Datatata

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Foreword

It is a great honor to introduce this collection of papers from the Datatata conference which took place at the Faculty of Fine Arts in Brno on April 12th, 2019. The conference name, Datatata, might evoke the sound of machine gun shooting projectiles at a fast pace, almost without interruption, similar to the immense amount of digital data spreading throughout the world. At the same time, it might remind one of the Futurist's unrelenting endeavour to capture sounds typical of modern society produced by new technologies such as cars, automatic weapons, planes, and other devices in the form of experimental poems. Through this poetic representation of new technologies, the Futuristic movement attempted to make various aspects of machines that were usually overlooked visible and audible (Petroşel, 2011). They draw attention to their beauty, violence, dynamic character, and the new perception of space and time that they brought to us. We actually face an even more challenging task in comparison to the Futurists. How do we capture the complex nature of digital data which has penetrated our lifes like a machine gun's fire? It should be added that, in this case, we speak about practically invisible projectiles flowing everywhere and smoothly escaping our critical reflection. Hovewer, digital data has its materiality in the form of vast data centers consisting of many servers filled with data. These places where data is collected and stored are carefully separated from users of digital technologies. Data is literally hidden in the clouds beyond our reach, even though they significantly affect our existence. Digital data structure and facilitate our everyday communication and activities, bring us information about the world we live in, and compute (quantify) our bodies and minds.

Human Perspective

Media theorist Lev Manovich, in his influential book "The Language of New Media" (2001), presented with the concept of a cultural interface that might contribute to a better understanding of interactions between big data and our culture. This concept refers to "the ways in which computers present and allow us to interact with cultural data" (Manovich, 2001, p. 80). Thus, these interfaces connect the layer of digital logic (algorithm, database, programming languages) with the layer of traditional cultural logic (narrative, visual representation, cultural traditions) and make data visible, audible, understandable, and customizable. In this space where the digital and cultural layers come into contact, new constellations of data, software, and culture emerge. For this reason, we should thoroughly investigate what kinds of cultural interfaces are created, how they structure, represent, and interpret digital data, what modes of thinking they embody, how they change existing cultural traditions and various areas of our life, and what ideas and desires concerning big data underlie these cultural interfaces.

Wesley Goatley develops this kind of critical perspective in his study "A Promise and a Strategy: Transparency, Spectacle, and Critical Data Aesthetics" focused on big data aestheticisation. He investigates ideologies and politics behind big data visualisation and introduces new possibilities for their critical reflection. First, Goatley tackles the question of why we consider data visualisations to be an objective representation of reality and outlines narratives that construct the seeming objectivity. Subsequently, Goatley shows that a vital critique of data can be made by artistic strategies that perform the deconstruction of interfaces for big data visualisations. He comes up with a useful artistic alternative to traditional scientific research that might significantly contribute to a more differentiated understanding of big data and develop some kind of resistance against dominant practices in this area.

Markéta Dolejšová in her contribution "Digesting Data: Designerly Speculations about Food-Tech Futures" maps the impact of big data on contemporary food culture. She gives a detailed description of data-driven technologies such as smartkitchen, diet personalization apps that transform our day-to-day food practices. To address public reception of the issue, current trends in the field, and outline possible future food scenarios, she realized the research project Edible Speculations. This project was based on a speculative design approach that uses design as a vital way for developing creative and critical speculations on future development of various trends, practices, concepts or social issues, through making artifacts. Dolejšová organized the project as a series of public events that invited passersby to participate in the creation of scenarios and personal recipes concerning food-tech futures. In this way, she obtained valuable insight, opinions and strategies that can be useful for further research in this field.

Also, we should not forget that digital technologies embody particular types of thought due to their performative character (Berry, 2015). Algorithmic-driven machines, through their specific functions and operations, manifest assumptions, ideas, and concepts that their creators insert into them. The fact is, software consisting of algorithms is not a neutral tool, but always takes some stand. For that reason, we should ask what kind of human thought is typical of software that process, arrange, and present digital data. Palo Fabuš, in his philosophical oriented contribution "Artificial Affirmation: Common Sense to the Nth Power", looks into this issue and asserts that machine learning software is characterized by two types of reasoning. 'Common sense' which is based on the process of recognition and 'good sense' defined by the process of prediction. However, at the same time, he adds that machine learning not only exteriorizes these kinds of reasoning but also amplifies and transforms them. This claim raises the crucial question. If machine learning were to exceed the sensory capacities of human beings, what would happen if we implemented this technology into our bodies and made it an inseparable part of our personality?

Non-Human Perspective

The actor–network theory formulated by philosopher Bruno Latour (2007) sees the world as a network consisting of objects, physical phenomena, living creatures, and technology. Each of these entities are endowed with the ability to act or develop some actions and change other actors whether they are alive or not. Thus, these entities make intricate connections between themselves and create particular networks made up of heterogeneous actors. Latour (2007) placed emphasis on the fact, that our social world is affected not only by the actions of living creatures but also by the actions of nonliving things. These objects participate in the creation of social reality and they affect a number of cultural practices. For that reason, we should take into consideration the autonomous actions of digital technology that we use every day and pay attention to its transformative power. In recent years, humankind has delegated a wide range of actions and activities to technological agents. We can describe them as autonomous data-driven agents that make decisions based on specific algorithms and control various objects, processes, and events. These decisions might have considerable effects on our life, however, digital technologies are usually perceived as useful blackboxes that obediently serve our purposes (Latour, 1999, p. 304). But what happens when these 'always on' devices break down? In this moment, digital technologies reveal their true nature; autonomous, intricate, imperfect, unpredictable and biased.

This very moment of failure is investigated in the study "Arizona Accident: Introduction to Simple, Complicated and Complex Systems in the Example of One Event" by Jakub Kopec. The author describes a car accident that occured during the testing of a self-driving Uber vehicle in Tempe, Arizona, in 2018. It is considered the first case of a pedestrian being killed by a self-driving car. Kopec attempts to take a closer look at the agency of a machine that takes over human activity and makes a decision based on an immense amount of data. The machine was not able to take into account a series of random events that emerged in the course of the accident and reacted only on the basis of a predefined set of rules. It led to a failure on behalf of the self-driving car. For that reason, Kopec argues that, it is necessary to implement some degree of randomness, typical of humans into the driving algorithm, even though it might sound paradoxical.

In connection to autonomous digital agents, there is also an urgent need to ask the question: How does the machine (algorithm) see us? Nevertheless, Tomáš Javůrek shows in his text "The Uselessness of Big Brother" that this is not the right expression due to the verb 'to see' associated with the ability of the human eye. Javůrek says that we are no longer spied on by the mechanical eye of the camera as in Orwell's book "Nineteen Eighty-Four". He argues that we should leave this anthropomorphic old-fashioned metaphor because it fails in the face of the fact that digital technologies dismantle our bodies (including our eyes) into a complex set of data that are analysed, recombined, and subsequently used for the creation of our personal profile. Moreover, these data are not limited to our physical bodies but reside in vast digital space where we leave a number of visible traces. Javůrek conludes that Orwells's vision of a future society where everybody is watched by ubiquitous telescreens is insufficient in the light of current digital surveillance technologies.

Lenka Hámošová points to the ability of digital technologies to imitate reality. In her text, "How Generative Adversarial Networks (GANs) changed the way we look at the world" she decribes new digital agents that are able with the help of big data to mimic our visual representations of reality and create synthetic images and videos that look real. She investigates the consequences this technology might have on our trust in visual media and outlines challenges posed by a permanent state of visual scepticism these synthetic images might bring. She calls for an open global debate on these questions and argues that common users should aquaint themselves with various tools for the creation of synthetic images in order to uderstand how they work and to develop a critical approach to the technology.

data + algorithms + humans + nature = new hybrid collectives

In contemporary digital culture, digital technologies make temporary connections and share data without human assistance. Matthew Fuller and Andrew Goffey (2009, p. 148) put it this way: “When people find it surprising to be addressed by a machine, we should note that this is perhaps correct: The machines are usually busy enough communicating with each other.” This language in which they communicate – an incessant stream of algorithms and data, is the new significant language of our time. It connects machines, humans, and nature, and creates new hybrid collectives (Kera, 2006). Thus, we can say that, this digital language “blurs the difference between technology and politics and technology and culture” (Kera, p. 56), and is able to overwrite existing cultural practices and concepts. Authors included in this collection of papers recognise the need to intefere in the automated dialogue between machines. For that purpose, they investigate the different characteristics of the language, and map the intricate nature of data-driven digital collectives. Moreover, their contributions are not limited to mere observations of current practises but they come up with actual findings and suggestions that might help to change the status quo whether it is an artistic project or a critical design approach.

Now, it is time to embark on the long critical journey toward the knowledge of data. See, touch, taste, hear and feel data. Think of it.

Adam Franc, Brno 2019

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A Promise and a Strategy: Transparency, Spectacle, and Critical Data Aesthetics

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Data

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This paper responds to the aesthetic representation of data in multiple cultural contexts, and how critical insights can be incorporated into practices of data aestheticisation. I will illustrate and discuss the concepts of mechanical objectivity, the spectacle of scale, and transparency, and their relevance to the critical study of data aestheticisation. To demonstrate how my critiques can be explored through practice, I will present my own work, Ground Resistance, an installation artwork that explored data and representation in a smart city system. In conclusion, I will argue that such critical approaches to data aestheticisation highlight data's subjective and interpretative character through drawing out the politically and ideologically contentious characteristics of both data *and* aestheticisation, towards critiquing claims of data's mechanical objectivity and the ideologies such claims reinforce.

1 Contexts

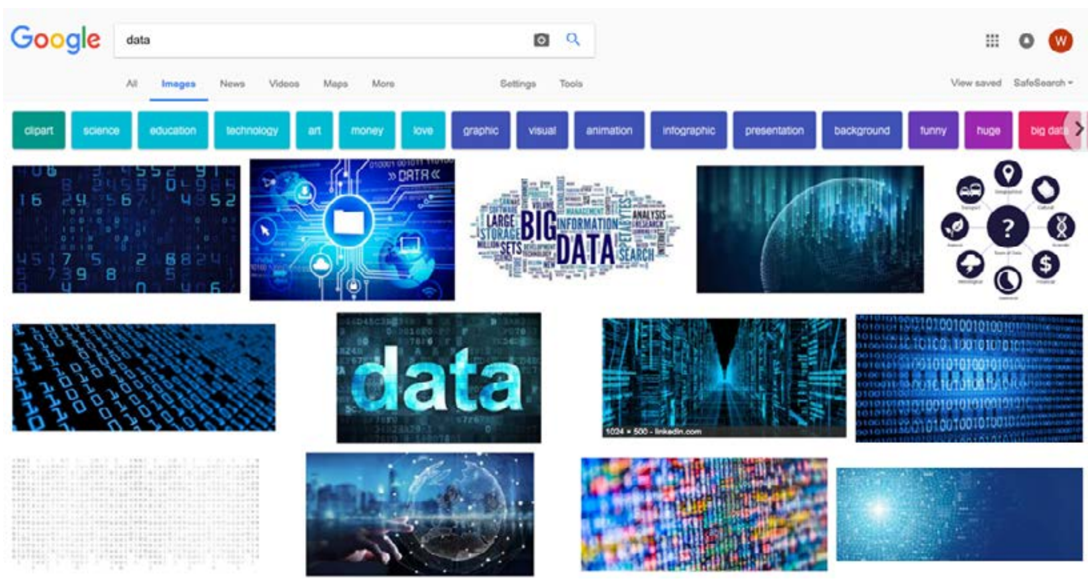
The rise of data-centered capitalism and surveillance has resulted in calls from many areas of study for further critical engagement with how data is created, distributed, and employed (Galloway, 2001; Liu, 2011; Haque, 2015; Chun, 2011; Easterling, 2014; Manovich, 2002). This is particularly the case in the field of critical data studies, such as when Rob Kitchen and Tracey Lauriault (2018, p. 18) state that "we have barely begun to critically conceptualise data and their apparatus and elements"; however, this conceptualisation is problematised by data's ontological condition. The fact that "data itself has no inherent holistic form (...) or inherent forms that are accessible to humans" (Swan, 2015, p. 474), contributes to an anxiety that "*data can see and manipulate us without our being able to see and manipulate them*" (p. 468, original italics).

One site where the ontology of data intersects with these anxieties is in data aestheticisation: the process of representing data through aesthetic methods, such as visualisation, necessary to making data perceptible. It is in such methods that data is applied in its varied spaces, towards varied ends, enacting varied politics and ideologies. In the case of data visualisations, it has been argued that they possess their own ways of producing knowledge (Gray, et al., 2016), and through this "assemble and arrange the world in specific social and material patterns" (Law and Ruppert, 2013, p. 230). This makes them valuable objects of investigation in the critical study of data.

2 A Promise And A Strategy

The potential for aestheticisations to assemble and arrange the world can begin to be understood when analysing trends in the way data is commonly represented aesthetically. When Google image searching for the term ‘data’, even a cursory overview makes several trends apparent in the hundreds of thousands of resulting images. Trends in colour (predominantly blue and white), arrangement (such as The Matrix-style raining digits), and symbols (such as dense masses of zeroes and ones, words, or shapes) are immediately evident and widely repeated (see Figure 1). A closer analysis also reveals that humans are often absent from these images, and the few who are present are predominantly represented as white males in business attire. Based on these images, an argument could already be made that in them data is repeatedly depicted as being utterly non-human, vast beyond comprehension, and the domain of a particular group of individuals in conventional positions of power.

Figure 1
Google image search results for ‘data’



David Beer (2018) has produced similar findings when examining the language and imagery used by the top thirty-six data analytics providers from a Google search, detecting consistent trends such as the repeated promises of omnipresence, prophecy, and extra-human cognition. In his study, Beer (2018) argues that these actors are “both creating as well as responding to these visions of data” (p. 466, original italics), creating a cyclical process where these 'visions' of the power of data analytics become reinforced, gaining further dominance with each repetition.

Beer's study suggests that the artefacts found in the image search are not simply cultural exhaust, but that their producers are perpetuating particular forms of understanding of what data is, does, and who it is for. Given this, the repetition of particular aesthetics throughout the images should not be overlooked, particularly as many of the images link to websites selling data-based products or services. My proposition is that these images can be understood as both a promise and a strategy. They are promissory in the ways they present data as exceeding human limitations, and possessing of a totalising reach and scope; an almost supernatural combination of properties. But they also strategically position data as the domain of those in traditional seats of power, which places these supernatural properties in their hands; for in representations such as these, what is present (as well as what is absent) "is never arbitrary, but determined by current power relations and ideology" (Schmid, 2012, p. 85).

These promises and strategies can be understood to be coercive in character when their repetition creates a dominant imaginary of data, one that both informs and reinforces claims made about and with data. As such claims are perpetuated through aesthetic means, this presents an opportunity to intervene upon this cycle of perpetuation by works of practice that reflexively critique the work of data aestheticisation, and its role in these promises and strategies. Through such approaches, critiques as well as counter-proposals to these promises and strategies can be deployed. To understand what form such practices may take, I will begin by examining one such influential promise: that of data's objectivity.

