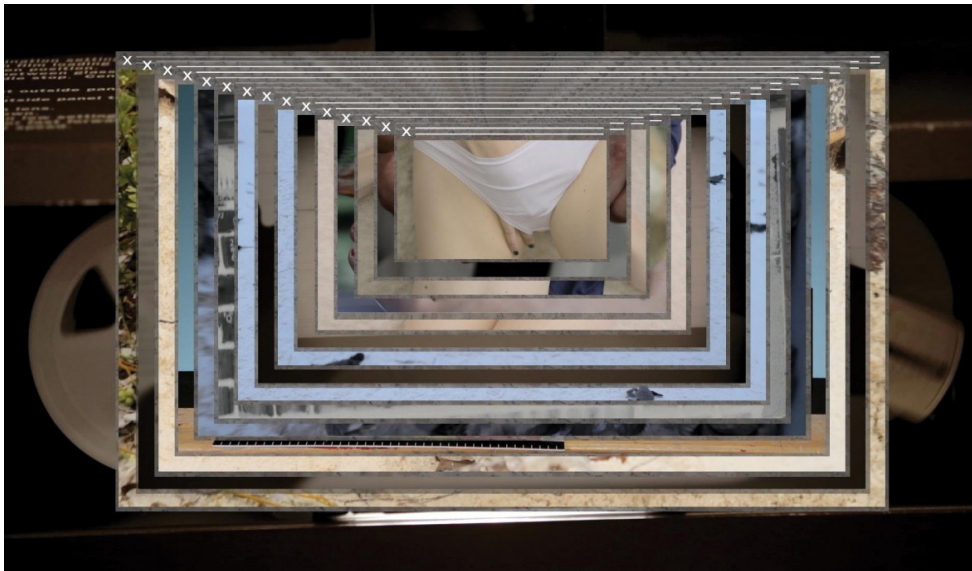
"Knowledge is made for cutting", Foucault once famously asserted (Foucault, 1984, p. 88). In other words, in an attempt to understand the whole, parts are formed. In *Grosse Fatigue,* this cutting of knowledge is represented by file systems: storages boxes, file drawers, the folders of computer files, and Google's search bar. These are all composed in rectangular shapes that crop, frame, set limits. Pop-up window upon pop-up window is interspersed with footage of the neatly-ordered archival facilities of the Smithsonian, suggesting a link between the different ways in which knowledge is cut out, shaped. The rectangle signifies order that results from human intervention.

In *How to Live Together: Novelistic Simulations of Some Everyday Spaces*, Roland Barthes points to the 90- and 180-degree angles of the majority of the living spaces we create: houses, apartment buildings, doors, windows, roofs. "It's all rectangular ≠ nature: no rectangles... Rectangle: as the basic shape of power"[33] (Barthes cited in Henrot, Elephant Child, p. 54). The rectangle is "the mark of the division between man and nature", Henrot claims (2016, p. 54). Rectangles shape the interfaces through which we navigate spaces of human dominion: databases, archives, maps, contractual papers, field guides, screens, books, and documents. Rectangles separate order from chaos. Rectangles mark off territory and separate inside from outside, what belongs, and what cannot belong, what fits and what does not fit within the four straight lines of its shape. "Conquest begins with mapmaking" (Henrot, 2016, p. 141). Henrot visually emphasizes the imposition of the rectangle by browser windows, folders, and files, the square vignettes and storage rooms and cabinets, boxes—the shape of order—and by juxtaposing them to spiralling objects such as shells—the shape of limitless infinitude.

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33 –   A classic example is the powerful effect of the shiny black rectangular monolith in Stanley Kubrick's *2001: A Space Odyssey.*

The final scene of Grosse Fatigue shows windows opened to Wikipedia's lemma of a world map of bipolar disorder and schizophrenia and images of caged animals. Here, the maddening quest for understanding life on earth is linked to contained wilderness and psychiatric disorders with symptoms of disorganized thinking and delusion. The experience of psychiatric disorder is presented in the form of a lemma; the "wildness" of the world is mediated through the rectangular form and straight lines of a cage. Grosse Fatigue associates the process of "rectangling" with the caging of animals. A pen is a closed space. Caging an animal is a safety measure. A cage reigns in the unpredictable, and tames it, domesticates it. In imposing clear boundaries, a pen makes the unpredictable, to a degree, predictable. By entering a rectangle, by putting things within a rectangle—also achieved through the preservation of objects within the rectangular spaces of an institution—a closed space is created, a space of finitude, to preserve and hold on to for eternity. Like a wild animal in a cage, the archive and the search engine contain disorder by enclosing it in a rectangle and by rendering it into an ordered list of "results" and a neat line of taxidermal animals.

The rectangle is also a key characteristic of another Google feature, the so-called Knowledge Graph. When users query a well-known person, event, place or thing, they encounter a square panel atop the search results, on mobile phone devices, or to the right of the top results, on most other devices. Google's knowledge graph feature was added to its search engine in 2012. Say you type in "Mae C. Jemison", the graph shows her full name, five portraits and headshot pictures—some older and some more recent—that are captioned "American Engineer". A short text below states,

Mae Carol Jemison is an American engineer, physician and

NASA astronaut. She became the first African American woman to travel in space when she went into orbit aboard the Space Shuttle Endeavor on September 12, 1992.[34]

Also included is an additional link to her Wikipedia lemma. In addition, it mentions her date of birth, the space mission she was on, where she went to school, awards received, and the names of her siblings. Reportedly, the information is taken from a variety of sources; however, the information provided is frequently unattributed. In October 2016, Google's CEO, Sundar Pichai, claimed that Google's Knowledge Graph "encompasses 70 billion facts" (Pichai quoted in Vincent 2016). That is, 70 billion search queries spawned answer boxes atop search results. Knowledge graphs also appear on contentious topics like "capital of Israel", to which Google's Knowledge Graph answers: "Jerusalem".[35] Query "best book of 2018" and it gives you a list of 53 books. Apart Chennapragada, Google's director of product management states: "So the knowledge graph is Google's understanding of the world and all the things in it" (Chennapragada quoted in Slegg, 2015). This comment suggests the world is a container of things. Its reconstruction of the world is one in which every question yields neatly ordered and boxed results. Of course, not everything can find its place in the limited coordinates of a rectangle.

The imposition of rectangles can have deadly consequences. *Grosse Fatigue* refers to ideas in Jacques Derrida's *Archive Fever: A Freudian Impression*. Derrida explores the subject of the archive from a Freudian

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34 –   This is the result of the search query "Mae C Jemison" of November 19, 2018. The content of the Knowledge Graph is subject to change.

35 –   This is the result of the search query "Jerusalem" of November 19, 2018. The content of the Knowledge Graph is subject to change.

perspective and examines the archival desire to collect and preserve in relation to what Freud called the death drive. Derrida draws attention to what remains outside of the archive, to its "forgetfulness, amnesia, the annihilation of memory" and asserts that there is "no archive without [an] outside" of that which is not preserved, or, by virtue of the archive, destroyed (Derrida, 2006, p. 78). Henrot reflects on this paradox:

> **This is how the collection of endangered species ends up precipitating the complete extinction of certain species, and how some inter-categorical species cannot be named, such as certain invertebrates that are not invertebrate (Henrot, 2016, p. 99).**

No archival drive exists without a destruction drive, claims Derrida. Death haunts the Smithsonian in a literal sense. The Smithsonian's Department of Anthropology, to which Henrot had full access, was created and expanded rapidly in the context of the end of the American Indian War. As Henrot comments: "[t]he first collection contributed in an exponential way to the Smithsonian's collections was the collection of American Indian artefacts" (Henrot 2014). The Department of Anthropology has the largest collection in the world of American Indian artefacts. The collection illustrates the historical nexus of power and knowledge. Henrot suggests that the genocide that gave impetus to the collection of the Smithsonian is now dressed up in scientific form masking the violence that fueled the foundation of the Institution. Indeed, Walter Benjamin claims that "[t]here is no document of culture which is not at the same time a document of barbarism" (2003, p. 392). To collect is to cage. To cage is to create a closed space. A closed space is to divide. To divide is to set limits. To set limits is to separate; like a zoo, it provides a way to engage with what is by virtue of the separation

considered the wild, the unknown, the other.

The rules of a collection involve classification (be it emblematic, didactic, encyclopedic, or otherwise). Classification has difficulty with what defies classification, with the extra-orderly: cross-links, diversions, hybrids, in-between bodies, monstrosities, the nebulous, imponderables, and other unstable categories. Jack Halberstam observes that in societies focused on classification, counter-archives exist "of bodies and modes of being that fall out of the definitional systems produced to describe them" (Halberstam quoted in Young, 2019). Any system of order needs an exception and exclusions to be validated. As noted in the previous chapter, when an object, animal or person does not fit the rules of classification, it becomes dangerous, with the potential to bring down curses on those who have disturbed the order of things. To maintain an ordered system always involves violence, partiality and politics. Like politics, you need to know the rules of the game to play the game. And like a game, systems of classification contain, bound, and are rule-based. To create an ordered system always involves violence. To create an ordered system is an interruptive act, which still, necessarily and inevitably, involves prejudice, predilection, and preference. No method of ordering exists without dissymmetry, without exclusions, without some quality of violence, skewing in certain directions and not others (Derrida 1992). The work of sorting, classifying, ordering, and ranking is outsourced by Google to its algorithms. This is how Google's index is formed. To be part of its index rules are established. Rules not only point to what is allowed and what not—to what is indexed and what not—but also to who sets the rules and who owns the index. An index, as is well known, is a tool of arrangement. Google's index is a means to create a system of order in what would otherwise be perceived as a chaotic multitude. To index is to practice exclusions. Exclusions generate a

list of results with a top and a bottom. Without cutting, discarding, and excluding, there can be no index and no ranked results. An index makes available and unavailable, connects and disconnects, and interconnects, recognises, misrecognises, and unrecognises. What is considered part of its index is therefore subjective, contingent, and self-referential.