3 Mechanical Objectivity

Much like the repetitions seen in Google image search results, strategic claims that data provides a view on the world that exceeds human limitations and biases are not hard to find. For example, 'predictive policing' companies such as Palantir make claims to the objective, value-free nature of their data even when these claims are contradicted by the database authors themselves (Winston, 2018), echoing more broadly the substantial relationship between claims to objectivity in the data analytics industry and "questions of power, subjectivity, governance, autonomy, representation, control, and resistance" (Kennedy, et al., 2015, p. 384). Amazon also leverage the supposed objectivity of data with devices such as the Echo Look, an internet-connected camera which they claim can tell any woman which outfit is optimal for them (Amazon, 2019), in spite of the fact that Amazons own reports show they employ a low proportion of women to develop such products (Mac, 2014).

In such examples, data is being positioned as both free of human bias, and as a form of truth, to justify the claims of these operators. I contend that there is a connection between such claims and the aesthetic representations of data seen earlier that positioned it as an advanced, nonhuman 'other' to be leveraged by powerful actors.

Critiquing such claims requires examining the notion that any technology can allow us to surpass the subjectivity inherent to human perception. This is referred to as 'mechanical objectivity' by Lorraine Daston and Peter Galison (2007), a belief they examine through the field of scientific atlases. These atlases were often heavy tomes of encyclopedic intent, containing artist-drawn images of flora and fauna coupled with descriptions of each item written by a scientist. Daston and Galison (2007) chart the tensions between artist and scientist in the field of atlas production, where many scientists felt that the artist's interpretation of how to best represent the flora or fauna at hand introduced an undesirable subjectivity to what was intended to be as objective a process as possible.

With the advent of photography, this conflict was seen by some of the scientists to have been resolved. Atlas authors who adopted this technology in its infancy saw the camera as "exactly representing the objects as they appear, and independently of all interpretation (...) *without the least contribution of the hand of man*" (Donné, 1844-45 cited in Daston and Galison, 2007, p. 131, italics added). Such a quote illustrates the belief that the exchange of the artist for the device extricated the 'hand of man' from the process, creating an impartial view finally realised through the mechanism of the camera. This mechanism was seen as a transparent and objective component of the process, subtracting nothing from the scientists' view of the world.

A contemporary photographer might see this as a naive understanding of photography, which in practice combines elements such as the camera body, lens, and film/image processor with the skill, experience, and 'eye' of the photographer, with each of these layers involving subjective interpretation and decision making. This same logic can be used to understand the subjectivity inherent to the collection of data, and unravel claims to its objectivity. For example, what data is gathered by a sensor is determined by the decisions made in the sensor's material construction, its placement, when it is turned on, when it is turned off, what measurement scale it uses ... this all before the data is stored, arranged, 'cleaned' and other processes that may occur before it is applied or published. Much as how a single event can be captured in many different ways by different photographers with different cameras, data produced in the world is not the objective 'truth' but just one possible view of it, constructed via multiple, inherently subjective, decisions.

4 Against Transparency

Despite this, the conflation of data with truth and objectivity is perpetuated when ‘transparency’ is declared as a goal in the work of data aestheticisation practice. Transparency in this context is the belief that, much like the tension between artist and scientist in the history of scientific atlases, aestheticisations should be an objective representation of data that does not ‘distract’ from it.

In his influential book on data visualisation ‘The Visual Display of Quantitative Information’ (2001), Edward Tufte sets a notion of transparency as a central goal for data visualisations when he calls for their authors to employ a ‘graphical excellence’ that tells “the truth about data” (p. 53). The truth he refers to here is not of data’s contemporary role in the exploitation of individuals and communities through algorithmic capitalism, but of a visualisation that represents data ‘truthfully’, i.e. without the personal bias of the aestheticisation’s author. This spectre of truth manifests throughout Tufte’s book, with questions such as “why do artists draw graphics that lie?” (p. 78) seemingly predicated on the belief that there is a truth inherent to data, and that this truth is obscured by the subjectivity of artistry.

Tufte’s argument strategically positions the aestheticisation producer as the gatekeeper of truth. His claim that “graphics *reveal* data” (p. 13, original italics) implies a ‘neutral’ practice of aestheticisation is possible, one that merely ‘reveals’ the truth contained within the data. However, much as how there can be no ‘objective’ data, there can be no neutral aestheticisation, as articulated by Johanna Drucker (2014, p. 5) when arguing that “[v]izualisations are always interpretations - data does not have an inherent visual form that merely gives rise to a graphic expression.” In this way transparency is an impossible goal, the pursuit of which obscures subjectivity by proposing an ideal, objective practice of aestheticisation.

It is a misunderstanding to consider data's 'truth' is to be found in the content of some given data set or graphical representation; I believe instead that *the underlying assumption of data as truth should be the target of critique*, and that challenging transparency offers an opportunity to challenge its underlying ideological narratives.

5 The Spectacle of Scale

This repeating narrative of 'truth' is also bound up in claims of authority through spectacle in data aestheticisation practice. Data visualisation projects with substantial press coverage and institutional backing such as *Phototrails* (Hochman, et al., 2013) demonstrate a common practice of leveraging abundance and complexity in the creation of a data aestheticisation that seems to imply the *a priori* authority of the authors, the data, and the aestheticisation.

Phototrails was a data visualisation project that collated 2.3m Instagram photos together, compressing their size and arranging them into a single image so that patterns in their form became apparent. In producing this distant reading of the images, the authors present multiple arrangements of them which they organised by features such as colour and location metadata. Across each of these arrangements of data, one trend is consistent: that *Phototrails'* explicit focus on what the authors call 'All-in-One' visualisations, of all-presence and mass-scale viewed at a distance, renders the deeper content of the individual images themselves near-illegible through its totalising gaze. Such 'all-in-one' views presuppose "a finite project (…) [suggesting] a containable problem-space" (Hall, et al., 2015, p. 94), a vision of a knowable and conquerable world that is created and presented by the authors.

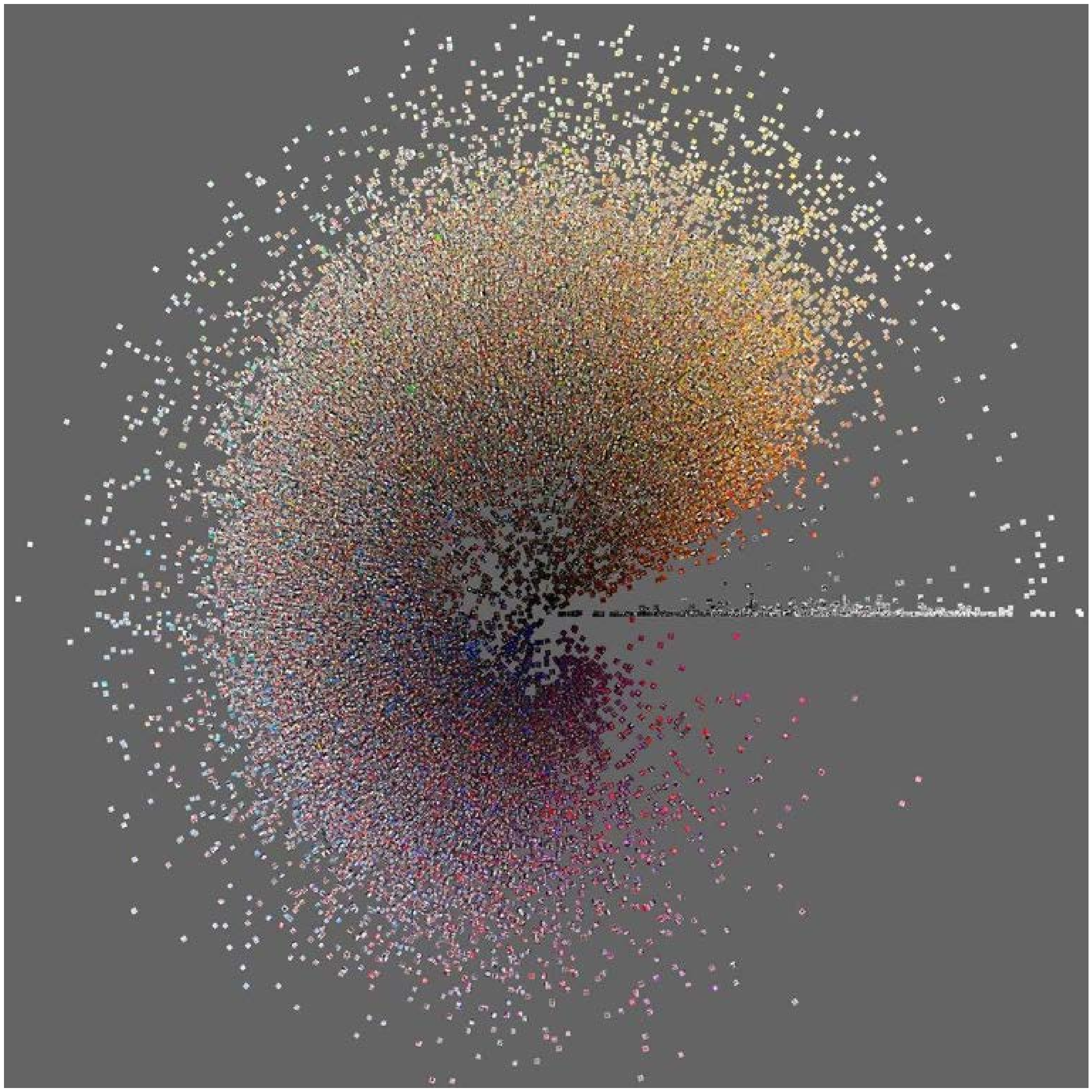


Figure 2
An image from the Phototrails project, described as representing Instagram use in San Francisco

When *Phototrails* reduces the individual content of the photographs down to two parameters (such as colour and quantity), it performs an example of Helen Houser's warning (2014, p. 328) that "the pressure to visualize complexity in a digestible form ends up excluding that very complexity." In this work, the presence of each photographer's subjectivity is lost, along with the depth of each individual image: what the photographers chose to photograph and why is lost; what insights the original images themselves may have provoked about society, culture and politics as seen from the intimate vantage point of the photographers are lost.

In spite of this, the project makes claims to qualitative knowledges such as “social, cultural and political insights” (Hochman, et al., 2013, no pagination) gained through these quantitative means. Such representations position both the author (and, through consuming the work, the audience) as “master of the known” (Houser, 2014, p. 328), a mutual reinforcement of both their own authority as revealers of this knowledge, and claims to the *a priori* authority of data itself. When scale is framed as a spectacular centerpiece from which the authority of the author can be assumed, it is performing “an epistemological claim in the mere act of display” (Gregg, 2015, p. 42). Yet again, this produces a promise of a potent view provided by data where human subjectivity is sublimated, and a strategic claim to authority through the leveraging of the power this promise suggests.

My argument is not that large scales and high volumes of data have no place in data aestheticisation, but that a re-thinking of established approaches to working with large data sets should be enacted; for in rejecting this spectacle, there is the opportunity to challenge the related narratives of data’s totalising reach and the assumed authority that the spectacle of scale perpetuates.

6 Resistance

The narratives of mechanical objectivity, transparency, and the spectacle of scale seen in these prominent spaces, and espoused by these prominent voices, demand a response from critical practitioners in this field. When the authors of data aestheticisations are in a position to influence such narratives, formulating challenges to them demands a critically reflexive practice that acknowledges the cyclical nature of both informing and responding to the wider understanding of data in this context.

To illustrate the approaches such a practice might employ, I will turn now to an examination of *Ground Resistance*, an installation artwork produced in collaboration between myself and Georgina Voss. This work engaged with the topic of 'smart cities' through exploring the data used in MK: Smart, a smart city project centered on the English town of Milton Keynes and operated by the Open University (MK: Smart, 2019).

According to the UK government, the term 'smart cities' defines "the use of data-driven digital innovations to improve services and sustainability in towns and cities (…) both nationally and internationally" (UK Parliament, 2019, no pagination). Our aim was to interrogate the notion of the 'all-seeing, always-on' smart city, where both manufacturers and operators alike make claims such as how their systems provide a view into "every corner of the city 24 hours a day, 7 days a week" (Paes cited in Townsend, 2013, p. 67), while also capitalising upon consumer narratives of simplification through digital technologies (SmartCitiesWorld, 2016, no pagination; Nirmal, 2016, no pagination). This has been argued to produce "a top-down, technocratic vision that … run[s] the risk of framing the city as a mere aggregate of variables" (Mattern, 2015, no pagination).

Figure 3
Ground Resistance, as seen from within the installation in Milton Keynes

6.1 Time

The installation was comprised of a 4m x 3m floor-projected map of Milton Keynes, which displayed geotagged data sets such as electricity and gas usage, traffic, car park spaces, and bus movements, selected from the online MK:Smart data hub. As with many smart city projects, the MK:Smart hub was comprised of data from multiple sources, both industrial and civil, each with different methods of data collection, aggregation, and delivery. This meant that while many of the datasets at hand were referred to as 'live' in the database, the specific metrics of time varied widely between each source. For example, roundabout usage was updated every sixty seconds, while car park space availability data was updated by its supplier every two minutes. This seemed to us an immediate space for critique through the foregrounding of human decision making that defines the functional limitations of the 'always-on' smart city.

The visual representation of the data in this work attempted to explicitly counter the smart city promises of an 'all-seeing' view of the city through a focus on temporality. The data was visualised as colour-coded circles on the map, with annotated text moving through the set over time, detailing the contents of each data point individually. To aestheticise the varying temporalities of the data sources, the visualisations would fade in visibility in time with the rate of data update; so a data set that was updating every minute would appear bright at the moment of its update, and be almost completely invisible at the point just before it updated again.

This created a data visualisation where a totalising view of the data at hand was impossible; data sets faded in and out of view in a-synchronous rhythms with each other, in contrast to an 'all-in-one' approach to data visualisation. Instead of leveraging scale and presence as authority, the sparser view offered by *Ground Resistance* employed temporality as a method of critiquing the limitations of the technologies at the core of these systems, and the related claims of an 'always on' smart city.

6.2 Absence

Although the data used in this installation related to elements such as household utility use and civic infrastructure, there were still areas of the town with a notable absence of geotagged data. For example, there was no data in these sets for the Coniburrow Estate, located very close to the centre:MK shopping centre where *Ground Resistance* was exhibited.

This absence of data was explored in *Ground Resistance* by analysing the six urban areas of the map for which there was no data in the sets at hand, and performing a sculptural intervention on the visualisation itself. Sheets of black acrylic were laser-cut to match the shape of these areas of absence, and hung on monofilament wire below the projector above the area the shapes corresponded to. This created shadows which imposed themselves on the projection as a black far deeper than can be achieved with projected light, creating truly black voids over the areas that were absent from the data.

This stark interruption of the seamlessness of the visualisation, coupled with the very visible sculptural element of the shapes hanging down between the audience and the projector, created an environment where the absences in the data were foregrounded, rather than obscured. Rather than attempting to produce a 'transparent' aestheticisation that claimed to only 'reveal' the data's contents our approach drew attention explicitly to the absences present in these systems and their data, as a challenge through practice to the notion of the totalising view of the smart city.