The moving in circles within rectangles of self-similarity give the narrator of *Grosse Fatigue* much anxiety. While we hear heavy breathing, the voiceover continues in a mournful tone:

And Bumba vomited up the sun, and the sun dried
up some water, leaving land,
and when the earth was to be made, it fell down from the sky.
Earth, hills and stones, all fell down from the sky,
and the Earth rose up like a mountain
And the King above the Sky said, "Punch holes in the Earth,
The water will drain away"
Woman Who Fell From the Sky rested on turtle's back
God blessed the seventh day and sanctioned it,
Because that in it He had rested from all his work.
The arrow of time points to the heath death of the universe.
And Pan Gu felt lonely
And Heart-of-Sky felt lonely with the loneliness that ends
the worlds.
Who can understand the loneliness of Gods?
Yaweh was lonely
And Ogo was lonely
Lonely like Wak and lonely like Allah.
The whole earth was heavy and then Yahweh rested.
…resting, Pan Gu laid down
and resting, he died (Henrot, 2013).

The inherent subjectivity and self-referentiality of human knowledge or, differently put, the inaccessibility of earthlings to a view from no-where—to objective knowledge—is expressed in *Grosse Fatigue* by way of emphasising the loneliness of the Gods in creation stories. Further, the unknown is rendered as both an ontological and epistemological problem. Not knowing the full story, not being able "to make sense" out of a vast and chaotic multitude, is associated with losing one's mind—in the form of images of a Wikipedia lemma about schizophrenia and bi-polar disorder—and with death. The point *Grosse Fatigue* seems to make is that some things cannot be detached from subjectivity. Queries into Google's vast database or into the Smithsonian's collection are mediat-ed and governed queries that happen within the bounded space of the web and the archive, which are limited spaces and bounded by time. By overestimating what Google, the Smithsonian and creation stories can provide, *Grosse Fatigue*'s searcher is seized by anxiety. Questions regard-ing existence cannot be answered by data or documents alone. Further, many things in human existence cannot be documented, transfixed, factually accounted for, indexed or datafied, or reduced to facts.[36]

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36 –   Take the story of Hans Christian Andersen's *Thumbalina* (1835). The facts are straightforward: a tiny girl is kidnapped by a toad who wants to marry her off to her son. The girl is held captive by the toad on a lily pad deep in the woods. Some wood creatures—fish, butterflies, and birds—come to her rescue. A swallow drops her off at a meadow where she meets a fairy prince, and they fall in love. These facts tell us nothing about the charm, warmth and wit of the characters, the poetics of the story, the allegorical style, nor of the contradictory and diverging meanings attribut-ed to the tale. In other words, life refuses to be entirely factual. In CUP Kierkegaard puts it thus: "[e]ven if a man his whole life through occupies himself exclusively with logic, he still does not become logic; he himself therefore exists in other categories" (CUP, p. 185).

BETWEEN FACT AND FAITH: SEARCHING AS COLLECTING

Collections depend on systems of ordering. Ordering systems represent, to use Tara McPherson's words, "a logic of the fragment or the chunk, a way of seeing the world as discrete modules or nodes, a mode that suppresses relation and context" (McPherson, 2000, p. 144). In his work, Kierkegaard suggests that the anxiety the limits of knowledge leads to can be taken up "by a passionate mentality devoted, paradoxically, to overcoming the ultimate limitation of her own understanding" (Cake, 2010, n.p.). Or in Kierkegaard's own words, one must "infinitely passionately relate himself to the indefiniteness of the definiteness" (CUP, p. 372). How this must be done remains unclear in Kierkegaard writings, but Walter Benjamin's conception of the collector demonstrates one way to leap into objective uncertainty passionately. His notion of collecting as a redemptive activity, 'a box in the theatre of the world' as he describes it, offers a way to live with subjective truth and within the limits of knowledge.

In the essay "Unpacking my Library", Walter Benjamin writes: "[t]here is in the life of a collector a dialectical tension between the poles of disorder and order" (1999, p. 60). Another dialectical tension he points to in *The Arcades Project* is between the collector and the allegorist, when he writes: "in every collector hides an allegorist, and in every allegorist a collector" (Benjamin, 2002, p. 211). In *Grosse Fatigue,* the dialectical play between order and disorder and between the collector and allegorist resembles a Google search engine on high-speed. The loose associations between words and images are immediately followed by additional image associations or juxtapositions that, in turn, are supported by other quick associative links made between images and between image and spoken word and within images.

Further, the editing of *Grosse Fatigue* resembles a synthesis between the finite and the infinite and between order and disorder. Images of spiralling objects reoccur in *Grosse Fatigue*. The spiral, as is well known, is the structure of the infinite, the unlimited and the endless—it represents chaos. Kristina Scepanski, one of the editors of *Elephant Child*, describes it as follows:

> **Camille Henrot deliberately sets out to overwhelm the viewer. The sheer number of objects, the concentration of the stories behind them, the splicing of different disciplines from diverse fields of knowledge, competing principles of classification and, not least, the sensory experience within endlessly looped soundtrack coalesce *en masse* to demonstrate the excesses of an unbridled urge to collect and hoard, an excessive almost pathological compulsive desire for order, which ultimately is condemned to spill over once more to create its own disorder (Scepanski, 2016, p. 8).**

Henrot represents order by way of desktop folders, browser windows, archival storage facilities and other ordering systems. These are interspersed with clips and images taken at the Smithsonian of lockers being opened or closed and panned images of its endless corridors filled with file cabinets and boxes. These rectangles and practices of order find their spiral counterparts in the next scene. A small file window hovers over others at the centre of the desktop screen. In this window, we see a video of a laptop playing a film. The film shows a man stumbling down a tungsten-lit institutional hallway. He falls against one wall, then against the other, trying to maintain some balance to then quickly topple and fall to the ground. The film is a clip from Rainer Werner Fassbinder's *World on a Wire* (1973), a German science fiction TV series

that plays on the possibility that the world exists entirely inside another world. Fred Stiller, the series' protagonist, struggles to keep his sanity in this web of worlds within worlds in which the lines between simulation, representation and the real are blurred. *Grosse Fatigue* seems to suggest that when searching for answers about the history of the cosmos, we are all Fred Stiller, thereby linking search engine anxiety to the limits of knowledge. The whole escapes our grasp, "[w]e will wander, improvise, fall short and move in circles" (Halberstam, 2011, p. 25).

Figure 13: Video still *Grosse Fatigue* by artist Camille Henrot

Images of globes reappear in *Grosse Fatigue*: an inflatable globe, a picture of the earth from space, the cover of the Whole Earth Catalogue, a desk globe and a button with the text, "Why haven't we seen a photograph of the whole earth yet?" Globes, and by extension images of

globes, imitate the perspective of *Panoptes*, the all-seeing. A globe offers a "model of totalizing vision" (Henrot, 2016, p. 138). Globes also provide an image of the world as an object. Importantly, globes place the one looking at the globe outside of it. It suggests the gaze of an all-seeing outsider. In looking at a globe, one takes the gaze and the position of someone who no longer inhabits the world, but holds it before their eyes, from a distance—like a lonely God. Henrot writes,

> **The museum [Smithsonian Natural History Museum] is like a neurosis... Everything must enter the museum: everything living, dying, or deceiving; all the fish in the sea, all the birds in the sky, all the animals of the forest. The aim of the Smithsonian's Natural History Museum—to be a museum of everything—is an irrational project that is driven by the wish, the ambition, to reconstitute a world (Henrot, 2016, p. 80).**

This reconstituted world, in the form of a collection, becomes an object under one's power and control. Benjamin repeatedly speaks of properties *in the hands* of the collector and to "the *tactical sphere*" of collecting (Benjamin, 1999, p. 63, italics mine). In *Grosse Fatigue,* feminine hands regularly appear: rolling an orange, throwing marbles, grasping eggs and a sea sponge. Emphasis is also given to the manual act of scrolling, leafing, touching, clicking, and grasping. Another pattern of the manual labour conducted: browser windows being minimized, maximized, overlapped, moved and dragged. Subjective and bodily presence is here presented as forming an essential part of collecting, selecting, and rejecting. Henrot writes that "as individuals, we understand an object by holding it in our hand... The word comprehend derives from the Latin *comprehendre*: 'com' meaning together, and 'prehendere' to grasp" (Henrot, 2016, p. 150).

What connects the Smithsonian Institution and Google is their shared desire to gather all within a demarcated space. In *Elephant Child,* Henrot associates this desire to own everything, to have the complete set without anything missing, and to hold on to it for eternity with the narcissism of a child, "[t]he hungry hoarding child who wants everything" (Henrot, 2016, p. 59). In a similar vein, Benjamin writes about the collector in *The Arcades Project*:

> **What is decisive in collecting is that the object is detached from all its original functions in order to enter into the closest conceivable relation to things of the same kind... It is the deepest enchantment of the collector to enclose the particular item within a** *magic circle***, where, as a last shudder runs through it (the shudder of being acquired), it** *turns to stone***. Everything remembered, everything thought, everything conscious becomes socle, frame, pedestal,** *seal of his possession* **(Benjamin, 2002, p. 204-205, italics mine).**

Possession, Benjamin adds, is the most intimate relation a collector can have to their objects (Benjamin, 1999, p. 67). What is the power of the circle of possession? What you can collect you can hold, and what you can hold you can control and protect. In *The Arcades Project*, a book that is also a collection of quotations, Benjamin associates the collector's accumulation of possessions with a struggle against time—against linear and progressive time and, ultimately, the end of time. The possessive relation between the collector and its objects is characterized by their fate, Benjamin states. "[T]he need to accumulate is one of the signs of approaching death" (Benjamin, 2002, p. 208). However, when entering a collection, that fate changes: it turns to stone (Benjamin, 2002, p. 205).

To collect is to synthesise the eternal and the temporal.[37] Or phrased in Benjamin's terms, the collection, a circle of possession that encircles the collected, forms a dialectical image at standstill. In a collection, past, present, and future converge into a single materialization of what Benjamin called now-time. Benjamin's conception of the collection also offers an opening to Kierkegaard's notion of the possible.

....

37 –   *The Arcades Project* contains a number of quotations from the work of Kierkegaard, specifically from *Either/Or* in which Kierkegaard discusses the synthesis between history and memory, past and present, and exterior and interior history. Benjamin's concept of history does away with history as a *narrative* and transforms the concept of history into an *image*. His account of the dialectical image offers a starting point for a materialist history as an encounter between the past and the present that is articulated as a rapidly emergent image—a flash. This transduction of images for narratives constitutes his immanent critique of the concept of progress. As he explains in *The Arcades Project*:

> *…not that what is past casts its light on what is present, or what is present its light on what is past; rather, image is that wherein what has been comes together in a flash with the now to form a constellation. In other words, image is dialectics at a standstill (Benjamin, 2002, p. 462).*

There are more links to be made between Benjamin and Kierkegaard. Both emphasise interruptions and transformative events. Rupture permits an opening through which the eternal and infinite can be allowed a place in the present. Benjamin's emphasis on "flashes", "moments", "suddenness", as well as Kierkegaard's stress on the "sudden", "the possible", "singular", and "seizing" counters with conventional modernist philosophies of continuity and progress. When Benjamin looks back at history, he sees not laws or systems of development but contradictory forces and a dialectical process in which impacts of the past play an important, yet often suppressed, part in the present. When Kierkegaard looks at human existence, he sees calculation, laws, and rules, but also contradiction, paradox, and absurdity. For Kierkegaard, heterogeneity and syntheses signify the non-opposition of opposites. For Benjamin, dialectical images signify the non-opposition of the what-has-been and the now. And for both, change must come from within. Alas, a more substantive comparative analysis of the central concepts and ideas of these two thinkers falls beyond the scope of this dissertation.
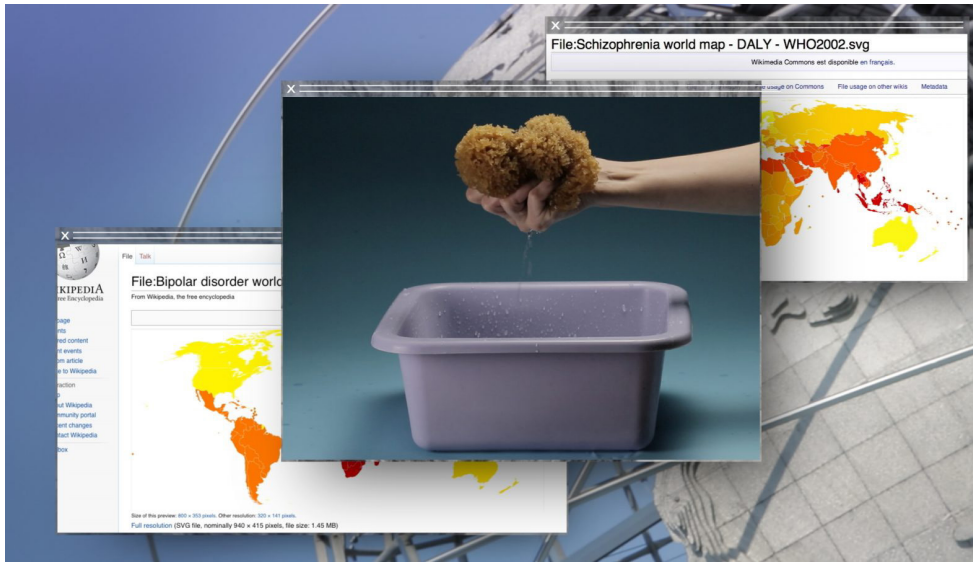
Figure 14: Video still *Grosse Fatigue* by artist Camille Henrot

In her reminiscence "Walter Benjamin: 1892-1940", Hannah Arendt writes about the primacy of collecting in Benjamin's philosophy. She identifies a redemptive quality central to his understanding of collecting. It is this redemptive quality that further connects the work of Benjamin and Kierkegaard. Arendt comments:

> **And inasmuch as collecting can fasten on any category of objects (not just art objects, which are in any case removed from the everyday world of use objects because they are 'good' for nothing) and thus, as it were, redeem the object as a thing since it now is no longer a means to an end but has intrinsic worth, Benjamin could understand the collector's passion as an attitude akin to the revolutionary, the collector**

"dreams his way not only into a remote or bygone world, but at the same time into a better one…" Collecting is the redemption of things which is to complement the redemption of man (Arendt, 1999, p. 46).

When mapped onto Kierkegaard's notion of the possible, the "redemptive" in Benjamin's understanding of the collection provides an opening to Kierkegaard's concept of the possible within the rectangular spaces of knowledge that have made the narrator of *Grosse Fatigue* gasp for air.

Ownership, Benjamin writes about the collector's object, is "the asylum" where objects "take refuge" (Benjamin, 2002, p. 19). He explains this in a way reminiscent of Kierkegaard's relational synthesis of the self: "[t]he collector delights in evoking a world that is not just distant and long gone but also better" (Benjamin, 2002, p. 19). It is the interior home of the collector, the dwelling space, that forms the asylum, not just of the collector's collected objects, but also of:

[t]he private individual, who in the office has to deal with realities, needs the domestic interior to sustain him in his illusions… [The interior] represents the universe. In the interior, he brings together remote locales and memories of the past. His living room is *a box in the theatre of the world* **(Ibidem, p. 19, italics mine).**

The collector gathers fragments from a world outside of their control to rebuild a world within their confines and control. The collector restores a fragmented world within the world—a box within a box. Benjamin relates this redemptive act of collecting to the attempt to reconstitute God, on a human scale.[38] A collection gives collectors the possibility to
…………..

38 –   As Daston and Park have documented in *Wonders of Nature*, in medieval

surround themselves with their belongings, to dwell in them, live in and with them, and to redeem them for the present (Benjamin, 1999, p. 67). A collection saves an object from the "drudgery of being useful" by making it a material manifestation of an eternal value frozen in time that, hence, cannot die (Benjamin, 2002, p. 209).

Grosse Fatigue is the result of Henrot's collection of a collection curated by people at the Smithsonian's Institution and by Google's algorithms. What is the function of the collection for Henrot? In Elephant Child, Henrot argues that collecting is a defence mechanism: "the desire to gather everything together always arises in response to a stress: it is a defense mechanism…"(Henrot, 2016, p. 84). The collection re-fabricates an encompassing whole, oneness. It re-creates completeness, she argues (Henrot, 206, p. 48). Here, Henrot echoes Benjamin who writes:

> **…for the collector, the world is present, and indeed ordered, in each of his objects. Ordered, however, according to a surprising and, for the profane understanding, incomprehensible connection (Benjamin, 2002, p. 207).**

According to Benjamin: "The collector lives in a piece of dream life" (Benjamin, 2002, p. 205). The collector arranges a miniature of the universe—a globe within a globe (p. 208). The collector's "deepest desire" is to "renew the old world," Benjamin writes (Benjamin, 1999, p. 61). As Henrot elaborates, this desire involves a restorative impulse:

⁓

Western Europe writers of encyclopaedias were often monastic Christians that studied God's creation in order to come closer to Him. Encyclopaedias often followed the structure of the days of creation by God. Likewise, John Prest argues in *The Garden of Eden* (1981) that sixteenth-century botanical gardens were not merely a collection of plants, they were considered re-creations of the garden of Eden (Prest quoted in Kwa, 2009, p. 277).

> **The aim of exhaustiveness, the desire of the complete collection, or the total history of the universe: each desire to collect is a desire to collect fragments that aims to effect a kind of symbolic restoration (Henrot, 2016, p. 59).**

Restoration implies origins and loss, the restoring to a former condition, the replacement of what is considered lost, dispersed. *Grosse Fatigue* represents the collections of the Smithsonian archives and Google's index as fueled by the age-old desire to repair and make whole again, to reconstitute the exterior within a demarcated space of the interiors of the archive and the database—imagined completeness as a defence mechanism against linear and progressive time. To collect is to re-create a world cleansed of frustration, like a miniature world—a box in the theatre of the world. In a box, things have their designated place, things considered to belong together are kept together and shielded from the outside. A collection is a box in a world. Henrot: "[w]hen the facts of life are painful, building a world of knowledge and ideas offers a shelter" (Henrot, 2016, p. 102).

> **The accumulation of objects is a way to build walls around a space, to create a world within a world… The return to the womb, an autarkic space protected from what it fears (Henrot, 2016, p. 48).**

To collect is to synthesise the temporal and the eternal. How does a collection relate to the infinite?

**SEARCHERS AS COLLECTORS OF POSSIBILITY
IN STRUCTURES OF FAITH AND KNOWLEDGE**

Collections make connections to forces, intensities, and capacities that roam inside and outside the dwelling spaces of the collector. The reappearance of hands that click, double-click, reject and select in *Grosse Fatigue* emphasise the ability to "edit" a story, as well as the ability to become a creator of those stories. Considered this way, *Grosse Fatigue* is a collection within a collection within a collection. The Smithsonian collection, it could be argued, is a creation story in reverse order. It attempts to make a whole out of fragments. By contrast, the list of URL results Google's search engine offers moves from link to link and makes connections that could be seen as selecting fragments from the whole. Collections make connections; they have a fictional quality; they tell a story. What does narrativization offer? A narrative provides linear structure, a before and an after, and causation within a limited space. Creation stories are linear stories of classification. They are often represented as following a linear, progressive structure, that clusters and organizes events around a continuum—*and then came the vertebrates, the jawless fish. And then came the nautiloids in the Devonian ages of fishes*. Stories also offer a sense of location and direction. This is how it began, we are *here* now, and *this* is how it ends—*and on the Seventh Day...* Like a narrative, science organizes its forms and contents into a series of events and gives them meaning. Every collection creates a story, retells a creation story, and collects stories within stories. By arranging objects, a collector produces a narrative. By making different selections or using the same objects but order them differently, different stories can be told. A collection forms part of an infinite spiral of possible stories in a finite and bounded space. A synthesis between the finite and

the infinite emerges. Collecting has infinite components, yet it involves plain and straightforward work: seeking, assembling, scavenging, perusing, gathering, purchasing—making all the necessary rounds, doing often thankless tasks, and having patience. Searching-as-collecting and the searcher-as-collector offers a relational play with components and connections between faith and knowledge, fact and fiction, and the finite and the infinite.