When the presence of multiple industrial and civic actors and these temporal and spatial gaps in the smart city are foregrounded in this way, data is presented not as a nonhuman, objective and omnipresent view of the world, but as being the product of knowable human decision making, with a reach restricted by the limitations of the technologies and practices of data collection itself.

Figure 4
Shadows can be seen created by the hanging acrylic shapes, which cast through the projection

7 Conclusion

The claim that data possesses a form of mechanical objectivity perpetuates across the sites of aestheticisation practice and its products examined in this paper. It underpins the narrative of a transparent or ‘true’ aestheticisation, as well as the authority created by a totalising, spectacular view. *Ground Resistance* demonstrates the capacity for a critically reflexive practice of data aestheticisation to engage with these narratives and to propose new forms of aestheticisation that challenge their related claims, offering an interruption to the cyclical perpetuation of the ‘promises and strategies’ of data described here.

Approaches in data aestheticisation practice such as these are representative of what I call 'critical data aesthetics', a disposition I have been articulating through a range of sites, including my doctoral thesis (Goatley, 2019) and artworks such as *Ground Resistance*. What resonates throughout such approaches is this: that an experimental and expressive practice of aestheticisation can highlight data's subjective and interpretative character through drawing out its politically and ideologically contentious characteristics; allowing for interventions upon the promissory visions of data and challenges to the strategic proliferation of their claims.

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Digesting Data: Designerly Speculations on Food-tech Futures

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From smart kitchenware and diet personalization services to digital farming platforms, technology design has become a frequent companion of our day-to-day food practices. Wrapped in techno-optimism, such technologies are often presented as solutions for diverse food problems, including everyday hassles with cooking and shopping as well as systemic issues of malnutrition and unsustainable food production. While food-tech proponents talk about better data-driven food futures, critics highlight the underlying techno-solutionism and negative impacts of food-tech innovation on food systems and cultures. Here, we present the Edible Speculations project that explores food-tech trends and risks through a series of Speculative Design (SD) case studies. Our findings can be of use for designers, researchers, and other practitioners interested in food-tech issues as well as in SD methods.

1 Introduction

Human-food practices are key drivers of personal and planetary health and have the potential to nurture both. However, current modes of food production and consumption are causing ill health and amplifying climate change (Willet, et al., 2019). Issues with malnutrition and environmental unsustainability in contemporary food systems have motivated a burgeoning realm of food-tech entrepreneurs and venture capitalists to propose various techno-solutions (CBInsights, 2018). Those of us privileged with purchasing power can enjoy cooking in smart AI-based ovens, customizing our diets to our DNA, tracking our household food waste through smart trash bin sensors, or shopping in 'unmanned' AmazonGO supermarkets. From food provisioning and cooking to eating and disposing, our mundane food practices become data-driven events that can be tracked, quantified, and managed online. This human-food automation feeds techno-optimistic visions of efficient food futures, but also concerns about the potential risks that novel food technologies put on the table: what are the implications of human-food automation for social food practices and traditions? How does our reliance on autonomous food technologies impact our tacit food knowledge? Is it safe to follow diet recommendations provided by algorithms? What are the privacy aspects of sharing personal data over online food services?

Such questions and concerns about the social impacts of food-tech innovation are a relatively recent topic in scholarly writing. Food Studies, as the flagship in the area of food-related research, has shown only a peripheral interest in food-tech innovation issues (Lupton, 2017). A relevant discussion has developed in Human-Food Interaction (HFI), an emerging field gathering food-oriented authors across disciplines that originated in the broader area of Human-Computer Interaction (HCI). A recent literature review of HFI scholarship (Altarriba, et al., 2019) shows that authors in the field have, to a large extent, embraced techno-centric perspectives and celebratory approaches to food-tech advancement. Except for a handful of critical works (see overview in Altarriba, et al., 2019), the majority of existing HFI research is solution-oriented: HFI projects that propose to fix, speed up, ease, or otherwise make interactions with food more efficient outweigh those reflecting upon the broader, cultural, environmental and political implications of augmenting food practices with technology. Critical works reflecting not only the opportunities but also the potential risks of food-tech innovation are thus largely underrepresented in existing HFI literature.

This gap in HFI is what motivates the Edible Speculations (ES) project. Initiated in 2012, the ongoing project involves a series of design research case studies examining food-tech issues through the lens of eventful Speculative Design (SD). At ES events, participants from the public craft data-driven recipes, dishes, and future food scenarios to discuss their food-tech concerns. Here, we present two ES case studies—the HotKarot & OpenSauce and the Parlour of Food Futures—performed between 2012-19 in multiple cities across the world. Drawing on our empirical observations and analysis of what participants made and said at two selected events (one for each study), we discuss the opportunities and limitations of eventful SD in driving critical HFI inquiries. Our findings will inform any authors interested in HFI themes as well as design researchers experimenting with eventful SD methods.

2 Edible Speculations

The ongoing ES project has thus far included six case studies, each of which addresses a distinct scope of food-tech themes and issues. Given our limited space here, we will focus on two selected case studies—The HotKarot & OpenSauce and the Parlour of Food Futures—to illustrate the potential of eventful SD in supporting participants' critical engagement with food-tech issues. Each study was initiated by the author of this text together with diverse collaborators—hence the use of we throughout this text. Before discussing both studies in greater detail, we will briefly outline the ES approach.

2.1 From Exhibitable to Eventful Speculative Design

The ES project aims to problematize existing food-tech solutions and unpack issues, rather than solve problems. Our use of SD supports this goal. As an approach to design research and practice, SD is recognized for supporting critical thinking rather than practical problem-solving (Dunne and Raby, 2013). Instead of designing user-friendly products, SD questions problematic social conditions, and provokes what-if imaginations of plausible alternatives. This so-called "problem setting" (Schön, 1984) is commonly facilitated through design artifacts that are provocative, interrogative, and "slightly strange"—falling out of the common logic of things and supporting imaginations of not-quite-yet realities. While the possibilities of speculation and provocation in design research were proposed earlier (e.g., Gaver and Dunne, 1999), SD came into wider recognition upon the publication of Anthony Dunne and Fionna Raby's Speculative Everything (2013). Dunne and Raby (2013) framed SD as an exhibitable practice presented in art-design galleries, in the form of finished artifacts—an approach that soon became criticized for being detached from everyday-life realms. Instead of including concerns of a wider public, authorial SD exhibitions cater to selected privileged social groups (Tonkinwise, 2014) and provide a limited option for the audience to intervene with their active inputs (Disalvo, 2016). Incidentally, one of the first 'infamous' projects that sparked a wave of criticism against exhibitable SD was a food-oriented speculation: The Republic of Salivation (2011) by London-based designers Burton-Nitta presented a dystopian vision of future food scarcity where citizens receive limited portions of food based on the emotional and physical demands of their jobs. Instead of provoking a debate about existing food insecurity issues, the project sparked a wave of criticism pointing out the superficiality of presenting a 'shocking' vision of future food scarcity that, however, is a real-felt problem for many people today already (Thackara, 2014).

Informed by these critiques, some design researchers started shifting their speculative practices towards more eventful, participatory and socially inclusive formats; drawing on methods and techniques from Participatory Design and co-design (Baumann, et al., 2017), Design Anthropology (DiSalvo, 2016), or performing arts (Chatting, 2014). These speculations, presented as design events open to participants' active interventions, support the use of SD as a "designerly version of public engagement" (Michael, 2012, p. 540). ES explores such eventful uses of SD, aiming to support at-the-moment engagement of diverse publics in hands-on discussions about food-tech issues. Following the aim to engage diverse participants, ES events are situated in publicly accessible venues, such as street festivals, farmer's markets, and community gardens. Instead of enrolling participants through a traditional recruitment call, we invite the participation of broadly any passersby who do not need a specific food and technology expertise. We documented each event through field observations, conversations with selected participants, and various sampled design materials produced in-situ (e.g., data-driven recipes, dishes, future food scenarios). Some interactions were audio-recorded; when recording was not available (due to the inability to gather informed consent during spontaneous interactions in public settings), we took written field notes instead. All collected data was analyzed manually, using qualitative methods. Vitally, all participants were able to withdraw from the interactions at any time.

2.2 Case Study I: Hotkarot & Opensauce

2.2.1 Background

1 Available at: <www.hotkarot.cz>.

2 Available at: <www.makesauce.cz>.

HotKarot & OpenSauce[1] is a street food bistro serving carrot hot dogs topped with sauces that are made of people's personal stories (see Figure 1). The sauces are created in the smart online recipe recommender OpenSauce[2] that enables users to upload their stories and convert them into personalized sauce recipes. The resulting data-driven sauces can be tasted at the bistro, which offers a varied menu: each person has a different story; each story has a different flavor determined by the OpenSauce algorithm. Using the bistro laptop, participants are invited to share any kind of stories—from personal memories and bios to short fictions and any various commentaries—that are then turned into a sauce, consumed, and discussed at the bistro.

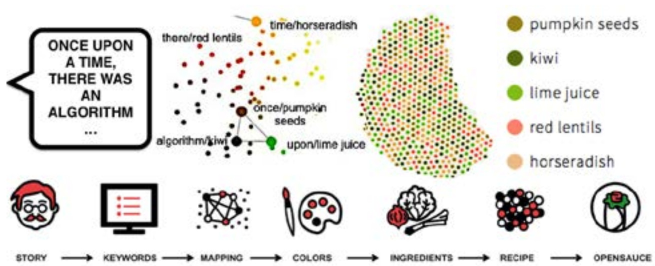

Figure 1
OpenSauce translated people's stories into sauce recipes

The OpenSauce translation of people's stories into sauce recipes (words into ingredients) relies on the network text analysis method (Paranyushkin, 2011): each source text (story) is analyzed for its most meaningful keywords, which are later matched with ingredients from the OpenSauce cookbook archive. The translation of story keywords into sauce ingredients does not reflect the actual semantic meaning of the source story, nor users' dietary preferences. The ingredient pairing is decidedly instrumental, following the keyword analysis and color mapping process. In this way, users have no control over the ingredients and taste of their personalized sauces: they need to accept that the smart OpenSauce system knows what is good for them.

As a SD provocation, OpenSauce simulates the deterministic function of smart food technologies and services that use quantified analysis of consumers' data (e.g., DNA, phenotype, lifestyle) to suggest personalized diets and food recommendations. OpenSauce shifts such food and diet personalization to an extreme level: instead of reflecting users' personal health data and food preferences, the system creates personalized recipes directly from their personal stories (what they say about themselves). Through this literal understanding of Brillat-Savarin's quote: "You are what you eat", the project aims to create a productive conflict (personal taste vs. personal data) and provoke participants' critical reflections on smart food technologies, practices, and issues. At the bistro, we focus on how participants negotiate between their personal food preferences and OpenSauce's personalized food recommendations: will they trust the 'smart' machine or their guts?

2.2.2 Event & Participants

Since its opening in Prague (CZ) in 2012, the HotKarot bistro was presented in various cities and countries around Europe, Australia and South-East Asia (details in Dolejšová, Lišková and Obert, 2017). Here, we discuss a three-day HotKarot event organized at the Street Delivery festival in Bucharest (RO) between June 13th - 15th, 2014. Throughout the event, four members of the design research team performed the role of bistro chefs, assisting visitors in the OpenSauce recipe making, observing their reactions and activities, and inviting them for short conversations about their bistro experience (see Figure 2). We collected 31 storytelling sauce recipes uploaded to the OpenSauce recipe book and notes from 52 live conversations with bistro visitors.

Figure 2
Interactions at the HotKarot bistro

2.2.3 Interactions & Reflections

While making and tasting their data-driven sauces at the bistro, participants shared diverse personal, performative, and sometimes provocative food-tech reflections. The generated OpenSauce recipes were sometimes tasty, sometimes not—some people were enjoying the flavor of their personalized snack; some had issues with it. One participant outsauced his biography, obtaining a recipe that contained peanuts, to which he was allergic. The irony of having his personalized 'life-based' recipe made of something that he was not able to digest, prompted the participant to share his skepticism about food-tech innovation and the increasing everyday-life presence of autonomous technologies: "We train technologies to make sense of us, hoping they will make our lives easier—this peanut story shows just how bizarre it might get. Instead of being empowered, we are losing control over our lives." His experience also illustrated potential risks with smart food-tech services providing invalid diet recommendations and causing health issues to users (discussed e.g., in Eissenberg, 2017).

Some participants who were similarly 'unlucky' and received recipes that did not match their personal preferences, decided not to obey and came up with creative ways to outsmart the OpenSauce chef. A young woman who disliked her spicy chili-infused recipe proceeded to swap her sauce with other bistro visitors. She eventually closed a successful deal with a visitor who was happy to trade his mild recipe made mostly of chickpeas, broccoli, and cream cheese: "We won, we defeated the machine!" they both cheered triumphantly toasting one another with their swapped HotKarots. This performative exchange enabled the participants to satisfy their taste buds and also to learn more about each other's stories: they managed to remain in control of their personalized algorithmic lunches, and got to know each other better. In this case, the bistro speculation created a playful space for lively conversations about participants' stories as well as food-tech concerns and opinions (see Figure 2).

The conversations and discussions held at the bistro often revolved around the tension between human creativity and technological efficiency. For some, using smart tech to suggest recipes and food recommendations was counterintuitive, as summarized by an older high school teacher: "Cooking to me is an impromptu act of creation. The moment of surprise with what will happen in the pan, how will it taste, is precious—something I would never give away to some smart machine." His notion of food creativity as an embodied act of performative heuristics sparked a larger conversation that was joined by a few other visitors standing around the bistro. While many of them were resonant with his insistence on preserving the element of low-tech human-driven experimentation and surprise in cooking, one participant, a local artist, presented an intriguing counter-proposal: "How much can you surprise yourself, anyway? Only within your zone of comfort. Using some external element —technological or not — can take you out of this comfort zone, and that's where the real surprises are." In her understanding, smart technology does not need to stand in opposition to human creativity; on the contrary, it creates an occasion for culinary surprises that are even more exciting.

Unlike the above thought-provoking remarks and comments, not all bistro interactions were meaningful. Some participants remained preoccupied with the whimsicality of the storytelling sauces and left the bistro without sharing any relevant thoughts on the outlined food-tech issues. In these cases, the SD bistro functioned as a spectacular site for mere entertainment, rather than a platform for critical food reflections. This is a limitation of our playful speculative food design, as we unpack later in our Discussion.

2.3 Case Study II: Parlour of Food Futures

2.3.1 Background

The Parlour of Food Futures[3] explores possible food-tech futures through the 15th century game of Tarot. The future forecasting is performed over a bespoke Food Tarot deck presenting 22 speculative food-tech tribes such as Datavores, Gut Gardeners, and Food Gadgeteers (see Figure 3).[4] Although primarily future-oriented, each tribe refers to some existing or emerging food-tech trend: for instance, Datavores refers to quantified diets, Gut Gardeners to microbiome diets. During one-on-one readings, participants are prompted to discuss food-tech issues shown on their selected cards and to speculate: What, where, and how would we eat in the near future? What would be the favorite snack of Chew Transcenders? Would a Monsa[n]tanist date a Food Psychonaut? Would Turing Foodies trust each oth-

3 Available at: <http://foodtarot.tech>.

4 Full deck available at: <http://foodtarot.tech>.

er? After finishing the reading (10-30 min), each participant is asked to select one card from the table and craft a short what-if scenario imagining that she is a member of the selected food-tech tribe (see Figure 4).

Figure 3
Food Tarot cards

Along with Tarot, a traditional card game and a divinatory tool, the Parlour project aims to enable playful interactions and support the notion of uncertain food futures open to multiple interpretations. The Food Tarot cards are inspired by the Tarot de Marseille deck (Major Arcana) which includes 22 cards with various philosophical and astronomical motives embodied by elements such as The Empress, The Magician, or The Emperor. Each element has a symbolic meaning, which we translated into our Food Tarot version: for instance, the Tarot card of The Emperor that symbolises the urge to *rule and control* the world inspired the card for Datavores—a tribe of Quantified Self dieters and life-hackers controlling their bodies through self-tracking of their energy intake and outtake (see Figure 3). Following the same logic, the card of the Empress representing the dominion over growing things, inspired a food-tech tribe of Gut Gardeners who experiment with DIY biohacking to grow their food.

2.3.2 Event and Participants

Since its inauguration in 2017 in Phoenix (USA), the Parlour has been presented at various food and art/design festivals as well as on random street corners (details in Dolejšová, 2020). Here, we summarise our findings from a two-day Parlour event organized at the inaugural Emerge Festival in Phoenix (25-26 February 2017). During the event, we — while performing the role of Tarot readers — collected notes from 34 Food Tarot reading conversations and the same number of scenarios.

Figure 4
Food Tarot readings and scenarios at the Parlour of Food Futures

2.3.3 Interactions & Reflections

During the card readings, participants often shared salient observations from their personal food practices and local food contexts. One participant, a long-term Phoenix resident, mentioned local food security issues and the frequent presence of food deserts (areas with limited access to affordable and nutritious food). In response to the Gastro Masochists card—dieters deliberately restricting their appetite through smart calorie trackers and weight watching platforms—he noted that such 'masochism' is often involuntary for people living in Phoenix food desert areas. He pointed out the global food security paradox, where wealthy consumers often need to avoid "an overload of ubiquitous food options and information", while less-advantaged people suffer from limited food access. This local remark steered our card reading conversation towards issues with limited socio-economic access to new food technologies and the negative role of food-tech innovation in extending the existing inequalities on the global food market.

Following the readings, participants produced scenarios where they shared their personal, skeptical as well as optimistic, future food-tech envisionments. Reflecting on the Genomic Fatalists card (dieters engaging in DNA-based personalized nutrition, tailoring their diets to their genetic predispositions), a young journalist visiting the Parlour questioned the security of sharing sensitive personal data (DNA) with commercial personalized nutrition services. Her scenario included a drawing of her future self in 2030, walking through a street full of bakeries, ice cream parlors, and wine boutiques and looking sadly into the shop windows, unable to buy anything (see Figure 5). As she explained in her scenario description, future citizens will have their bank accounts linked to their personal genetic data profiles that will be available to health insurance companies. While aiming to keep their clients fit and profitable assets, insurers will not allow any citizens to reach beyond the "average health standard". In her scenario drawing, she has just reached a slightly beyond the "normal weight" for her age and gender category, and her card is thus blocked to purchase any food or drinks classified as unhealthy. This dystopian scenario illustrated the participant's concerns with diet personalization technologies as tools of mass government-led surveillance.

A somewhat contrasting, optimistic scenario was shared by a university student who, reacting to the Ethical Cannibals card, imagined a sustainable and communal way to grow food on his own body. In his vision for the future, he would consume specially modified probiotics to "hack" his gut flora to be able to grow edible mushrooms on his skin. Using the human body as fertile 'soil', his mushrooms would have the nutritional qualities of animal protein. When we proceeded to unpack his scenario, asking about its ethical aspects and other details, he highlighted the fact that eating the mushrooms would not harm anyone — on the contrary, he would happily offer his personal harvest to his friends and also to potential dates in bars; a practice he named the *Human-Food Exchange Club* (see Figure 5). In his scenario, Ethical Cannibalism represented a sustainable and 'humane' form of harvesting animal protein but also a way to socialize with others.

Figure 5
Genomic Fatalists and food-tech surveillance; Ethical Cannibals and Human-Food Exchange Club

The ideas and reflections gathered at the Parlour extended our Food Tarot speculations (embodied in the card deck) with observations and insights from participants' personal food practices and contexts. However, similar to the HotKarot bistro, some Parlour participants spent their reading session chit-chatting and drawing silly food-themed pictures, instead of reflecting on the food-tech practices shown on our cards. Their scenarios and reading contributions were often of no value to us. One such scenario proposed that Nutri Explorers—a tribe experimenting with alternative and bio-hacked nutrient sources —

would "hate to eat insects with heavy poop". Why poop? Why heavy? What insects? The participant's cheeky response: "because everybody hates poop" was numbing. In cases like this, the Food Tarot deck merely functioned as a fun tool rather than a SD medium provoking critical thought. In the following section, we discuss both the positive and negative aspects of the Parlour and HotKarot interactions in detail.

3 Discussion: Eventful Food Speculations

Both presented case studies—HotKarot & OpenSauce and Parlour of Food Futures—experiment with eventful SD situated in everyday public contexts. Participants, typically ordinary passersby of varying demographic and professional backgrounds, were invited to join spontaneously, without any requirements concerning their food or technology expertise. At both presented events, issues related to food-tech innovation became a casual topic accessible to the public. While certainly not accessible to all (not everyone has the option to visit cultural festivals to engage in food design provocations), the event interactions reached beyond the realm of professional designers, researchers, and technologists. Instead of enabling mere spectatorship, the SD events supported participants' creative material involvements: provoked by the OpenSauce recipe recommender and the Food Tarot deck, participants crafted (edible or other food-based) material commentaries and scenarios embodying their food-tech reflections and future envisionments. Through their active input and interpretations, they shifted our SD from authorial and fixed, to participatory and unfolding.

Critically, the participation at both events was motivated by *speculation* — the unusual and provocative design setting of the bistro and the Parlour. Many participants mentioned that they would not be willing to contribute to 'traditional' food research formats, such as surveys and focus groups. The SD setting of both case studies thus yielded an opportunity to glean insights from people who might not share them otherwise. Such insights gathered from everyday food practitioners can expand the ways how we, as food design and research professionals, understand food-tech issues and imagine possible food futures. At the same time, both events conveyed experiences that were, reportedly, enjoyable, and meaningful for the participants. Both bistro and Parlour created an opportunity for anyone to engage in creative food experiments and discussions, meet new people, and learn something new about food-tech advancement. One Parlour participant even mentioned that going through the Food Tarot reading and discussing the food-tech practices shown in the deck felt like being in a "live food Wikipedia". In this sense, taking part in the case studies was useful both for us, as design researchers, as well as for the participating public.

However, this usefulness was of a varying degree, and our SD did not always inspire reflective or insightful engagements. Some participants stayed preoccupied with the whimsical character of the artifacts and were not able to (or willing to) provide any meaningful feedback. This is not an unusual limitation of SD projects, which are sometimes criticised for being mere 'criticool' spectacles rather than stimuli for critical thinking (Laranjo, 2015). In exhibitable SD, 'criticoolness' is often determined by formal aesthetic aspects of a SD artifact and how are they accepted by spectators. In eventful SD, on the other hand, a design researcher can assist participants in their interactions with a presented artifact and make sure that they understand what the artifact is trying to say and do. While this option to shepherd participants' interactions and steer them towards a meaningful exchange is an advantage of eventful SD, it also creates an additional requirement for design researchers and their ability to communicate, perform, and improvise in and with the public. Especially in 'uncurated' public settings, where participants have varying degrees of knowledge about the addressed theme, keeping everyone productively engaged can be a challenging task. A crucial part of this effort is a careful reflection-in-action process (Schön, 1984): emerging insights, comments, and information are used to move forward with the research, but also revisit previous considerations.

We have, to some extent, failed in our reflection during the two case studies, causing occasional criticoolness and disengagement to surface. Still, our trial-and-error experience yields some insights that can be of use for future work (ours or anybody else's). Reflecting on our design research experiences ex-post, we can say that it is crucial to take all participant responses seriously—even the seemingly silliest ideas can lead to interesting commentaries and scenarios, if they receive the appropriate attention. A good example is the Human-Food Exchange Club scenario. Entertain participants' ideas even if they seem silly, ask follow-up questions, listen, respond, negotiate, and reflect. We also noted that it is extremely useful to have enough people involved in the design research team, in order to properly attend to all emergent ideas, concerns, questions, and curiosities. Being unable to do this can make participants feel neglected and, hence, 'fool around' instead of providing proper responses.

4 Conclusion

Our long-term ES project aims to investigate how, or indeed if, eventful SD can support critical inquiry into HFI themes. In this paper, we have attempted to outline the possibilities and limitations of this approach through a brief summary of two ES case studies and two selected events. The events created a compelling—although not flawless—opportunity for participants to engage in playful but also critical explorations of food-tech issues. Speculating in the everyday, naturally messy and contingent, created some challenges but also opportunities to gather surprising, valuable food-tech insights from diverse publics. Such insights helped us to expand our understanding of the possible roles that new technologies play, or might play, in food cultures. We hope that other HFI authors, or more broadly anyone interested in food-tech research, might find eventful SD to be a useful approach as well. Further, we believe that the eventful SD applied in our case studies can also be used outside of food research contexts, to investigate other themes where the public's insight is of value.

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Data and Algorithms: A Queer Love Story? Queer Post-human Perspectives on Data-algorithms

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I want to suggest that scientists and politicians often forget about the relationship in which data is created, namely, the relation between data and algorithms. In this case I would like to make the claim that data and algorithms are co-constituted and to go further, that by not naming this relationship data becomes the new transcendental object in the age of the internet. In opposition to this I want to rearticulate from the perspective of a political scientist the relationship between both of then as a queer configuration of the human/code and capitalism. I am going to call it data-algorithm and think of this term as an embodiment Cyborg.

1 IT Girls

We live in a digital, data-driven age (Süssenguth, et al., 2015, Boström, 2016). New breakthroughs in machine learning and neural network research have enabled us to use data to establish new types of technologies and new technopolitics (Sejnowski, 2018, p. 27,Weber, 2018). These technopolitics are characterized by the collapse of a clear boundary between nature and technology or, more humanistically speaking, a collapse of the boundary between the human and the technical, based on the term technoscience (Reichle, 2009, p. 6). The cyborg becomes the IT girl of the new era. The IT Girl here refers, in an ambiguous sense to the scientific prominence of the term cyborg, coined by Donna Harawy and meanwhile canonical, and on the other hand to the connection between information technology and gender (Balsamo, 1995 Hovenden, Janes and Kirup, 2010 Loh, 2019). The IT girl is the ambivalent figure between utopian cyber feminism of the 90s and the new economic importance of the digital infrastructure called the Internet (Plant, 1998 Zuboff, 2019).

Apocalypse or Utopia is not incidental, but also not obvious. In addition to new economic forms and concepts of division of labor, as well as the transhumanistic interpretation of the new target, politics is also changing (Srnicek, 2017, p. 38; Kurzweil, 2013, p. 179). At the same time, concepts of automatic reasoning[1] and autonomous democratic citizens collide in an irreconcilable manner (Amoore, 2013, p. 9).

In the following text I would like to explain this failed relationship based on a boring story, a love story. How, with the help of the technical requirements of the 21st century in the field of information technologies, new policies beyond the human / male subject can be imagined, and why this conception is incompatible with the current state of technology in the age of big data and AI. It is ultimately about the celebrated but failed

1 Automatic reasoning is first of all a kind of logical reasoning. Hiebei is generated from existing knowledge through new reasoning. A well-known example is the sentence: "All humans are mortal", "Socrates is a human", the conclusion here would be: "Socrates is mortal." (Bath 2013, p. 95). In relation to digital technology, such as Corinna Bath, for example, on cloud computing, as digital storage locations, autonomous reasoning as a tool can draw on various knowledge bases (databases), different computers, and not only draw new conclusions from the knowledge of one source, but also use different data sets to generate new connections and new knowledge. The algorithms used generate knowledge instead of humans. The resulting knowledge is not linked to the initial knowledge in the referential sense, rather the algorithm creates something new. (Bath, 2013, p. 96)

marriage of enlightenment and the subject. We can not release her happily into the sunset. The idea of pure reason paired with a subject, that is autonomous[2] and rational. (Braidotti, 2014, p. 31)

2 place autonomy in the conceptual tradition of political theory and mean a state of free will. I follow Cornelius Castoriadis who sees autonomy as the basic idea of modern philosophy and interprets this concept as the founding element of ancient Greek democracy [Castoriades, 1990]. Unlike theorists like Janina Loh, who updates the question of autonomy for intelligent systems, I reject autonomy as an anthropocentric concept [Loh, 2019]

In this article, I argue for an understanding of data and algorithms that correspond to that of gender, gender in a queer manner. Autonomous and masculine are the forerunners of a rule that is changing under new technical circumstances, but does not want to stop fighting for the white man at the top. To see that, I want to understand data and algorithms as co-constitutive. There is no innocent data that we can protect against company access. Data has always been processed algorithmically in our (bio) digital age. They are proactive, networked and dynamic (Alpaydin, 2016, p. 11). In the first step, I will work out the classical understanding of subject, which is still held socially. This will be done using the transnational experimental space, known as the European Data Protection Regulation, as a paradigm of the white male subject.

I would, however,like to go further and disclose the new conditions for a techno age in a posthuman, queer theoretical framework. First, data and algorithms are illuminated at a critical moment against the background of their relationality.

I contextualize data to show new developments and to make the posthuman development of new actors understandable. This concludes by explaining why a combination of data and algorithms is a necessary conceptual movement.

Finally, with the help of Puar's concept of the 'Data Body' (2017, p. 155) and Haraway's 'Informatics of Dominations' (1995, p. 48), I will demonstrate that the relationship between data and algorithms are powerful hierarchical connections that secure and produce domination, and then, in a utopian, partisan attempt, try to show the political dimension of data and algorithms in order to ask how we could use them in an utopian way.

2 The Private is Political

As mentioned earlier, new information technologies, such as the Internet, have posed a new challenge to our Western, capitalist democracies (Houben and Prietl, 2018, p. 333). The central question for the subject and the fundamental rights holder is that of privacy and data sovereignty. Regardless if it is health related data at the doctors, cat videos or porn, what he looks at is and must be supplied to the public eye, if not withdrawn, at least with his consent. The political claim to this way of thinking finds expression in the recently adopted EU Data Protection Regulation. Beyond the nation state, data is now attributed to a subject. It is protected, and what is of fundamental importance in capitalist systems, is that its data is protected (European Parliament and European Council, 2016, Art. 1 GDPR). “This regulation is applicable to the protection of natural persons with respect to the processing of personal data and rules.”