To search is to collect, and to collect is to create a dwelling space. Dwelling is an embodied activity that takes place in the thresholds between finitude and infinitude, the temporal and eternal. Camille Henrot's *Grosse Fatigue* represents a web search as an activity filled with contradictions. It enacts web search as the result of a continuous exchange between two opposites that influence each other: the analogue and the digital, the historical and the contemporary, the factual and the fictional, faith and reason. Quests for knowledge are about thinking *and* being. Kierkegaard writes in CUP: "thinking and being signify one and the same" (CUP, p. 407). Kierkegaard would insist that these dwelling spaces of collectors are not autarchic spaces; they are never cleansed of frustration nor rinsed clear of uncertainties. Likewise, search queries are always haunted by the limits of knowledge, by dispersion, by disorder, which stains the neat list of results offered to the searcher. Paradoxically, the very ordering and sorting operations of search algorithms invoke uncertainty and anxiety. Acknowledging this and reckoning with these limits is as close as one can get to faith and as close as one can get to the possible. Seen this way, collecting is a reminder of the synthesis between faith and knowledge and the collector's relation to the infinite, as well as a way to move in and out of a world without permanent certainties.

In the previous chapters, I sketched out the concept of algorithmic

anxiety through a close reading of a range of prominent contemporary artworks that address concerns about facial recognition algorithms (chapter 2), trading algorithms (chapter 3), and, in this chapter, search algorithms (chapter 4). In the next and concluding chapter, I synthesise the main ideas of the previous chapters that together affirm the importance of an aesthetics of possibility in relation to algorithmic anxiety.
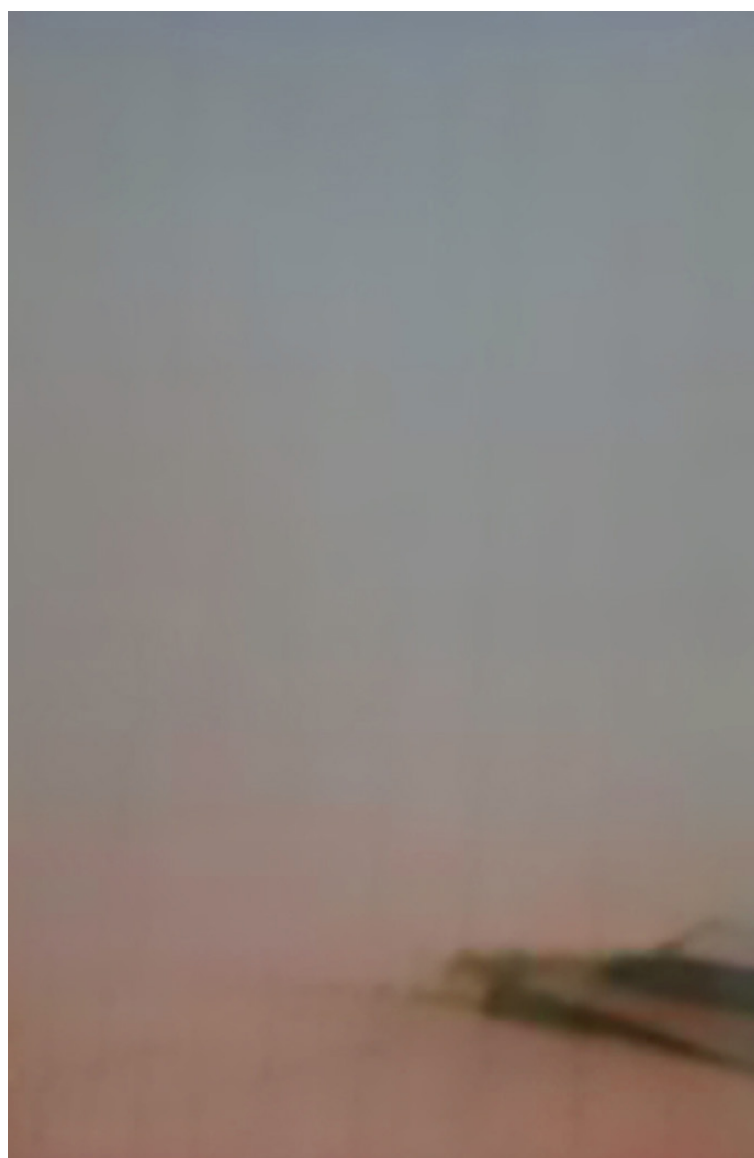
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Conclusion:
From Algorithmic Anxiety
to Algorithmic Possibility,
or Movement at the Spot

Despair is the absolute extreme of self-love.
It is reached when a person
deliberately turns his back on all help from anyone else
in order to taste the rotten luxury
of knowing himself to be lost

—**THOMAS MERTON,** *SEEDS*

INTRODUCTION

IN THIS CONCLUDING CHAPTER, I RECAPITULATE AND TEASE OUT THE MAJOR IDEAS OF THE PRECEDING CHAPTERS. At the start of this dissertation, I introduced present-day anxieties braided around the entwinement of the social and the algorithmic. Algorithmic culture has evoked anxieties that are symptomatic of its logic of automation, optimisation, accumulation, and exploitation. I observed that the proliferation of, in particular, the mechanics, apparatuses, and infrastructures of facial recognition algorithms, trading algorithms, and search algorithms had drawn the attention and concern of a growing group of contemporary artists over the past decade. I framed what I have referred to as algorithmic anxiety as an extension of Kierkegaard's distinctive concept of anxiety, mapped onto prominent contemporary artworks that engage explicitly with facial recognition, trading algorithms, and search algorithms.

In chapters 2-4, I fleshed out the concept of algorithmic anxiety through analyses of a range of prominent contemporary artworks that explicitly tackle concerns about the algorithmic capture of the face (chapter 2), automated trading on the financial markets (chapter 3), and algorithmic mediation of web search (chapter 4). In line with Kierkegaard's conception of anxiety, I described algorithmic anxiety as a relational synthesis between confining and extending constituents of the self, actuality, and knowledge, of which the finite, necessity, and temporality are confining and the infinite, possibility, and the eternal the extending constituents. Put simply, I argued that where necessity converges, possibility diverges. Algorithmic anxiety happens when one side of the reciprocal relation is overlooked, underdeveloped, or ignored. It is conditioned by a sense of being entangled within a system within which you cannot freely move and within which you experience

a lack of power and resources to escape.

The question that algorithmic anxiety poses is one of positioning: it is a matter of relating to the possible while simultaneously accounting for necessity. What resonates in the majority of artistic portrayals is an emphasis on necessity: on the converging aspects of the self, the structures of actuality, and the production of knowledge in algorithmic culture. Further, algorithmic anxiety represents a desire to move away from centralised powers and central mediators; a desire for changes in the distribution of resources, political power and information, as well as a desire for participatory and inclusive forms of government. It gets at the ways that algorithms, which are, in part, intended to reduce and control the anxieties around the incomprehensibility and unpredictability of social reality, instead refashion the anxieties they purport to manage.

A few intriguing contemporary artworks frame algorithmic anxiety as the relation between, on the one hand, the radical openness of the self, knowledge and actuality; *and*, on the other hand, the rigid algorithmic regimes that attempt to circumscribe this openness. In these works, algorithmic anxiety provides the opportunity to relate to the extending aspects of self, the structures of actuality, and the production of knowledge. Here, artists do not merely reflect on the experienced anxieties about algorithmic culture, but also re-imagine the entanglement of the social and the algorithmic, pointing to alternative relations of entanglement. In various ways masks (chapter 2), spectres (chapter 3) and collectors (chapter 4) represent alternative ways of relating to algorithmic culture. The artistic portrayals of these ambiguous motifs point to or hint at where there might be room to manoeuvre, where cracks and fissures appear. The relational conceptualisation of masks (chapter 2), spectres (chapter 3) and collectors (chapter 4) developed in this dissertation's analyses of artworks hints at conditions that could

make changes in the entanglement of the social and the algorithmic possible, by tacitly but poignantly pointing to bottom-up, smaller-scale, and collective and participatory movements that allow for different ways of relating. These different forms of relating, these movements, take the form of syntheses between individual independence and collective interdependence, between opening up and cracking up, and between means and ends. I will now outline the chapters in more detail and relate algorithmic anxiety to the possible algorithmic culture more broadly.

CAPTURING THE FACE ANXIETY
AND THE POSSIBLE OF THE MULTIPLE SELF

In the first case study in chapter 2, I approached algorithmic anxiety by assessing works by three contemporary artists—Zach Blas, Adam Harvey and Sterling Crispin. In different ways, each respond to recognition algorithms with masks or camouflage techniques designed to disrupt and critique the perceived proliferation and threat of facial recognition devices and practices. The algorithmic capture of the face causes anxiety partly because the desire for sovereignty, autonomy, and self-transparency are perceived to be tarnished and inhibited by the potentialities facial recognition technology is associated with: to police, inspect, nudge, and oppress. The logic and practices that manifest themselves through facial recognition technology are perceived to pose a risk to individuals and groups in society and to become a tool for those in whose service facial recognition technologies operate. Unable to know the future or see what risks facial recognition technology may entail, these artists imagine what the future may bring forth and hold on to what we are afraid to lose in the future, but are believed to possess in the pres-

ent: autonomy, privacy, sovereignty.

Algorithmic anxiety in the face of facial recognition systems is shaped by the desire for something that is perceived as hampered or at risk. Desires, of different people in different contexts and situations, cannot be separated from gender, ethnicity, geographic location, abilities and aspects of one's socio-political or economic habitat. A close reading of masks and camouflage practices indicates a desire to belong, to community and solidarity, a desire to be recognised and seen, as well as a desire to withdraw, depersonalise, and hide in the masses. As strategies of hiding, withdrawing and depersonalising, face masks and camouflage cannot be separated from the desire to be seen and belong. The algorithmic anxiety evoked by facial recognition technology emerges from the dynamic between the desire to be acknowledged, valued, recognised, and included *and* the fear of being objectified, denied, excluded, and disregarded; between the desire to be autonomous and independent *and* the fears that the inability to be such evokes. The work of Blas, Harvey, and Crispin show that relationality always involves risks, the risk of being judged, exposed, or objectified.

Masks and camouflage offer symbols and practices of resistance to these posed threats. Their prevalent use in contemporary art builds on a cultural-historical tradition of facial concealment, as well as on black-boxing strategies used by political protest movements, in civil conflict, and (guerilla) war. By exploiting weaknesses in recognition technology, face masks and camouflage do not merely represent a subversive hacking of facial recognition technology. Beyond this, face masks and camouflage offer movement, understood to comprise more than the fading-in-of- and fading-out-of-sight of facial recognition technologies.

Masks and camouflage emblematise the grip algorithmic facial capture technologies have on the self and offer an intervention in this field

by allowing for a reorganisation of an experience of power imbalance and precariousness. Crispin fears that algorithmic facial capture and the profit-driven data it produces will become a dominant way of assembling and imagining people. However, his *Data Masks* suggests that this model is forced upon social reality, but is not reality itself. The gap between the two is a space of possibility, symbolised by covering the face as the desire for a space to cover. Further, the face masks of Blas and Harvey's camouflage print suggests that though much importance is given to the autonomous, self-contained, self-organising person, facial recognition technology's grip might be loosened by way of moving towards collectivity, collaboration, community work, and solidarity.

Masks and camouflage are not tools to resolve algorithmic anxiety. Over and beyond an intervention into facial recognition technology, the face masks and camouflage couture of Blas, Harvey and Crispin could be considered as stylised performances of the embodied, situated, and relational self. Rather than pointing to the vulnerability of the self and its relation to others, masks and camouflage point to different forms of being and relating such as interdependency, community, collectivity, among others. Masks and camouflage symbolise the possibility to manoeuvre vis-a-vis algorithmic capture and circumscription by multiplying and strengthening one's connections to and engagements with others. To manoeuvre as the specific kind of movement opened up by masks and camouflage.

BLACK BOX ANXIETY AND THE POSSIBLE OF SYSTEM COLLAPSE

Artistic engagements with automated trading has given the possible quite a different appearance. The second case study, described in chapter 3, was dedicated to a close reading of algorithmic anxiety caused by

trading algorithms. Algorithmic trading causes anxiety in part because the infrastructure of trading algorithms is conceived as a black box.

This concept of the black box of finance, which is central to the artworks I analysed in this chapter, suggests that algorithmic trading is like an impenetrable black box, outside of human reach and influence, whose operations are invisible, unimaginable and unmanageable, yet can have catastrophic effects. Flash crashes and volatility on the financial markets have been imagined as the effect of these ever-faster, invisible, complex, and unruly trading algorithms that work in mysterious ways inside this black box. However, the artworks I discussed tend to respond to this figure in distinct ways: by either trying to open it up or by conceiving it as spectral.

In response, some artists have taken to visualising parts of the black box of finance in order to open it up: by rendering its invisible structures visible. Their works share a focus on wires, cables, electronics, modems, and screens, as well as on the bricks and mortar of data centres. They also evince a noticeable emphasis on the output of algorithmic processes, in the form of representations of machine vision and visualisations of algorithmic patterns of calculation. They tend to focus on algorithmic failures and vulnerabilities, in the form of flash crashes or other breakdowns. They evoke algorithmic anxiety by using the imaginary of the black box to represent trading algorithms as a separate world unconcerned with anything other than capital accumulation or profit maximisation. Crucially, some artists who work on algorithmic trading emphasise the perceived difficulty of effecting the operations inside finance's black box.

However, some artists imagine the black box of finance as not merely the result of the developments in, or characteristics of, algorithmic trading. Femke Herregraven and Emma Charles's artistic engage-

ment with trading algorithms points to the spectral condition of the black box of finance. In their work, this spectral relation emerges as the black box of finance is portrayed as having been produced through a *synthesis* between a wide range of—seemingly oppositional—market actors and facets: past and present; visible and invisible; material and immaterial; regulators and operators; local and global; human and machine. In their work, the spectral symbolises the ambiguous relations that constitute the black box of finance and which defy rationalisation, systematisation, and prediction.

Charles figures the spectral by a flood, the suggestion of a ghost or hybrid inhabiting the black box of finance. Herregraven does so by the suggestion of God-like powers represented by a rapidly rotating column of wind inside of a trading room. As water and wind, the spectral is formless and makes its way through cracks and around obstacles. A flood or a prodigious whirlwind can be described as interventions which, in the words of Jack Halberstam, "do not seek to make life better under the current conditions of exploitation and extraction, but [try] to figure out how to bring things to the point of collapse" (Halberstam quoted in Young, 2019). Wind can break while water can crash into things. The spectral events in the work of Charles and Herregraven do not fix, mend or improve anything, but rather momentarily tear the black box of finance apart. Collapse and catastrophe are here imagined as conditions to change, and as manifestations of possibility.

Sometimes the only way to change is to rip something down. Herregraven and Charles seem to suggest that another system is possible when this one breaks. As Halberstam puts it:

> **The question that seems most pertinent now, in an era of environmental decline, financial corruption [is] how do we**

> **unbuild the world? ...The contemporary anarchist does not seek to make life better under the current conditions of exploitation and extraction, but tries, rather, to figure out how to bring things to the point of collapse (Halberstam quoted in Young 2019).**

The spectral interventions of Herregraven and Charles dissociate the black box of finance from its socio-technical infrastructure and open it to transformative encounters, represented by alternative forms of relating and of presence, and by extension alternative ways of doing economics.

The desire to shake and break the black box of finance, the desire to grind the machine to a halt (even if momentarily) and the drift and force with which this happens in artworks of Charles and Herregraven, reflects the resolute rejection of the operations of the black box of finance. Further, breaking it down forms the mirror opposite of the helplessness and powerlessness evoked by the black box of finance's perceived imperviousness. An observation made by Siddharta Mukherjee on homeostasis is apposite here: "[t]here's a seemingly glassy transparency to things around us that work, made visible only when the glass is cracked and fissured" (Mukherjee 2018). When glass cracks and fissures, it becomes marked. Shards reveal the bits and pieces that together made up its smooth and shiny surface. When glass shatters, it gives way to other spaces that exist within the seemingly totalizing frame of the black box of finance. Shaking and breaking stuff may open it to alternatives that exist within and roam amid the seemingly all-encompassing and never-ending spaces of algorithmic capital accumulation. As James Baldwin writes in a different context: "Any real change implies the breakup of the world as one has always known it, the loss of all that

gave one an identity, the end of safety" (Baldwin 1956, p. 568). Indeed the end of safety, as real change might be for the better, but might also be for the worse, as everything is possible within the possible.

SEARCH ANXIETY AND THE POSSIBLE OF PASSIONATE ACTS

Chapter 4 discussed search anxiety: the anxieties surrounding the centralisation and corporatisation of access to online information. Google's search engine evokes anxiety about the possible exploitation of personal aggregated search data and the algorithmically ranking and listing of search results in the interest of, among other things, traffic and revenue. Search anxiety is about the possible in relation to a shared dependence on one for-profit company for access to online information. Moreover, search anxiety revolves around the tensions created by searching for knowledge and answers in a context shaped by a for-profit logic.

This chapter zoomed in on one significant artistic response: *Grosse Fatigue*, an experimental film made by Camille Henrot that espouses the act of collecting. *Grosse Fatigue* enacts web search as a form of collecting *within* a collection. This chapter linked *Grosse Fatigue* to Kierkegaard's notion of passion to argue that the film's depiction of our relationship to the centralised, monetised, and ordered structures of Google's search engine grounds search anxiety in possibility. This happens by reframing our searching condition and the act that gives form to it, collecting, as a passionate activity bordering on a feverish condition. Referring to Walter Benjamin's conceptualisation of the collector, it suggests that to search is to collect, and a collection represents an idea or value that the collector feels passionate about and is strongly committed to. In other words, a collection is a concrete abstraction: to collect is a concrete act that happens in connection to abstract ideal, values and desire.

Kierkegaard claims that passion is one way to relate to the possible. Passion can be described as an enduring desire that requires nourishment, but that also nourishes you. In *The Undercommons: Fugitive Planning & Black Study*, Stefano Harney and Fred B. Moten describe passion as "the duty beyond duty" (2013, p. 35). Passion, they argue, both sustains and exceeds the self. Further, passion is an ambiguous force. One feels passionate about something or someone, yet passion as a feeling transcends that someone or something. As Harney and Moten describe it, with passion, you step out of the anxiety of the unknown and into what exceeds both truth and oneself (Harney and Moten, 2013, p. 35). Passion represents something of intrinsic value, something that exceeds the logic of profit and capital accumulation, something that transcends the present order of things.