In this case, data is classified as the possession of the respective person and thus, as they are assigned to the citizen, are regarded as their private property worth protecting. This can be exchanged under legal regulations, published, and become part of the political community. The liberal notion of a person is anchored within this regulation in the age of intelligent machines. But what does personal data mean? Who is a person in the age of digital avatars and instagram personalities? And what happens if we give up the notion of data as possession, not in favor of other state-like entities like Facebook, but instead commit ourselves to a post-human revolution in the spirit of Braidotti, who exchanges the male, white subject for the plurality of identities and rhizomatic concatenations (Braidotti, 2019, p. 42).

3 Data

As already asked, the crucial point of my argument is that a subject position, as briefly mentioned above, can not hold itself in view of the underlying technique. The idea of personal data might have an impact of some kind in view of pre-digital data, but it is difficult to see it even for digital data. For this reason, I would like to briefly outline in three steps a possible form of data which I shall call systematization in terms of the relationality of data and algorithms and their relationship to posthuman becoming.

But what can be data? Kitchin gives a potential definition that clarifies which fundamental epistemological settings involved data. "Data holds concepts: they are abstract, discrete, aggregative [...] and are meaningful independent of format, medium, language, producer and context" (Kitchin, 2014, p. 3).

In addition to this general statement, the question remains, what types of data are there? Does the General Data Protection Regulation mean the same data that Sejnowski (2018) has in mind when he talks about the revolution? Can the male citizen resort to the same personal data as Haraway's cyborg? To clarify this, it requires an interpretive framework which I would like to establish by means of the digitization of data. I will discuss three types of data.

3.1 Predigital Data

First predigital data. These data are understood in the political-theoretical context above all as means of domination. Through this data, power becomes a controlling subjectivizing form of government. Canonical examples here are above all Foucault's considerations on population policy and the associated data registers, such as birth rates, death registers and the like (Foucault, 1977). They are characterized by three features against the background of their technical feature. They are monomedial, monocausal, and are predominantly expressed in universal statistics (Alpaydin, 2016, p. 5). Data are hereafter limited to a carrier medium, such as the birth register. Furthermore, the data is traceable to a source and remains related to it. They can also be integrated into statistics, such as GDP. In doing so, I must emphasize that while this data continues to play a role in the global North, albeit subordinate (e.g., the still-used written index card system for some libraries), it is still the key data source for many people. Digitality, it is a resource that is unevenly distributed along well-known colonial lines. (Arora, 2016, p. 1682). To date, information infrastructures are not universal structures. For example, Facebook would like to enable Internet access in regions of Africa, but not to all pages, but to those page specified by Facebook. This creates a two-tier Internet, which on the one hand shows itself to the user as a free structure in the rich Global North and on the other hand becomes a power tool and takes on paternalistic features, as it is offered in the Global South.

> “Wikipedia serves as a Trojan horse, paving the path for Facebook’s monopoly among the Global South’s data-driven subjects. Democracy of information and select IT brands are indelibly tied together through such efforts.” (Aora, 2016, p. 1686)

3.2 Digital Data

Digital data, on the other hand, has new qualities that make it posthuman artefacts. Contrary to the paradigm of isolation and tool character or power, digital data is described through connectivity, mobility, and sociality (Alpaydin, 2016, p. 10).

> This type of data is closely linked to the computer and the mobile phone as hardware. Digital data are networked, they are not fixed to a medium and can easily be woven into emails,

text messages, or as an Excel spreadsheet. They do not have to be transmitted, as the written tables of Foucault. Furthermore, these data are mobile, which means they are (almost) everywhere and (almost) always available through the mobility of the terminals over the Internet. The paradigm of the Global North is availability. The access restriction of data today is an anachronistic, colonial demonstration of power (see Laboria Kubotniks, 2015, p. 15).

We live in a hierarchical digital world. The Internet is a new social structure that regulates communication, economy, sexuality. Thanks to platforms, our life is linked to new, networked logistics, and smart medicine, linked to data and portability. Hacker attacks and the fear of being involuntary offline have become an omnipresent global threat to the sovereign (Maurer, 2016). At the same time, people are cut off from these new societal resources because of where they live, their financial resources, and other categories of inequality. They lose the ability to articulate themselves, their ability to act and the opportunity to create a future (Aora, 2016, p. 1688).

At the same time, Demos is not the state's data lifter, as Foucault put it, but the 21st millennium with Instagram becomes a data producer and produces more knowledge than ever before in societies (Houben and Prietl, 2018, p. 323). Unpatriotic, this circumstance is also called „Dataquake“[3] (Alpaydin, 2016, p. X). There is an infinite amount of data. But these data are no longer mono, they are agile and stand out. More data turns smart technology into even more data. Everything you hear on Spotify independently creates data about your music preferences. So shall we protect our posthuman future Spotify avatar, with the aforementioned politics of the white male subject and his data? And if we can produce more data than ever before and apparently continue to produce it, why should we even go into personal data? Who would be interested in ownership if it would no longer be considered exclusive? The sovereign, whoever that was, can no longer deal with registers and exercise control in that sense.

3 All this digital processing results in an emmense amount of data, and it is this surge of data – what we could call a „dataquake“- that is primarily responsible for triggering the widespread interest in data analysis and machine learning. (Alpaydin, 2016, p. X)

Answers to these questions need to wait a bit; because there is another type of data that has been integrated into our lives.

3.3 Biodigital Data

For a long time, our bodies have not been pure objects to be measured or digital replicas of ourselves (Puar, 2017, p. 155). Our DNA coagulates into data that manifests itself in computers as carrier material; in the sense of DNA computing, by means of which synthetic DNA is taken as a starting point in order to re-code information based on missing components. Here materiality literally becomes data. They connect to the computer, they become digital, and not through the mediating process of computer simulation, such as computer simulation in artificial life (Kember, 2003, p. 87). And here DNA is viewed as data, but that does not mean that DNA should serve as a metaphor for "the source of life" (Chun, 2011, p. 114). Rather, DNA should be seen as data in a relational materialistic understanding. In contrast to Wendy Chun, who understands the metaphor of DNA as code, as ideology that capitalizes life or enables life to be valued per se, I would like to go into the ambivalence of existing technologies that use DNA as a data source. Nevertheless, I would like to come back later to Chun's argument of the code as an instrument of rule (Chun, 2011, p. 111). In my understanding, DNA data is not just code and not just material. I therefore represent Eugene Thacker's approach. In his investigation of DNA chips, the scientist assumes a dynamic relationship between biology and technology. The DNA is used by him in connection with computer technology.

Thacker describes using the DNA chip as a diagnostic tool „The sample DNA, once isolated, is then passed through a microarray (or DNA chip), where fragments of known DNA are attached to a silicon substrate. The DNA chip then "analyzes" the sample through fluorescent-tagged hybridization.

The resultant pattern of hybridization can then be scanned by the microarray computer, which digitizes the hybridization pattern (represented as a grid of colored dots), where it can be ported to software for microarray assays. That initial digital pattern is then "decoded" or sequenced according to the known DNA on the DNA chip, and can then be compared to on-line genome databases (such as the human genome projects), to identify gene expression patterns associated with a given genetically based disease. In this elaborate and routine process, not only are several types of materialities at work, but also several data types are being transmitted, translated, and passed through various media. (Thacker, 2004, pp. 72-73). The biological component is no longer regarded as pure information, but receives a double function as an algorithm / hardware and data (Thacker, 2004, p. 98). Thacker, who refers to Adler's bicomputer, tries to solve the Saselman problem with DNA strands. Thus, Adleman's DNA computer makes computing and biology inseparable, but in a certain way. It integrates the logic of the modern computer (input/output, memory, processor, logic blocks) with the structural properties of biological components and processes. This is more than the simple grafting of Boolean operators onto the physical medium of DNA, for, as Adleman and other biocomputing researchers note, DNA is a unique "computer" in its own right. Its parallel processing, dual binary logic, and immense storage capacity make for an entirely novel computing system. (Thacker, 2004, p. 97) The DNA chips are hybrid tools that arise in tension between materials and interpretations and can only exist in them. At the same time, they are new structures that do not just reveal the boundaries, "but the technical contextualizing of biological processes to perform extrabiological tasks." (Thacker, p. 70). DNA is no longer a discovered entity, but a new one in the form of the DNA chip. DNA is decoupled from a human organism but not from a physical aspect, DNA is still considered materially and put into context in relation to a body.

If we do not go back to the General Data Protection Regulation, the question remains, what will we do with DNA that becomes part of the computer and the computer (Thacker 2004, pp. 17-18) which keeps the hardware ready for a future of smartmachines and new life?

Where digital and predigital data still allow a separation of medium, data, and hardware, they coincide with biodigital data. DNA as an element of the new infrastructure is what? Posthuman? Post Digital?

4 Algorithm

The debate about big data is not just about the data, it includes the algorithm. In the course of the exponential growth of data, the limit of human control has been revealed. It took a technique to tell us what we wanted to see, be it product proposals, terrorist suspects or the potential Tinder dream partner. In the mid-80s, a technique was developed that can be counted as a type of AI. This form draws on so-called neural networks and works with deep learning techniques. Solution programs are written that have little to do with regulation, but are fed with a large amount of data that shape the former input and generate new output (Parisi, 2018, p. 99).

It is most similar to a Jamie Oliver recipe. They have a certain specification of what they want to make, pizza, pasta salad … They know they do not bake the salad and cook the sauce, they often have an ingredients list. Now imagine that instead of the required iceberg lettuce there is only rocket in the fridge. You have already made more than one salad and of course know that iceberg lettuce is not the only option. So you use the rocket because that's your best option, otherwise you would not have a salad. You're acting like a smart machine now.

You learn from an existing knowledge set and change the rule, the salad recipe, to get results.

Of course, this is an example of little social relevance and should only approximate what we are dealing with in algorithms.

The exciting thing is, the latest approach from the existing food in the refrigerator, to stay with the example again, to develop a recipe.

This means returning to the actual story that "Data starts to drive the operation; it is not the programmer anymore but the data itself that defines what to do next." (Alpaydin, 2016, p. 11)

The process of searching on Amazon, the question of who gets put on the American terrorist list, and so on, is no longer decided by one person (two or three million people), but results from the amount of data the training data set of the underlying program recieves (Bath, 2013, pp. 40-45.). This raises the question of the relationship between input and output. With a salad, we also know about unusual ingredients, in the end a salad comes out. It's not a scary thing, but what if we suddenly end up with a bioweapon instead of a salad? Same ingredients, but the intermediate step remains hidden. That is the problem with algorithms, they are, to some extent, obscure to us and elude democratic control. Since we can not fully understand it, let alone master it, we simply use it. Above all, the underlying data for training the algorithm is crucial. Various researchers have pointed to bases in training datasets that produced racist, sexist, or homophobic outcomes (Noble, 2018,O'Neil, 2017, Eubanks, 2019). Here it becomes clear why I assume a co-constitution. The data that help algorithms to be effective are not controllable for us as political actors. We can not read much from them. The algorithm is a tool of evaluation, only through this means does information result and, what is to be emphasized in this case, results in politics.

So when it comes to privacy, it's actually about the interaction of algorithm and data. Because one without the other would not be interesting for political actors. It is interesting to note that, as Alpaydin describes, the data itself takes on the role of the algorithm step by step. Their dynamic positioning, mobility and connectivity make them an actor. New forms of machine learning use dynamic algorithms, i.e. algorithms that adapt to changing conditions. They take new information into account and, unlike information theories from the 1940s, include the contextual meaning of data (Parisi, 2018, p. 102). Deep learning algorithms, such as the Google brain network, also work with context-specific content from data training sets. The data is given a new kind of quality that the solutions of the algorithm are part of. The main focus is on deep learning approaches, with and based on the specification of the data (Parisi, 2018, p. 102). This method is very different from the paradigmatic founding ideas of a structure-driven AI which Alsion Adam describes as follows

> “ Similarly, the idea of searching for a solution to an AI problem involves characterizing the problem as a number of discrete and formally described states, one or more of which will be a starting state of the problem and one or more of which will be a goal or solution state. Operations or rules, which move the problem from one state to another, and a test or evaluative function, which determines whether the problem has reached its goal or solution state, must also be defined. The problem then is seen in terms of a search for a solution, going from one state to another and another and so on until the goal is reached. Hence, the problem is moved from one formally defined state to another in some way which is regarded as rational, perhaps guided by a heuristic or rule of thumb which may help to find a solution more quickly. (Adam, pp. 26-27)

The question then is, how do we respond, what are our political answers? Because one thing should have become clear; the protection of personal data is a relic from another time. We are in the time of posthuman artifacts where nuclear bombs can be made from rocket. Showing ownership will not put a barrier on the connected digital world.

5 Where is the Love Story?

In order to go back to the technical relationship between data and algorithms, it is important to recall two premises of current information technology. On the one hand, we have algorithms available with regard to modern computer technologies as tools that solve computer-based problems using a defined sequence of rules. On the other hand, because of the nationwide supply of computers in the Global North, we have a very large amount of data available.

The complexity of this data can make it impossible to use pre-built algorithms. A classic example here is the sorting of the email mailbox. The decision of whether or not an email is spam cannot be made through standardized solutions, because there are endless possibilities to design such an email.

But due to our numerous other emails in the mailbox, we can have the program create an algorithm with the data that approximately fulfills this task. Here, the data are the starting point for the algorithm (Alpaydin, 2014, p. 2). However, as already described above, most of these algorithms in the field of machine learning are not deterministic but produce solutions that are simply not reproducible (Loh, 2019, p. 44). A relationship between data and algorithm develops that is expressed through its specific contextuality and can only be recognized as the interaction of both components. This data is generated by photos, text messages, videos, and the like. Organizing them, working with them, for example, for scientific purposes or services, such as search algorithms or Spotify suggestions require a new way of solving such problems. (Aplaydin, 2016, p. 11) So, having shown how algorithm and data are related in the technical sense, we now come to the question of the technopolitical dimension and the question of the relationship between gender, algorithms, and data.

For that, I would like to work out two dimensions. On the one hand, with the help of Puar's concept of the Data Body, I would like to deal with the material effects of data algorithms, and on the other hand, with Haraway's idea of the computer science of domination. Here, data and gender become scalable values whose interchangeability makes them a tool of domination.

5.1 Data Body

Puar uses surveillance technologies as the starting point of the investigation. This surveillance creates and is designed for a racialized, gendered subject. This must be identified, interpreted. Surveillance becomes an intimate thing, less a fact than a narrative, but contrary to a European legal basis, Puar sees this as a hierarchical operation that turns out to be a politics of subjectification. It is not the question of privacy that needs to be asked, but the question of who emerges (Puar, 2017). This surveillance in a post-9/11 area is focused on a future subject, one that is conceptualized as a terrorist. This creates the data bodies, networks of millions of pieces of data, big data. At the moment of public safety, movement data, account data, social data are condensing into a single potential body that could act in the future. The data creates the reality of those affected. Data is no longer the description of a past or present, it becomes narratives of a threatening future. However, this threat is not evenly distributed. It rests on the shoulders of people of color as the supposed others, and on queers spreading contagious diseases, especially AIDS. Algorithmic processing solidifies this inequality within mathematical necessities. On the basis of the US death lists for the elimination of persons suspected of terror, on the basis of the data corpus of brown men, apparent facts are determined, from which terrorists surrender (Weber, 2018, p. 224). Here, the discourse is not egalitarian. The subject of the General Data Protection Regulation is not monitored. It monitors and kills people who are brown or black and do not live in Europe. Here, structurally, people are targeting surveillance because of gender and race and receiving a body that seems momentous but has never heard of you. (Puar, 2017, p. 151). Data and its use are hierarchical operations, they are always embedded in a power relationship, in gender and race, which does not do justice to the question of privacy.

5.2 The Informatics of Domination

But there is not only the hierarchical subdivision within data technologies, but also a network: scalability. Data as I have explained, is described today by its interchangeability and connectivity. The scalability of things/data is captured by a colonial moment. It's about an expansion of the concept of data and algorithms. In order to create a comprehensive system, it also requires a comprehensive transformation of the associated objects/subjects/relations in order to link them together (de Sena, 2018, p. 207).

As Haraway explains in the '90s, it is a powerful operation that shapes those moments of late capitalist society. According to Haraway, information and biotechnology is always a relationship, a historical, social order, that are new sources of power. Power is generated here by means of information. All digital data could be represented by means of coding processes as information and could be reassembled by generalizing or, as I have already explained with reference to the AI, formalized language - in the sense of capitalist exploitation. Consequently, boundaries between humans and machines are contingent. Subject and collective collapse by means of this operationalization of power. Everything can be interconnected with everything. This interconnection as materialization Haraway here refers to as cyborg. This computer science concatenates the domination tool (code) and cyborg. This works only through information infrastructure and this only through standardization. Knowledge must be designed in such a way that it can be linked to other knowledge (Haraway, 1995, pp. 48-60).

5.3 Data*Algorithms

So it is anything but peaceful in our new world of AI, moving data and seeking immortality for omnipotent people. We are dealing with a hierarchical formation of data points that focus on colonial and homophobic practices. At the same time, a global infrastructure is created that specializes in networking, everything must be conformist in order to be able to be data. Against this background, I would like to emphasize again why data and algorithms can not be considered separately in a struggle for emancipation.

In the classical way of thinking of an algorithmic problem-solving model, data and algorithms are different things. There is data that is evaluated. In our day and age, in the context of big data, this is no longer the case. The data we have available is so dense that in their entirety, with the right arrangement, they give dense descriptions of apparent futures (Puar, 2017, pp. 207-156). It is already through the creation of data, you reproduce capitalist structures. They are made usable in the Global South for our autonomous cars and our drones. A new, old proletariat creates before the computers of this world the data that changes this world (Couldry and Mejias, 2019, p. 337). They are created and formatted with the knowledge of their usability. Without subsequent recovery, our hunger for data, there is no data. Algorithms and data are two moments of the same global production, with a reconfiguration of gendered division of labor: coding is the well-paid job of the white, male nerd. Training these programs is the job of others. It is a historical process in western industrialized countries, which does not mean the exclusion of women in the area of programming, but the specific structural gender distribution of work and wealth. Nathan Ensmenger describes these processes as follow

> “Unlike other technical or academic disciplines, which have been traditionally male dominated and had to be opened up to female participation, computer programming started out with

> an ambiguous gender identity. An activity originally intended to be performed by low - status clerical staff — and more often than not female — computer programming was gradually and deliberately transformed into a high status, scientific, and masculine discipline. (Ensmenger, 2010, p.136)

6 Data ~~Design~~ art?

Let's come to the most difficult question and the end of the performance. What can we do if the infrastructure of our society can not be saved now? What if the internet, as Plant once described it, is not a utopian kindergarten, but the monster's den (Plant, 1998)? And what should be done if there was always blood on the other technology we used? If privacy is not salvation for us queers? In the analyzes presented, data is regarded as the subject of data science and, with its digitality, it is subject to certain design requirements, as described. Nevertheless, could there be a kind of utopian design based on these provisions? Can there be data art?

6.1 Cost-benefit Ratio

One of the most compelling prerequisites for the presented data configurations, such as the Data Body, is a streamlining of data * algorithms. Russell and Norvig, in their standard work on Artificial Intelligence, the data-driven AI, make the following fundamental paradigm: "A rational agent is an agent doing the right thing" (Russel and Norvig, 2012, p. 63).

The right thing is always a cost/benefit analysis, and looking back on our human and posthuman times, everything is subjected to a universal cost/benefit analysis, and art, music, and sex are understood as rational choices of humanity in the market of opportunity. It seems little wonder that the emergence of AI and the invention of neoliberalism celebrate their birthday together (Shanahan, 2015, p. 83). AI and also the data * algorithm are deprived of a political, communal discourse. They have an inherent rationalist Tellos. The question of democratic participation can not arise in this construction, there is no question to ask.

6.2 Datatata Dadaism

So we've sneaked through a severely rationalized world, got acquainted with data, and revealed its gender.

So what is the way out of this world, if not our personal data?

Today's technologies pose a problem to our understanding of democracy based on autonomous decisions. Machine-locking, the big-data technologies, do not often allow us to reconstruct decisions (Weber, 2018, p. 227). We are confronted with mechanisms that have something oracular about them. We always only see the results. Working is left to the work of others. One way, which I would like to discuss here as a conclusion, is what I call Data Dadaism. We will not, as Haraway has already written, return to an innocent zero, and we will not gain the knowledge to understand an algorithm.

But what we have is the possibility of manipulation, of the game. We have to think about which data we want to use. So far, we've gone from data to portray terrorists, gay men, financial transactions, but what if data does not mimic and algorithms dance with them? One strategy of subversion of the punks is to disrupt the semiotics of rationality and usability, with the will to produce something other than commodity. It's about creating utopian data, what can the world we want to live in look like? We have seen that imagining futures is the new effective temporality of the big-data age (see ibid., p. 238).

Then why not create a network of data * algorithms that does not understand killing but building worlds? For example, artist Cecilie Waagner Falkenstrøm (2017, no pagination) developed such an artificial intelligence called Frank in 2017: “FRANK is a contemporary oracle that gives personal guidance regarding existential dilemmas.”[4] Here FRANK is used as a tool of solidarity. Users receive openly formulated advice, which is not provided as omniscience but as providence to be interpreted and questions the conventional rational cost/benefit paradigm of AI research with its open-ended knowledge transfer.

4 Available at: <https://www.ceciliefalkenstrom.com/ai-frank/>.

At the same time, FRANK shows a “hidden rationality in what might seem as a highly ambiguous response” (Falkenstrøm, 2017, no pagination) in contrast to a value-creating AI, FRANK creates a new way of thinking that is explicitly differentiated from a logic of exploitation. This could be an approach for an alternative use of data that does not deny the political, but shuts itself off from one-dimensional logic. This could be called Data Dadaism.

This is by no means irresponsible play in the face of the apocalypse but an access point play against the all-encompassing logic of exploitation. We can no longer win by omnipotence. We have never been able to do that, only now, as white Europeans, do we have to realize that the technology that should lead us to an imaginary omniscience is paradoxical trickery. This trickery does not care about the injured pride of a natural legal entity; that’s why we, who are striving for a different world, should not do it, but strive for the data * algorithms we want.

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Artificial Affirmation: Common Sense to the Nth Power

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Drawing from Bernard Stiegler's concept of technology as the exteriorization of the human, this contribution suggests that common sense (with its component of good sense) as a faculty of judging by recognition finds its exteriorization in machine learning. While common sense finds its equivalent in the principle of reflection on the one hand and in the practice of matching data with a model on the other hand, good sense is embodied by the algorithmic diagrams of Markov chains. Consequently, it is suggested that while these processes present a machinic form of Nietzsche's reactive forces, they turn into active ones in the moment of their dramatic upscaling, to be understood as the affirmation of common sense to the nth power.

1 The Demand for Machinic Powers of Recognition

What is common sense? What does it mean to apply common sense? According to Gilles Deleuze, to use common sense doesn't mean as much to think as it means to recognize. It is thinking only to the effect of identification: this is a window, this is a moon rock, this is racism. Following Stiegler's theory of exteriorization of the human in technology, I would like to suggest in this paper that it might be helpful to understand contemporary forms of artificial intelligence, meaning the machine learning methods, not just as an exteriorization of the faculty of common sense but also as its deep transformation into something new.

According to a recent study (Eckstein, et al., 2017, p. 2827), when a picture of a bathroom (see Figure 1) is shown to people who are posed the question of how many toothbrushes there are, most of them find one. Even though there are two of them. The other one, although it is technically more visible, is harder to notice, since it falls out of the usual scale of toothbrushes humans expect to see. Which is not at all the case in machine learning, since it is not necessarily bound by human scale or by convention, so it can find each toothbrush as easily as the other one. It is examples like this and others that suggest that if machine learning exteriorizes a specific human capacity than it is not just any kind of intelligence but common sense specifically. However, it must be stressed straight away that it doesn't merely simulate human common sense but actually pushes it to its limit and thus creates a common sense to the nth power. And, as I'd like to suggest, that is something quite different if not precisely the opposite.

Figure 1
Find the toothbrush

Needless to say, data is everywhere today, and at some point we even started to call it Big (Kitchin, 2014, no pagination). It turns out that since the 1980s, when the concept of an information society started to catch on, data turned from a mere component of digital ecology into the central industrial, scientific, and political resource, and the very element of our lives. The building of the first phase of the Square Kilometer Array is planned to begin in 2020. It is a system of telescopes 100 times more powerful than any of those existing at the moment (The SKA Project, 2019a, no pagination) which, if it reaches its second and target phase by the end of the 2030s, is expected to generate about as much data traffic each year as the entire internet in 2015 (The SKA Project, 2019b, no pagination). One cannot expect human beings to comb through the exascale volume of this data using their limited brains and eyes. Therefore, just as they scaled up their ability to hear immensely by inventing all sorts of radars and sonars and recording and distribution devices, the challenge of interpreting Big Data is to be answered through upscaling the human thought processes by way of machine learning.

2 Technology as Supplement

If we are to claim that machine learning exteriorizes common sense, we need to understand the concept of exteriorization. Bernard Stiegler derives this concept from Derrida's notion of supplement. This was, in its turn, developed in order to transcend the oppositions between interior and exterior, subject and object, or living and dead, specifically in relation of writing to memory. In Derrida's understanding (1967), writing and memory supplement each other, or, in other words, memory becomes what it is only in so far as it is exteriorized first in the technology of writing. Stiegler (1998, pp. 152-153) pushes this notion further claiming that "A 'prosthesis' does not supplement something, does not replace what would have been there before it and would have been lost: it is added … The prosthesis is not a mere extension of the human body; it is the constitution of this body qua 'human' (the quotation marks belong to the constitution). It is not a 'means' for the human but its end."

With Stiegler (1998), we can think of technology as the prosthesis of an organ or a limb that wasn't originally there. For many people, the prosthetic nature of technology reveals itself, for example, when they leave home without a phone (or keys, or a handbag, …). It is the feeling of missing something essential, and although it is probably not painful, it formally resembles the so-called phantom pain felt by people in limbs they have lost. Following Stiegler's notion (2014, p. 5) of general organology, technology can be understood as the logic of organs, since that is how they operate as one assumes them or relies on them. It might be tempting to say that the cell phone is mirrored in our mind like some kind of ghost organ, but that would only reinstate the opposition between inside and outside that was to be abolished in the first place. So it is important to realize there is no mirroring, there is only supplementation. Be it phone or handbag, those technologies become fully and objectively what they are only in so far as they are being grasped subjectively which is a process that never ends. There is always the matching yet never the match. This doesn't mean we have to get rid of the notions of interior and exterior but we have to understand them as mere byproducts of this never-ceasing supplementation. We can, therefore, talk about the processes of interiorization and exteriorization. We exteriorize our communication faculties in the technology of the phone, and in turn interiorize this technology in that feeling of the bodily organ, let alone by reordering the common world around this new fact. And in a similar vein, I would like to suggest that what we are seeing in the technologies of machine learning is the exteriorization of common sense.

3 Human Good Sense and Common Sense

In Difference and Repetition, Deleuze criticizes the dogmatic image of thought for its assumption that thought has a natural affinity with truth, i.e. the dogmatic assumption that thinking and thinker want truth and truth is something virtuous. He is referring to the philosophy of representation and its understanding of differences in terms of prior categories, meaning that the truth it conceives is the truth of recognition. Or, in other words, that to recognize is to think (Deleuze, 1994). The thought modelled on recognition is there to dissuade us from the trespassing of certain limits or actually to prevent us because 1) it is not useful (meaning that utility of knowledge lies in its capability to predict), 2) it is bad (meaning that life is supposed to be virtuous), 3) it is impossible (meaning there is nothing to be seen or thought beyond the truth) (Deleuze, 2002). This dogmatic image of thought is enacted by the collaboration of two capacities: *common sense* and *good sense*. Deleuze (1994, p. 226) says that "Common sense [is] defined subjectively by the supposed identity of a Self which provided the unity and ground of all the faculties (the same object may be seen, touched, remembered, imagined or conceived), and objectively by the identity of whatever object served as a focus for all the faculties."

Common sense assures me that there is a match between what is inside me and what is outside me. In this way, the difference is subordinated to identity. Things are different because they fall into different categories. They are different precisely in not being identical or the same. *Good sense* – that is what everyone with good intentions has. To have a good sense is to know one's way around what is there. Thus, when I see A, it is B that shall occur to me (where B may be all the memories that resemble A). This way, the good sense maintains the identity of the object in space and time, it allows us to say it is "this" or "that," which is a way of saying that good sense provides hierarchies. "Good sense and common sense each refer to the other, each reflect the other and constitute one half of the orthodoxy. In view of this reciprocity and double reflection we can define common sense by the process of recognition and good sense by the process of prediction." (Deleuze, 1994, pp. 226, 292). This way, good sense and common sense converge in providing stability to thought. Together they constitute what "everyone knows," *sensus communis* as the knowledge of the community.

If we were to compare the dogmatic image of thought to a classic shape sorting toy, good sense would provide the shapes and their relationships, while common sense would guarantee the match between an object and a hole. However, in real life things do not always match, recognition is often insufficient, and for Deleuze (1994), just as for Nietzsche (1989) before him, to follow common sense and to exclude that which doesn't fit because it is new, unusual, weird or illogical means to oppose life itself. So to go beyond the dogmatic image of thought one must affirm life by facing the disturbing things that force one to think, because "is it when we do not recognize, when we have difficulty in recognizing, that we truly think" (Deleuze, 1994, p. 138), that we discover and invent new forms of life.