However, as Henrot performs it in *Grosse Fatigue*, collecting does not signal a break from, nor exceed, the bounded and finite spaces of Google's indexed web. Indeed, to search is to collect *within* Google's collection. Searching as collecting is collecting within a collection. Forming a collection could be considered as the building of a box in the theatre of the world, as Benjamin describes it. The box, the collection, may represent a value or an idea around which a collector frames their activities; not outside of or separate from, but within the world. To foster a collection is to establish relations that enable the coming together of people and things that gravitate around — and are limited by — a common value, aspiration, or ideal, the forming of a commonality. To collect is to gravitate around values, valuables, and currencies other than profit. Collecting is a response to Google's favouring of traffic over knowledge and clicks over content. To reframe searching as collecting within a collection is a limited and time-sensitive gesture oriented toward possibility and geared toward different narrations, relations, and

cohabitations within Google's engine. To search is to collect within a collection, and to collect is to foster the act of worlding —however brief, disorderly, and loosely-organised. Collections, like assemblages, "are defined by the strength of what they gather as much as their always-possible dissipation" (Tsing, 2015, p. 43). Like nodes and links on the web, the relations and connections within an assemblage are ephemeral, variable and fragile; they come together and fall apart, they break and dissolve. With search anxiety, what Kierkegaard calls the possible is not about radical change, necessarily, but about the endless ways to draw and re-draw relations centred around shared values and strengthened by passion.

The artworks pointed to tactics of collaboration, of commonality, and practices of mobilisation, reorganisation, and rupture as constitutes of the possible in relation to algorithmic anxiety. But what ties masks, spectres and collectors together?

MOVEMENT AT THE SPOT AS THE RESPONSE
TO ALGORITHMIC ANXIETY

After Kierkegaard, this dissertation argues that masks, spectres, and collectors are tied together by movement *at the spot*. Movement at the spot, Kierkegaard writes, "neither moves from the place where it is nor arrives anywhere… [it] is literally a movement in that place" (SUD, p. 36). Movement at the spot is not reactionary, but imaginative and creative. This "movement of infinity," as Kierkegaard calls it is a way of thinking, being, and imagining to preserve yourself, of creating a space to catch a breath, to buy time, and to organise and reorganise (FT, p. 36). It also provides a metaphor for re-thinking and re-imagining the confining and limiting aspects of algorithmic culture. Algorithmic anxiety could be considered

as a lack of movement, lost motion, or as the desire for motion.

When the algorithmic is represented as central in the organising, governing, and confining of the socio-political sphere and in the distribution of wealth and information, movement is a way to battle the algorithmic anxiety this evokes. What Kierkegaard describes as "movement at the spot" does not mean to — Romantically—fan the flames of faith and passion, or to celebrate imagination and collaboration (SUD, p. 36). Neither does it mean to jettison the algorithmic or to embrace it. Movement at the spot is not merely a "fantasy of exit" (Sharma 2017). Instead, movement at the spot is a way to understand algorithmic anxiety as grounded in necessity *and* possibility.

The mask, the spectre, and the collector are figures of movement *at the spot and while entangled*. Where algorithmic regimes attempt to confine motion and openness, movement is the response. What always moves is difficult to grasp, and hence to be mathematically modelled, duplicated, or regulated. Movement at the spot challenges the logic of algorithmic entrapment. It is less about what it will bring — again, everything is possible within the possible — and more about actualising the potentiality to shift positions, to find a space to catch a breath. Masks, spectres, and collectors are about "finding ways through and around" (Halberstam, 2013, p. 6). In motion, one can become aware of limits one did not know existed and imagine possible ways around these delimitations. Living with algorithmic anxiety requires motion. Masks, spectres, and collectors tell us that the algorithmic structures we inhabit and that inhibit us, in uneven and unequal ways, might be challenged by moving at the spot, by actively imagining moving through and around algorithmic tangles. They point to conditions for change and how to make room, however small, in a confined space.

What becomes imaginable with movement? To move at the spot has

a lot to do with positioning. It is about shifting positions within the uneven and unequal relations of power in the entanglement of the social and the algorithmic. This is done by strengthening ties, practising solidarity, by organising and re-grouping from within, as well by throwing sand in the machines. Masks, spectres and collectors provide room for the desire to make *and* unmake relations and connections, to produce zones of indiscernibility *and* collective presence, and to tear down *and* to re-arrange, assemble, and rebuild. As long as we fail to imagine fissures, openings or alternatives to algorithmic culture, we remain stuck and cornered in its grid. Masks, spectres, and collectors offer a vision of being otherwise entangled.

In writing about the aesthetics of possibility, Ashton T. Crawley also connects possibility with imagination. He phrases it thus: "possibilities exist alongside that which we can detect with our finite sensual capacities" (Crawley, 2017, p. 2). He adds: "imagination is necessary for thinking into the capacities of infinite alternatives" (Crawley, 2017, p. 5). Movement at the spot is a form of what Crawley calls "the nevertheless and in spite of condition": that though one may feel enclosed, contained, circumscribed, "that—nevertheless, and in spite of—there is an excessive force that sustains" (p. 81). The word "nevertheless" and the phrase "in spite of" "mark the always available and plural otherwise possibility" (p. 82). Movement at the spot symbolises what *may* condition otherwise possibilities. Kierkegaard observes: "[p]ossibility is for the self what oxygen is for breathing" (SUD, p. 40). Elsewhere, he writes, "[d]rawing breath in Latin is called *respiratio*, a word which indicates a flowing back of what had first flowed out. In drawing breath the organism enjoys its freedom" (E/O, p. 1310). Movement at the spot symbolises taking a deep breath, the kind of breath taken just before someone makes a move.

Masks, spectres and collectors represent different guises of possibility *grounded in necessity.* This grounding in necessity is of crucial importance. By grounding in necessity, these figures, to refer to Donna Haraway, stay with the trouble. To stay with the trouble, Haraway writes in *Staying with the Trouble: Making Kin in the Chthulucene* (2016), is to reject the cynics, the technofixes, and the techno-apocalypses (p. 3). Staying with the trouble requires "unexpected collaborations and combinations" that are "always situated, someplace and not no place, entangled…" (p.4). As figures of movement at the spot, masks, spectres and collectors stay with the trouble represented by algorithmic regimes of confinement. Masks, specters and collectors represent situated responses to algorithmic anxiety. Their situated responses prompt different ways of relating to the entanglement of the social and the algorithmic. Taken together, masks, spectres and collectors form small gestures and creative experimentations with alternative ways of establishing connections, of being with others, and subversive acts of (dis)assembly. They point to where there is room to manoeuvre as well as the limitations of the movement that they, in different ways, bring into view.

IN CLOSING…

It would be too easy to judge these artistic figures of movement on the basis of whether or not they have any measurable impact or whether these works lead to concrete outputs. Admittedly, none of the artworks discussed pave the way towards equivalence or equilibrium in happy co-existence with algorithms. None of them tackles or undoes algorithmic power abuses and ongoing capitalist exploitation in algorithmic culture. Nor do they provide a clear-cut answer to the amassing of personal data by corporations, to flash crashes on the financial markets,

or skewed and slanted search results. The notion of movement at the spot will not assure those who want systematic and step-by-step formulas to be freed from algorithmic anxiety, wholesale. Nor will it please those concerned with policy recommendations, tools and protocols by providing advice on how to deal with internet monopolisation, algorithmic capitalism, surveillance, automated financial markets, or the monetisation of online communication and (dis)information. These figures will not be able to assuage the anxieties of those who believe technological determination means that we are already claimed by it. Movement at the spot is not likely to change the minds of those for whom the wedlock between capitalist corporations, the state, and algorithmic exploitation reveals what the future will be whilst rendering artistic interventions futile.

What movement at the spot offers is a contribution to the making of an artistic imaginary of possibility characterised by convoluting, entwining, and synthesising relations. Movement at the spot is not merely about understanding that many things take the shape of a relational, yet uneven synthesis; or understanding the performativity of the confining and delimitating representations of algorithms. Movement at the spot imagines the possible as possible *vis-a-vis* the troubles it is in. Yet, it never accepts these troubles as fixed, given, or impervious to change, but continually seeks ways through, around, and in between them. Movement at the spot is situated, embodied, yet also an imaginative orientation towards possibility. It needs to be sustained by the continual work of the synthesis of possibility and necessity and the finite and the infinite. This work involves relational practices of being, thinking, and doing—concrete, imaginative, and otherwise, both small and large—that bring movement into view.

Social life will continually find itself confronted, contained, and

constrained by continuously moving and changing mutations of algorithmic confinement, capitalism, control, and governance. This is what conditions movement at the spot, what mobilises it into action. Practices of movement at the spot are not merely up against "algorithmic culture" and its past, present, and future mutations. Movement at the spot is a response to the tendency to represent the present as an all-encompassing, capitalist, and controlling power structure, impervious to intervention or subversion. It is up against assertions that relational experiments with alternative ways and practices of being, thinking, and doing "will never work," "are already co-opted," "are too small to be meaningful," "won't make a difference, anyway," and the like. It pushes back against cynicism, fatalism, determinism, or the tendency to succumb to their substitutes, like neoliberalism, nihilism, positivism, legalism, and so forth. It pushes back against abstracted thinking about and limiting narratives of what is possible. Movement at the spot is a minority position facing a multitude of forces that act against it and that threaten to undermine it. It might even bring more harm than good. And yet, *nevertheless...*

▬

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SUMMARY, OR TL;DR

This dissertation analyses prominent artistic engagements with facial recognition algorithms, trading algorithms, and search engine algorithms through the concept algorithmic anxiety.

Algorithms sort, search, recommend, filter, recognise, prioritise, predict and decide on matters in a range of fields. They've come to play a role in the production of knowledge, in security programs, and in drone warfare; they help automate routine jobs, education evaluations, social services, and copyright infringements. Mundane aspects of our lives, such as work, travel, play, consumption, dating, friendships, and shopping, are also, in part, delegated to algorithms. Various scholars have indicated we now live in an algorithmic culture. The claim that algorithms increasingly shape, organize, and co-produce everyday life has given impetus to anxieties about algorithms in the present and their future developments. Anxiety is a recurrent theme of commentary on the entanglement of the social and the algorithmic. Whilst these concerns are widespread, they are particularly apparent in numerous exhibitions that thematise aspects of algorithmic culture.