4 Principle of Reflection

I'd like to argue that the forms of artificial intelligence known as machine learning exteriorize common sense and in doing so they transform it. Already from the performative nature of the programming code, one can say that the computer transcends representational thought (i.e. thought modelled on recognition). We can say that the code as a series of calculations or commands (which is, in effect, the same thing) is a machinic embodiment of Austin's illocutionary acts: I promise, I agree, I dare you. It is not as important what they mean as what they do. They enact something. And in a similar vein, code points to that which begins existing only after we compile it and run it. At the same time, it must be stressed that this enactive power of code comes from no hidden capacities but, to the contrary, from its utter transparency: there can be nothing in the code that would not be reflected in the machine that runs it – Galloway (2006, no pagination) calls it the *principle of reflection*. It means that the code with its structure of commands and data must rigorously reflect the underlying structure of technical implementation. According to Massumi (2002, p. 137) "Digital technologies in fact have a remarkably weak connection to the virtual, by virtue of the enormous power of their systematization of the possible." In other words, in the computer, everything is actual. This will lead me to consider the code as a reactive force, but I shall explain that in due time. For now, it suffices to say that because the computation strictly adheres to a match between the code and the actual implementation of the

Turing machine that runs it, the principle of reflection could be seen as a low-level instance of the exteriorization of the capacity that provides identity, meaning the capacity we call common sense. And because of the fractal nature of computation, meaning the peculiar capacity of the computer as a whole to function as its own part, we can find the principle of reflection not just within its elementary processes like the compilation but also in the top-tier applications eventually reaching the most convoluted instances of machine learning.

5 Machinic Common Sense and Good Sense

When we talk of AI, there are two main paradigms to discern: so-called Good Old Fashioned Artificial Intelligence (GOFAI) and machine learning (ML). It is pattern recognition in both cases, but in the former, the patterns are pre-recognized, determined by the human programmers, while in the latter recognition of patterns is partially or entirely autonomous (in supervised or unsupervised learning respectively). It is the difference between symbolic deduction and statistical induction. Instead of applying "innate ideas" of GOFAI, ML builds up its capacity to recognize through a more or less passive synthesis. By recognition, classification or recommendation as a prediction of association, prediction of category, prediction of number or sets of numbers (weather forecast, day traffic, market demand, etc.) is meant. But to prevent further anthropomorphization of the advancements in artificial intelligence, it is important to realize that what we are dealing with in machine learning is, as Adrian Mackenzie (2017, p. 46) says "finding a mathematical function that could have generated the data and optimizing the search for that function as much as possible."

Now to the question of, in which way does machine learning exteriorize common sense. While for a human, according to Bergson (1991, p. 208), "to perceive consists in condensing enormous periods of an infinitely diluted existence into a few more differentiated moments of an intenser life, and thus summing up a very long history", a machine learns by creating a model of either statistical induction or as a system of weights by backpropagation through the layers of a neural network. This means that for a machine, just as for a human, "To perceive means to immobilize" (Bergson, 1991, p. 208). Or, in other words, to assume identity. So just like human common sense articulates the generality of each object by comparing it to what it already knows, machine learning recognizes and sorts objects. When Foucault claims that common sense is the capability to recognize the similar, "the exactly alike and the least similar – the greatest and the smallest, the brightest and the darkest" (Foucault, 1998, p. 357), one can already assume the machinic exteriorization of these processes in searching for optimum, e.g. local minima of functions.

Human recognition may be defined by the harmonious exercise of all the faculties upon a supposed same object: the same object may be seen, touched, remembered, imagined or conceived. No doubt each faculty – perception, memory, imagination, understanding – has its own particular given and its own style, its peculiar way of acting upon the given. An object is recognized, however, when one faculty locates it as identical to that of another, or rather when all the faculties together relate their given and relate themselves to a form of identity in the object (Deleuze, 1994, p. 133). According to Bryant (2008, p. 86) "For Deleuze, common sense does not refer to basic know-how that all sensible people have, but rather the conditions under which such a claim to know-how is possible. This condition manifests itself in the form of an unspecified unity and identity on the part of the subject and an unspecified identity on the part of the object." With regard to ML, we find the exteriorization of common sense in the matching of the data model embodied by a neural network and the data.

On the other hand, “Good sense is based upon a synthesis of time” (Deleuze, 1994, p. 225). In other words, good sense is that which provides the immanent logic of association: when I see a lion I expect danger. The lion in itself and the danger in itself are not as relevant here as the relationship between them. The exteriorization of good sense in machine learning would then correspond diagrammatically to the weighted relationships between layers of neural networks that can be described mathematically by Markov chains, that is, “a stochastic model describing a sequence of possible events in which the probability of each event depends only on the state attained in the previous event” or, as Mackenzie suggests, “A Markov chain is a way to constrain the choice of random samples to follow particular paths.” So one can say that by creating for itself the Markov chains the machine acquires a habit of recognition and the ability of prediction, or its own form of common sense and good sense. Assuming the argument of technological supplementation holds, the prosthetization of common sense by machine learning means that while in its first instance the ML resembles common sense, in the last, fully affirmed instance it becomes something else.

6 Machinic Common Sense as a Reactive Force

Machinic common sense becomes something else as we move from the individual steps as the atoms of calculation to light-speed processing of immense volumes of data, which, I believe, could be characterized as artificial affirmation. This assumption is rooted in Nietzsche's concept (1989) of active and reactive forces. A reactive force is everything that separates a force from what it can do. Nietzsche (1989) calls it law as it expresses the triumph of the weak over the strong. It's a triumph of reaction over action when a force is separated from what it can do and becomes reactive. There are many forms of reactive forces beside law: representation, ressentiment, religion, morality and … common sense. The active force, on the other hand, is every force which goes to the limit of its power (Deleuze, 2002, p. 58-59). It is a force which affirms its difference, which makes its difference an object of enjoyment and affirmation (Deleuze, 2002, p. 61) as the eternal return raises the simulacrum to the highest power, the "nth" power. However, the "nth" power does not pass through varying degrees of participation (second, third, …), but rather is immediately affirmed of chaos itself in order to constitute the highest power.

Common sense is a reactive force because it embodies a law (i.e. to be identified as a toothbrush it must be this shape), meaning the ground of any prediction. And we can immediately see this reactivity of common sense both on the level of code with its principle or reflection since it is not just actual but also void of any ambiguity and on the level of machine learning, at least in the first instance, as its aim is mere recognition. So how come there could be an affirmation, albeit artificial, if both the code and the ML application are reactive in principle? Deleuze (2002, p. 66) asks this very question: "An active force separated from what it can do by reactive force becomes reactive. But does not this reactive force, in its own way, go to the limit of what it can do? If active force, being separated, becomes reactive, does not, conversely, reactive force, as that which separates, become active?" And he goes on expounding the ambivalence in the heart of reactive forces as he shows on the example of a religious or a sick man that the reactive force itself, when pushed to its limit, can become active (the separation from what we can do brought about by sickness can engender an insight, a new resolve, a weakness can sometimes transform into power). But to quote from 'Genealogy of Morals' (Nietzsche, 1989, p. 33): "Human history would be altogether too stupid a thing without the spirit that the impotent have introduced into it." Here we can recognize an ambivalence important to Nietzsche (1989): all the forces whose reactive character he exposes are, a few lines or pages later, admitted to fascinate him, to be sublime because of the perspective they open up for us and because of the disturbing will to power to which they bear witness. They separate us from our power but at the same time they give us another power. They bring about new feelings and teach us new ways of being affected.

7 Machinic Common Sense as an Active Force

The spirit brought about by the impotence of reactive forces finds its reincarnation in computer with its all too narrow focus on well-defined tasks yet processing them with breathtaking speed. It is much like an idiot savant as it embodies the elementary, simple and actual form of common sense by automating statistical induction. The catch is that as soon as we push this artificial common sense to its limit by scaling up the computational power to the order we have seen in the recent decade, something new emerges: a common sense to the nth power.

There are methods how to design an antenna when NASA needs to produce unusual radiation patterns (Hornby, et al., 2006) or how to design an aeroplane section that is as light and as strong as possible (Airbus, 2016), but it is both time and labour-intensive. However, if we amplify what is basically a trial-and-error process with the help of generative algorithms a new kind of design practice emerges. Amplifying a common sense to the nth power can suddenly lead even to unexpected aesthetic qualities. Which is all the more surprising as one doesn't expect aesthetic considerations when one exercises common sense. Yet that is what happens when it is affirmed by considerable computational capacities. Because, as Foucault (1996, p. 35) reminds us, an affirmation "is not related to the limit as black to white, the prohibited to the lawful, the outside to the inside, or as the open area of a building to its enclosed spaces. Rather, their relationship takes the form of a spiral which no simple infraction can exhaust."

The automation has never been a mere delegation or substitution of human capacities; if anything else, this is already suggested by Stiegler's concept of prosthetization. But it is with the ML that we see most clearly that automation is not just a simple substitution, mechanization of a task, but, provided there is an intense enough upscaling, one can see it is a transformation so radical that it merits to be called affirmative.

So the question is now what are we going to do facing this amplified image of the dogmatic image of thought. Machine learning is prosthesis of an organ we never had; we have had common sense but not common sense to the nth power. And as this exteriorization of common sense unfolds, it immediately begets the question what is to be the result of the interiorization of machine learning. What are we to become as soon we interiorize the common sense to the nth power.

Looking for an answer to this question is as futile as it is exciting. There are examples that can inspire such excitement and I think the most exciting are those that come with a solution to the problem we didn't know we had. Like training machine learning to adopt a capacity a human beekeeper would never ever imagine she could have.[1] So when it comes to the future of thought, one can speculate on the grounds of a comparison to the photographic camera as it has exteriorized naive representation by painting in the 19th century. And just like there is not much sense in competing with the camera (apart from the hyperrealism) it is even clearer that there is no rea-

1 It's been said that a human looking for a queen bee involves a disruption of the normal life cycle of the hive, causing significant stress to the bees inhabiting it, but whether there is a queen or not in the hive, can be discerned with the help of machine learning from the sounds the beehive produces (Inês, et al., 2018).

son to compete with machine learning. Just like the calculator didn't supplant mathematicians but only took over the boring parts of their job, and the camera didn't supplant painters only took away the point of realistic representation and opened the field of painting into fabulous explosion of new forms of painting. So if we assume that the power of art lies in its capability to provide answers to unknown questions than the examples such as the one with the beehive would suggest the convergence of science-technology complex with art as it comes with solutions to problems we didn't know we had. But should such liberation of creative thought be eventually the case or not, I guess it is never too soon to ask, with Deleuze, what it means to think beyond common sense or to truly think.

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Arizona Accident: An Introduction to Simple, Complicated, and Complex Systems in the Example of One Event

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A tragic collision between an Uber company vehicle and Mrs. Elaine Herzberg, which happened last year in March in Tempe, Arizona, is remarkable not only because it marks the first fatal accident between a self-driving car and a human. Just as interesting, or perhaps even more so is the fact that it was precisely recorded via the monitoring apparatuses of the vehicle. Outputs of the record provide materials for a criminal investigation of the event and the publically announced ones became important sources for this contribution. If the aim of the official investigation carried out by the competent authorities is to find the accident's culprit, this contribution does not focus on looking for justice. Rather it is [re]searching the event as an initial moment to reassess excessively rigid contemporary rules and conventions into more complex ones, the adoption of which due to dissemination of computational technologies is becoming inevitable as was the accident itself.

> “To really appreciate architecture, you may even need to commit a murder. Architecture is defined by the actions it witnesses as much as by the enclosure of its walls. Murder in the Street differs from Murder in the Cathedral in the same way as love in the street differs from the Street of Love. Radically.” (Tschumi, 1976-77)

1 Introduction

Architecture and the events for which it serves as a venue are another means of expression of that same space. The space which is a domain defined through its architectural framing based on a certain set of rules, and through its occupancy it enables freedom of movement and realization of specific living needs. On the one hand it is countable, organizeable, or firmly defineable, on the other hand it is open to diversity, changeability and the liveliness of what can happen within it. Architectural and urban design include both of these opposing sides and thematize a search for relationships between them. Between static and dynamic, closeness and openess, control and freedom ... In recent decades such ambivalent space has been problematized by computerization and digitalization which pervades more and more fields of human activity. Through new computation tools and techniques it is possible to calculate precisely with dynamic values and their variables which were almost ungraspable before, or to dynamize originally static spatial organizations and forms. The common denominator, which creates such emerging fields of possibilities, is complexity or multiplicity (on the problem of multiplicity in urbanism see Kopec, 2017). This contribution is an attempt to unfold the problematics of complexity in the example of one event and to touch on some paradoxes which, despite our efforts to achieve it, still persist into the post-digital present. In a time when the borders between machine and human are bluring the accident revealing their collision is more than interesting.

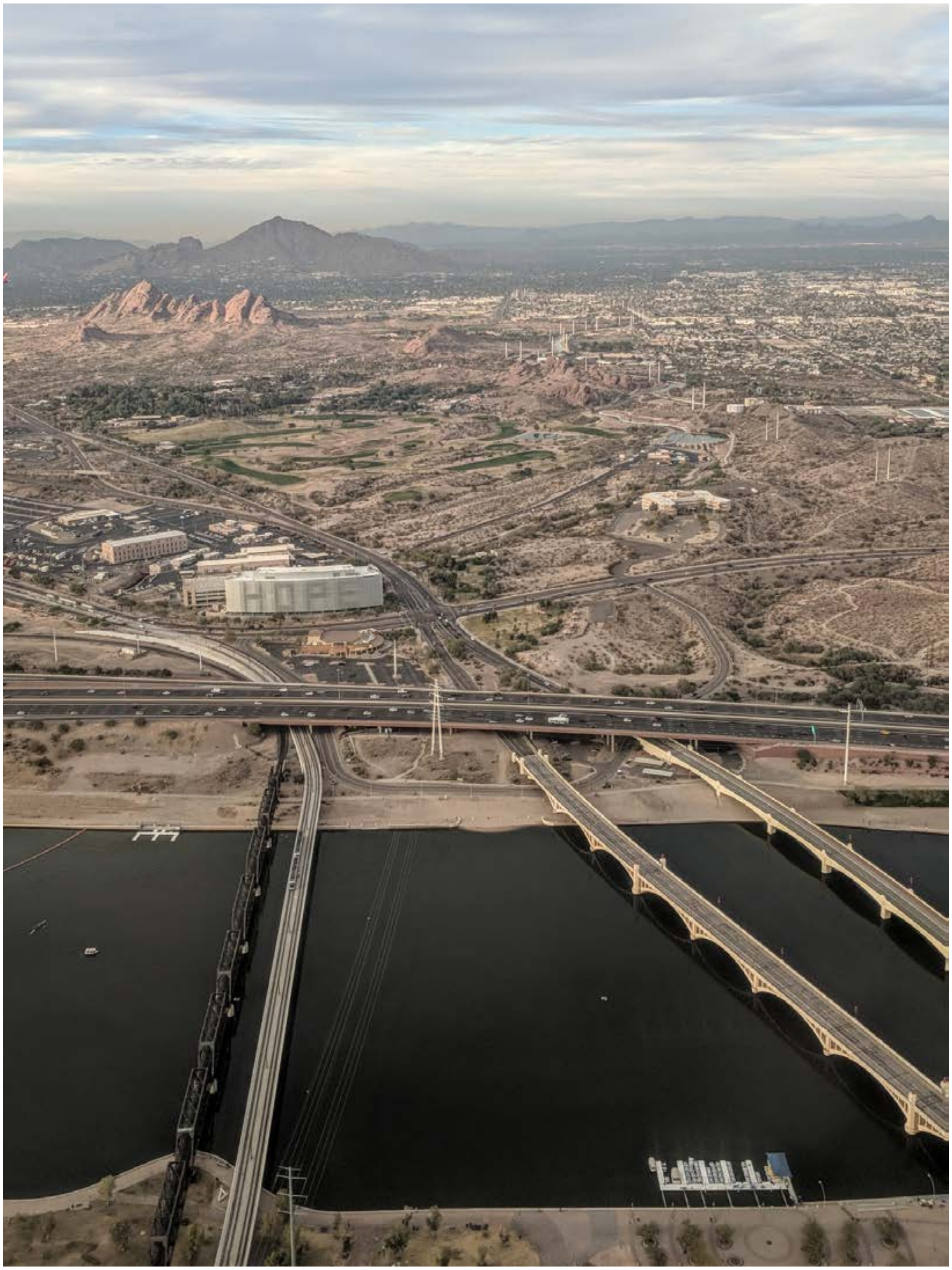

Figure 1
The landscape of the event. The area where the collision occurred is approximately in the middle of the aerial photograph

2 Simple Facts

On Sunday, March 18th 2018 at approximately 9:58 PM an Uber car operating with a self-driving system in computer control mode struck a pedestrian who walked across Mill Avenue in the city of Tempe, Arizona near Phoenix. 49-year-old Elaine Herzberg died as a result of the injuries, 44-year-old backup safety driver Rafaela Vasquez was not injured. Given the fact that the vehicle was equipped with many recording and computational devices, the accident was documented in unusual detail. The event was summarized in the preliminary investigation report (NTSB, 2018), several camera records, and media reports which made the collision into a global affair.