For a long time, artistic engagement with algorithms was marginal in contemporary art. Over the past 8 years, however, a growing number of artists and critical practitioners have become engaged with algorithms, resulting in algorithmic theatre, bot art, and algorithmic media and performance art of various kinds, all of which thematise the dissemination and deployment of algorithms in everyday life. With this rise in artistic engagements with algorithms, certain types of algorithms have garnered more attention than others: facial recognition algorithms, trading algorithms and search engine algorithms have evoked more artistic responses than other types. These algorithms are associated with

a range of concerns and uncertainties about the deployment, future developments, and the possible implications of algorithms' growing implementation. Taken together, these three types of algorithms address significant supra-individual anxieties of this decade: socio-political uncertainty, the global economic crisis, job insecurity, ongoing recession, the centralisation and financialization of access to online information, and political polarisation and instability.

The principle aim of this dissertation is to analyse what underpins the anxieties about facial recognition algorithms, trading algorithms and search engine algorithms. It focuses on a limited number of artworks, made by Western artists, that engage explicitly with these three types of algorithms and that have circulated widely and repeatedly in a wide range of thematised group exhibitions on different aspects of algorithmic culture over the past eight years throughout Europe, Canada, and the Americas. The second aim of this dissertation is to develop a concept to theorise the anxieties braided around these three types of algorithms which are made manifest and rendered visible in the artworks it analyses: the concept of algorithmic anxiety.

The concept of algorithmic anxiety that this dissertation proposes takes as its point of departure Søren Kierkegaard's concept of anxiety, in particular his conception of the self, knowledge and the actual as a relation to the possible and the unknown. The first chapter develops this concept in detail by combining Kierkegaard's work with major points of concern in the academic literature of social, cultural, computational, Science and Technology Studies, and algorithmic studies' conceptualisations of algorithmic culture. These concerns — which I describe as algorithmic governance, algorithmic selves, algorithmic opacity, and algorithmic replacement — pervade critical discourses about algorithmic culture. The concept of algorithmic anxiety provides us with a way of

understanding how anxiety arises through the way these concerns mediate the possible and the unknown.

Drawing on Kierkegaard, this dissertation argues that algorithmic anxiety can be understood as a relational synthesis between confining and extending constituents of the self, knowledge, and the actual, as they are entangled with algorithms. Put simply, where *necessity* converges aspects of the self, the structures of actuality, and the production of knowledge in algorithmic culture, *possibility* diverges aspects of the self, the structures of actuality, and the production of knowledge in algorithmic culture. Algorithmic anxiety happens when one side of this reciprocal relation is overlooked, underdeveloped, or ignored. This dissertation argues that the question that algorithmic anxiety poses is one of positioning: it is a matter of responding and relating to this relational synthesis.

In the chapters that follow, this dissertation analyses recurring modes, motifs and metaphors in prominent artistic engagements with facial recognition algorithms, trading algorithms, and search engine algorithms to explore the anxieties inspired by the entanglement of the social and the algorithmic. Where different algorithms evoke different anxieties, the artworks that engage with these recurring modes, motifs and metaphors point to different anxieties and different possibilities. The relational conceptualisation of masks (chapter 2), spectres (chapter 3) and collectors (chapter 4) developed in this dissertation point a sense of being ensnared within a system within which you cannot freely move. At the same time, the Kierkegaardian reading this dissertation presents of each of these ambiguous motifs, simultaneously points to aspects of algorithmic culture where there is room to manoeuvre and to reposition in relation to the possible within algorithmic culture.

What resonates in the majority of the artistic portrayals this disser-

tation analyses is an emphasis on the converging aspects of the self, the structures of actuality, and the production of knowledge in algorithmic culture. These artworks evince a shared focus on infrastructure, represented by wires, cables, electronics, modems, and screens, as well as on data-centers and bricks and mortar. Noticeable, too, is an emphasis on the input and output of the mechanics of algorithmic processes and apparatuses—practices of ranking, classifying, sorting, predicting—in the form of representations of machine vision and visualisations of algorithmic patterns of calculation. On the other hand, we also find artistic engagements that point to diverging aspects of the self, the structures of actuality, and the production of knowledge in algorithmic culture. They share a focus on collectivity, ephemerality, entropy, ambiguity, and malleability.

Chapter 2 discusses anxiety and possibility in relation to facial recognition algorithms through prominent mask and camouflage projects. It situates these projects within the larger cultural history of masks and camouflage. It analyses the anxieties about the loss of self, autonomy, independence, and privilege in relation to the different forms of (self) relating — such as interdependency, community, collaboration, and collectivity — that these art projects articulate.

Chapter 3 focused on black box anxiety. It discusses anxieties that are shaped by an understanding of the financial markets as an impenetrable and unpredictable black box whose outputs we cannot access or control. Using cultural and historical accounts of spectrality and hybridity, the second half of the chapter discusses the spectral forces that recur in prominent artistic engagements with trading algorithms and which point to system collapse and catastrophe as conditions of possibility in relation to anxieties about the black box of finance. It looks at re-imaginings of the black box of finance, from a mysterious closed off

monolith to a space cohabited by revolting spirits imagined as preternatural occurrences.

Chapter 4 looks at search anxiety, which can be described as a crisis of truth and an effect of Google's financialisation, monopolisation, and corporatisation of access to online information. After introducing popular and recurring artistic responses to search anxiety, the subsequent sections of this chapter focus on one particular artwork which reframes web search as a practice of collecting. Using Walter Benjamin's account of the collector, it conceives web search as an act of collecting that can be understood as a limited and time-sensitive gesture oriented toward possibility: towards a repositioning within Google's search engine monopoly.

The final chapter, chapter 5, explores the concept of algorithmic possibility. Drawing on Kierkegaard, it reframes this concept as a kind of "movement at the spot" and posits it as a response to algorithmic anxiety. It argues that figures of movement, as embodied by masks, spectres, and collectors, grounds the imagined converging aspects of algorithmic culture in its imagined diverging aspects, creating a synthesis between the finite and the infinite aspects of algorithmic culture that brings the power of the possible into view. The possible, it concludes, can be found here: in motion, reflected in collectivity, in commonality, and in break-down in relation to algorithmic entanglement.

SAMENVATTING

In dit proefschrift worden prominente hedendaagse kunstwerken over gezichtsherkenningsalgoritmen, handelsalgoritmen en zoekmachine-algoritmen door middel van het concept algoritmische angst geanalyseerd.

Algoritmen sorteren, zoeken, filteren, herkennen, prioriteren en beslissen over zaken in een groeiend aantal gebieden. Ze zijn een rol gaan spelen in de productie van kennis, in beveiligingsprogramma's en in drone-oorlogvoering, ze helpen bij het automatiseren van routineklussen, bij het stellen van diagnoses, en worden gebruikt bij onderwijsevaluaties, en bij allerlei sociale diensten zoals bijvoorbeeld toeslagen en uitkeringen. Ook alledaagse aspecten van ons leven, zoals werk, reizen, sport en spel, consumeren, daten, vriendschappen en winkelen, worden deels gedelegeerd aan algoritmes. Verschillende wetenschappers hebben aangegeven dat we vandaag de dag in een algoritmische cultuur leven. De bewering dat algoritmen het dagelijks leven in toenemende mate vormgeven, organiseren en coproduceren, heeft een impuls gegeven aan angsten en zorgen over de ontwikkelingen en implicaties van het groeiende gebruik en afhankelijkheid ervan. Angst is een terugkerend thema van in debatten over de verstrengeling van het sociale en het algoritmische en in tal van kunsttentoonstellingen die aspecten van de algoritmische cultuur thematiseren.

Artistiek engagement met algoritmen was lange tijd marginaal in de hedendaagse kunst. Echter, in de afgelopen 8 jaar zijn een groeiend aantal kunstenaars zich met algoritmen gaan bezighouden, met als resultaat algoritmisch theater, botkunst en verschillende soorten algoritmische media en performance kunsten die de verspreiding en toepassing van algoritmen in het dagelijks leven thematiseren. Met deze

toename van hedendaagse kunst over algoritmen zien we dat bepaalde soorten algoritmen meer aandacht krijgen dan andere: gezichtsherkenningsalgoritmen, handelsalgoritmen en zoekmachine-algoritmen roepen duidelijk meer artistieke reacties op dan andere soorten algoritmen. Deze algoritmen worden bovendien in verband gebracht met angsten over toekomstige ontwikkelingen en de mogelijke implicaties van het gebruik ervan. Deze drie soorten algoritmen worden in verband gebracht met belangrijke supra-individuele angsten van dit decennium: sociaal-politieke onzekerheid, de wereldwijde economische crisis, baanonzekerheid, voortdurende recessie, de centralisatie en vercommercialisering van de toegang tot online informatie, en politieke polarisatie en instabiliteit.

Het voornaamste doel van dit onderzoek is om de onderliggende ideeën en aannames te analyseren die ten grondslag liggen aan angsten voor gezichtsherkenningsalgoritmen, handelsalgoritmen en zoekmachine-algoritmen aan de hand van prominente hedendaagse kunstwerken die deze algoritmen tot onderwerp. Daartoe richt het zich op kunstwerken, gemaakt door westerse kunstenaars, die de afgelopen acht jaar herhaaldelijk hebben gecirculeerd in Europa, Canada en Noord- en Zuid-Amerika in een breed scala aan thematische groepstentoonstellingen over verschillende aspecten van de algoritmische cultuur. In dit proefschrift wordt het concept 'algoritmische angst' ontwikkeld om de onderliggende ideeën over het zelf, over wat kennis is en wat de werkelijkheid behelst, welke aan de angsten voor deze drie typen algoritmen ten grondslag liggen, beter inzichtelijk te maken.

Het concept 'algoritmische angst' neemt Søren Kierkegaards concept van angst als uitgangspunt. In het eerste hoofdstuk wordt algoritmische angst uitgewerkt door Kierkegaards werk te vervlechten met centrale onderwerpen uit de academische literatuur over algoritmische

cultuur van onder meer sociale en culturele studies, wetenschaps- en technologiestudies en algoritme studies.

Leunend op het werk van Kierkegaard wordt beargumenteerd dat algoritmische angst begrepen kan worden als een relationele synthese tussen noodzakelijkheid en mogelijkheid. In *Het begrip angst* beweert Kierkegaard dat momenten van angst onvermijdelijk en fundamenteel onderdeel zijn van het menselijk bestaan en zelfs dat ons begrip van de wereld geworteld is in angst. Anders gezegd, onze relatie tot de wereld – onze kennis ervan, ons handelen in de wereld en onze ideeën erover – zijn gegrond in angst. Hoewel we angst in het lichaam voelen, en in het hier en nu ervaren, is het een toekomstgerichte emotie. In *De ziekte tot de dood* stelt Kierkegaard dat angst wordt gevormd door het onbekende, door iets waar we geen kennis mee kunnen maken. Dat kan angst zijn voor een mogelijkheid van het bestaan of een angst voor jezelf. De voorwaarde voor angst, zo betoogt hij, is de onmogelijkheid om in de toekomst te kunnen kijken; het is de openheid en onbekendheid van de toekomst die ons angst inboezemt.

Kierkegaards visie op angst ligt besloten in zijn idee van menszijn. In *De ziekte tot de dood* stelt hij dat de mens *zelf* een verhouding is, namelijk een verhouding tot het zelf. Deze zelfverhouding stelt een synthese tussen eindigheid en oneindigheid voor, tussen het tijdelijke en het eeuwige, tussen noodzakelijkheid en mogelijkheid. Volgens Kierkegaard wordt deze synthese door God gedragen en door de mens gesteld. Doordat de mens een verhouding is, een synthese van tegenstellingen, is z/hij vatbaar voor angst. Mogelijkheid, oneindigheid en het eeuwige maken dat de toekomst open en onbepaald is. De mens heeft wat dat betreft weinig in de melk te brokkelen. Onder meer sekse, etniciteit, economische klasse, geografische positie, burgerschap, gezondheid, en uiteindelijk sterfelijkheid begrenzen de mogelijkheden

van de mens, maar deze begrenzingen zijn nooit absoluut noch allesomvattend. Mogelijkheid omvat al het mogelijke, en 'al' omvat zelfs het ondenkbare, onkenbare en onvoorstelbare. Zou dat niet zo zijn, dan zou de toekomst in zekere mate berekenbaar, voorspelbaar en waarschijnlijk worden. Angst is daarom ook mogelijkheid van verandering, het mogelijke verlies van iets en het begin van iets anders – het toekomstige, het onvermoede.

Simpel gezegd, waar de noodzakelijkheid aspecten van het zelf, de structuren van de actualiteit, en de productie van kennis in de algoritmische cultuur convergeert, divergeert mogelijkheid aspecten van het zelf, de structuren van de actualiteit, en de productie van kennis in de algoritmische cultuur. Algoritmische angst ontstaat wanneer een kant van deze wederkerige relatie over het hoofd wordt gezien, onderontwikkeld is of genegeerd. Dit proefschrift stelt dat algoritmische angst gaat om positionering: de verhouding tot mogelijkheid.

Angst komt voort uit een scheve verhouding van de mens tot zichzelf, kennis en het werkelijke. In deze scheefstand in de synthese, voert de ene kant van de tegenstelling de boventoon ten opzichte van de andere. Wanneer iemand zich bijvoorbeeld verliest in grenzeloze fantasieën en dromen, wanneer hij denkt dat hij onbegrensd is, is er sprake van een gebrek aan eindigheid, en een teveel aan oneindigheid. En omgekeerd, wanneer je nadruk legt op je beperkingen en op noodzakelijkheid, kun je verzanden in determinisme, fatalisme of nihilisme. Wat dan ontbreekt is een gevoel van verbreding, van mogelijkheid. In angstige toekomstvisioenen over algoritmische cultuur lijkt er dan ook sprake van een wanverhouding tussen het eindige en het oneindige, een wanverhouding tussen noodzakelijkheid en mogelijkheid.

In de volgende hoofdstukken, hoofdstuk 2-4, worden terugkerende modi, motieven en metaforen in prominente kunstwerken die zich

specifiek richten op gezichtsherkenningsalgoritmen, handelsalgoritmen of zoekmachine-algoritmen onderzocht. De relationele conceptualisering van maskers (hoofdstuk 2), schimmen (hoofdstuk 3) en verzamelaars (hoofdstuk 4) verbeelden een gevoel van verstrikt zijn in een systeem waarbinnen je je niet vrij kunt bewegen. Een Kierkegaardiaanse lezing van deze dubbelzinnige motieven wijst echter op aspecten in algoritmische cultuur waar er ruimte is om te manoeuvreren en te herpositioneren ten opzichte van deze ervaarde verstrikking en ten aanzien van het mogelijke en het oneindige in relatie tot algoritmische cultuur.

Wat in het merendeel van de kunstwerken die besproken worden resoneert is een wanverhouding tussen noodzakelijkheid en mogelijkheid, waarbij de nadruk ligt op noodzakelijkheid. Dat wil zeggen op de convergerende en begrenzende aspecten van het zelf, de structuren van de actualiteit, en de productie van kennis in de algoritmische cultuur. Dit komt in de kunstwerken onder meer naar voren door een gedeelde focus op infrastructuur, gerepresenteerd door draden, kabels, elektronica, modems en schermen, maar ook op datacenters en kantoorfaciliteiten. Opvallend is ook de nadruk op de input en output van algoritmische processen - het rangschikken, classificeren, sorteren, voorspellen – welke vorm krijgen in kunstzinnige representaties van machinevisie en visualisaties van algoritmische berekeningspatronen. Aan de andere kant, en in mindere mate, zijn er kunstenaars die juist wijzen op verbredende en het mogelijke in relatie tot het zelf, de structuren van de werkelijkheid, en de productie van kennis in de algoritmische cultuur. Hier wordt gewezen naar collectiviteit, vergankelijkheid, entropie, dubbelzinnigheid en veranderlijkheid als mogelijkheidsvoorwaarden.

Hoofdstuk 2 bespreekt angst en mogelijkheid in relatie tot gezichtsherkenningsalgoritmen door middel van prominente masker- en camouflageprojecten en plaatst deze binnen een grotere cultuurges-

chiedenis van maskers en camouflage. Aan de hand van deze masker-projecten analyseert dit hoofdstuk angsten voor het verlies van het zelf, autonomie, onafhankelijkheid en privileges. Deze worden afgezet tegen een Kierkegaardiaanse lezing van het masker die ruimte laat voor ver-schillende vormen van verhoudingen tot het zelf en de ander - zoals onderlinge afhankelijkheid, gemeenschap, samenwerking en collecti-viteit – waarmee de angst voor het verlies van het zelf, autonomie en onafhankelijkheid anders benaderd kan worden.

Hoofdstuk 3 richtte zich op black box anxiety. Het bespreekt angsten ontstaan door een zeker begrip van de financiële markten als een on-doordringbare en onvoorspelbare black box waarvan we de output niet begrijpen noch kunnen controleren. De tweede helft van het hoofdstuk gaat dieper in op de spectrale krachten die terugkeren in een tweetal belangrijke kunstwerken over handelsalgoritmen. In deze kunstwerken worden spectrale krachten in verband gebracht met de voorwaarden voor de mogelijkheid van verandering van geautomatiseerde handelen op de beurzen. Aan de hand van Kierkegaards begrip van het mogelijke verandert de black box in deze kunstwerken van een mysterieuze af-gesloten monoliet tot een ruimte die wordt bewoond door opstandige geesten die laten zien dat verandering mogelijk is.

Hoofdstuk 4 gaat in op zoekangst. Zoekangst kan omschreven worden als een waarheidscrisis en een effect van Google's monopolisering en vercommercialisering van de toegang tot online informatie. Na een bespreking van populaire artistieke reacties op zoekangst, richt dit hoofdstuk zich in het bijzonder op één bepaald kunstwerk dat het zoek-en op het web herinterpreteert als een praktijk van verzamelen. Met behulp van Walter Benjamins concept van de verzamelaar, wordt het zoeken op het web gerepresenteerd als een specifieke vorm van ver-zamelen die een herpositionering binnen het zoekmachinemonopolie

van Google mogelijk maakt.

Het laatste hoofdstuk, hoofdstuk 5, neemt het concept van de algoritmische mogelijkheid onder de loep. Naar Kierkegaard wordt dit algoritmische mogelijkheid gekaderd als een "beweging ter plaatse" welke een reactie op algoritmische angst inhoudt. Het stelt dat figuren van beweging, belichaamd door maskers, schimmen en verzamelaars, een relationele synthese vormen tussen convergerende en divergerende aspecten van de algoritmische cultuur en de kracht van het mogelijke laten zien. Het mogelijke, zo laten de kunstwerken zien, is te vinden in beweging, weerspiegeld in collectiviteit, in gemeenschappelijkheid, en in afbraak in relatie tot algoritmische verstrengeling. Het slot van dit hoofdstuk stelt dat algoritme angst ons voor de taak stelt om werk te maken van de wanverhouding tussen begrenzing ten koste van verbreding, tussen mogelijkheid en noodzakelijkheid. Wanneer we de algoritmen en de leefwereld als verstrengeld zien, als een verstrengelde synthese, kunnen we genuanceerder naar aspecten van algoritmische cultuur en specifieke algoritmen kijken.