The City of Tempe provides the ideal conditions for testing the self-driving vehicles. There are wide roads, a flat terrain and a dry climate. The accident site is in between the Marquee Theater and the Tempe Town Lake, 360 feet (110 metres) to the south of the nearest crosswalk. The road is divided with a large separatory median into the opposite directions. The median containing shrubs and trees is divided by brick landscaping in the shape of an X, with signage from all sides of the brick median warning pedestrians to use the crosswalk.

The pedestrian walking a bicycle set out from this median at the spot of a warning sign which was just beyond the reach of public lighting. Mrs. Herzberg's bike was not lit up, and she was wearing dark clothing, poorly visible in the night. This is how she proceeded across a four-lane one-way road consisting of two left-turn lanes, two through lanes, and one bike lane. She did not look around to make sure a vehicle was not approaching.

The Volvo XC90, on the second lap of its evening test drive, had been operated with a self-driving system in computer control mode since 9:39 p.m. The vehicle was traveling at 43 mph (69,2 km/h), the posted speed limit on this part of the road was 45 mph (72,4 km/h). According to data obtained from the self-driving system, the system first registered radar and LIDAR observations about 6 seconds prior to impact. The system classified the pedestrian as an unknown object (a so called false positive object which does not pose any danger to the car), as a vehicle, and then as a bicycle with varying expectations of its future travel trajectory. At 1.3 seconds before impact, the self-driving system determined that an emergency braking maneuver was needed to mitigate a collision. Such a maneuver is not enabled while the vehicle is under computer control, to reduce the potential for erratic vehicle behavior. In that case the vehicle operator is relied on to intervene and take action, but the system wasn't designed to alert the operator. It is apparent from a record made by the camera with an inward-facing view of the vehicle operator, that the backup safety driver was checking the drive randomly. Her eyes were down cast toward the dashboard watching her smartphone on which she was streaming the TV show The Voice. The self-driving system data showed that the vehicle operator intervened less than a second before impact by engaging the steering wheel slightly clockwise unfortunately in the direction where the pedestrian was heading. The vehicle speed at impact was 39 mph (62,8 km/h). The operator began braking less than a second after the impact. Due to poor lighting where the pedestrian entered the roadway, it is not clear from a record made by the front camera, if the operator could have seen the pedestrian earlier than at the last moment, if she would have kept her eyes on the roadway (in order to check out this circumstance the police carried out a partial reconstruction of the event to investigate roadway lighting intensity). According to the preliminary report, although her toxicological specimens were not collected, the vehicle operator showed no signs of impairment at the time of the crash. On the contrary the toxicology test results for the pedestrian were positive for methamphetamine and marijuana. The accident is recorded as the first fatal collision involving a self-driving car. As a result, testing of Uber's self-driving vehicles was temporarily halted not only in the Phoenix area, but in San Francisco, Pittsburgh, and Toronto as well.

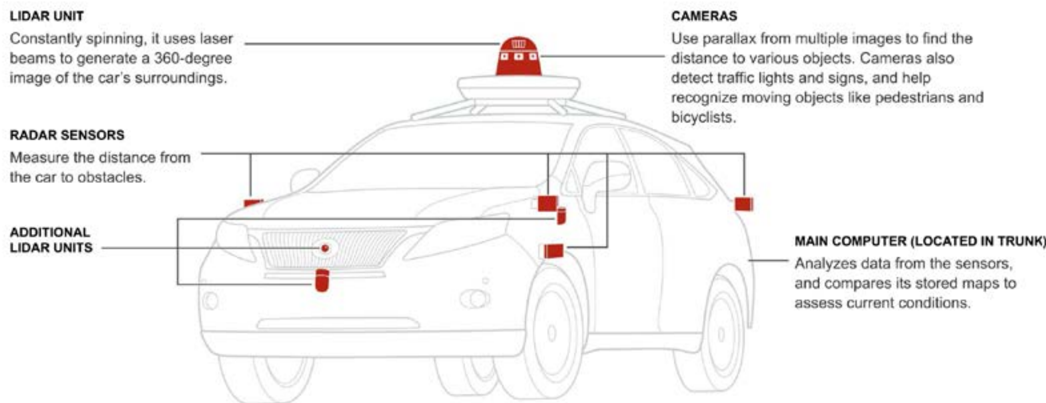

Figure 2
Gates, G., 2016. How a Self-Driving Car Works. The Car is a Lexus model modified by Google. Uber's sensing system uses similar technology.

3 Complications

A long time before the advent of digital technologies Russian physiologist Nicolai Bernstein compared the motor apparatus of man (and higher animals) and an artificial self-controlling device (Bernstein, 1957). He distinguished a clear biomechanical distinction between them in a number of degrees of freedom, which determines the ability to change the position of their body in space. To achieve the full moveability in the reference framework of Euclidean space it is necessary to have at least six degrees of freedom - three in the direction of movement along the x, y, z axes of the coordinate system and another three in the rotation around these coordinate axes. Through their combination it is possible to assume any position in a given space.

To demonstrate how the control of a movement is complicated by each other additional degree of freedom he described this problem through self-driving control of ship and car movement. In the case of the ship it is simple, it is enough to control of one degree of freedom only - that of the direction or course on the surface of the sea. This problem is easily and adequately solved by the use of an autopilot with compass. Compared to a ship, a car travels along a road of limited width which curves and bends determinate the need of another degree of freedom. To control this it is necessary to have a more sophisticated system of sensors. Bernstein mentions a receptor of the distance from the line and its signs, a receptor of the angle between the axis of the machine and the line and its signs, a receptor of the effective curvature of the road, a summing and analysing comparator system and a system of regulation to suppress the incidental swing of the machine to one or the other side of the course. Albeit there was no automat of a similar type constructed in the 1950s, the technical knowledge for the construction of receptors of all these types existed. The point of the difficulty lied in the organization of the central recording and computing system, due to the absence of sufficiently powerful computer technology. Hence Bernstein would not be surprised by the equipment of the self-driving vehicle tested in Tempe. Its self-driving system consisted of forward- and side-facing cameras, radars, LIDAR, navigation sensors, and a computing and data storage unit integrated into the vehicle was not too far from his assumptions. (In addition the vehicle was equipped with an aftermarket camera system that was mounted in the windshield and rear window and that provided additional front and rear videos, along with an inward-facing view of the vehicle operator. In total, ten camera views were recorded over the course of the entire trip.) It seems to be difficult how many devices are necessary to control one more degree of freedom. But how simple is such a system in comparison to our body!

Degrees of freedom of the human body, like bodies of the other vertebrates, are mediated through the joints. Their number is given by the shape (some joints enable more than one degree of freedom), the muscles ensure their moveability. With regard to a total number of 230 joint connections 244 degrees of freedom are mentioned. Beside these anatomical degrees of freedom (DOFs), the human body is blessed with neurophysiological DOFs (multiple motoneurons synapsing on the same muscle) or with kinematic DOFs (different trajectories, velocities, and accelerations achieve the same goal) as well which are essential for architecture. If we consider their possible combinations, human beings are able to perform movements in an almost limitless number of ways without doing any of them in the same manner repeatedly. Bernstein established this enormous number of degrees of freedom of the moving organ; the fundamental problem of the motor control theory. Based on these he defined the co-ordination of a movement as the process of mastering redundant degrees of freedom of the moving organ. In other words, its conversion to a controllable system.

From two different sides, the effort to achieve complexity on the one hand and the reduction of acquired intricacy to realize the intended act on the other, we arrive at the same - the system of rules and their (un)control. Of course the social or cultural norms aquired by humans are more complicated than the traffic rules organizing self-driving vehicles. As Greg Lynn mentioned (Lynn, Vaško and Kopec, 2019): "Sidewalks are harder than streets. Since streets have signs and lights, having a car drive itself is much simpler than having a robot walk on the sidewalk with people ... I designed doors and I've thought about the space on both sides of the door, but I never really thought about the intricate dance of how people go through a door together." Such customs differ not only in different situations and occasions but as well as in diverse local and global communities and societies and of course in various cities, districts, or countries. These are not intended to set down the only correct manner, but rather define a range of what is socially, ecologically, or economically acceptable. Such limits are not fixed, but they are changing based on emerging precedents. One of them could be considered the accident in Tempe, if it was really unprecedented in something. But was it really so?

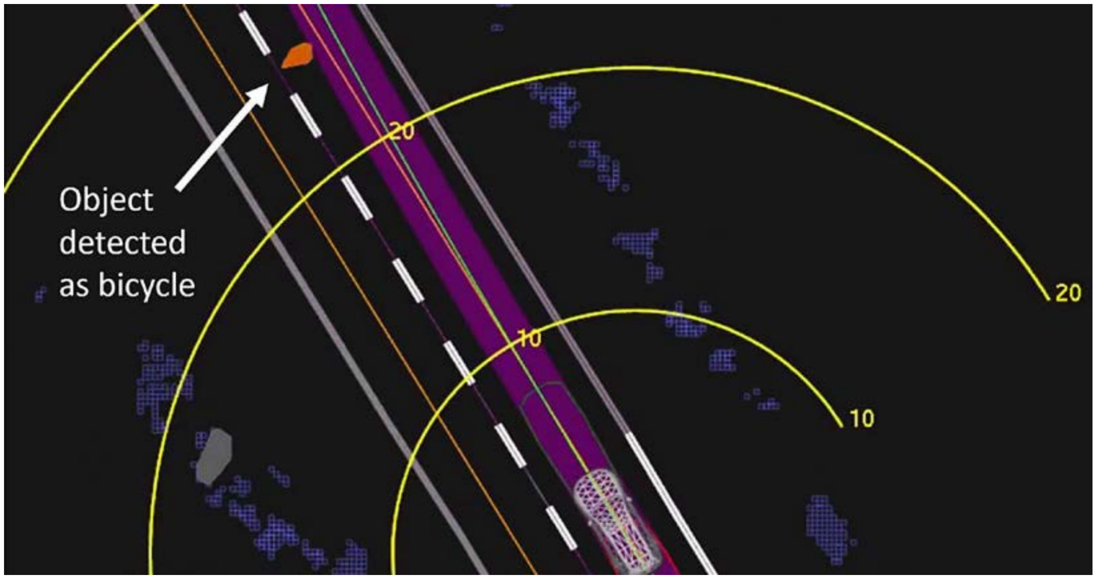

Figure 3
View of the self-driving system data playback at about 1.3 seconds before impact, when the system determined an emergency braking maneuver would be needed to mitigate a collision. Yellow bands are shown in meters ahead. Orange lines show the center of mapped travel lanes. The purple shaded area shows the path the vehicle traveled, with the green line showing the center of that path.

4 Complexities

A simple system is easy to understand and control, for example according to such mechanism the police investigate the accident. It is represented by a set of rules, regulations, standards or norms effective in a given situation in time and space. On its basis it is possible to find the culprit of the accident and to punish him. Complicated and complex systems don't tend to such clear results, because these don't work with the only one but with the many. An indicator of the difference between complicated and complex systems is the fact of how they react to emerging, unpredictable situations or even if they are able to co-create such a coincidence. The behavior of a complicated system is limited to predictable steps, the evaluation of which, from an enormous amount of input data and its subsequent combinations and iterations goes beyond a simple system. This is how computing systems work and through them algorithms or simulations. On the contrary, the behavior of a complex system cannot be accurately predicted. In a given situation it is possible to define the properties of its parts, as well as the relations of these parts to the whole, but the whole escapes the exact definition, it is constantly changing. This is how weather, diseases, economy, unplanned settlements, movements of lifeless matter or growth and life cycles of organisms can be understood. All these complex systems are capable of adapting to unexpected situations (meaning adaptability based on acting and reacting, emerging and vanishing, creating generations or cycles). Sanford Kwinter called such behaviour emerging wildness. (Kwinter, 2008; for more information about complex systems check the website of the Santa Fe Institute in New Mexico which is focused on complexity theory studies since 1984, https://www.santafe.edu).

Let us look at some of the unpredictable moments that occured during the tragic event in Tempe in the case of the self-driving vehicle; I mean the moment at which the system wasn't able to evaluate an unknown object on the road. At first it was evaluated incorrectly as a false positive object which doesn't mean any danger to the car. Up to 1.3 seconds before the collision, the self-driving system newly evaluated the danger of collision and the necessity of an emergency braking maneuver to mitigate it. But such a maneuver wasn't possible due to the prevention of erratic behavior of the vehicle operated under computer control. We can say that the self-driving system wasn't able to solve any of these unexpected situations, because it acted predictably according to pre-programmed rules that did not include such a possibility. On the contrary, the pedestrian behaved very unpredictably during the whole event. She walked across the roadway from the spot, which was unexpected for the self-driving system and the backup safety driver too, in addition she appeared unexpectedly from the shadows of the roadway lighting at the last moment before the collision took place. Unpredictably, she did not look around before she entered the roadway and when she crossed it, her gaze was turned away from the approaching vehicle as if she had not noticed that she was crossing the thoroughfare. Moreover, if her behaviour was impaired by drugs, it could not be predictable by nature (see Witt, 1971). Therefore, the only moment of an effort to get the situation under control from the side of the involved humans was the operator's attempt to avert the accident, however too late.

Figure 4
The accident site and its architecture and landscaping

5 Preliminary Conclusion

If the pedestrian really wasn't visible until the last moment, the accident still would have probably occurred even in the case the car would have been conventionally driven by a human driver. It seems that nothing really unprecedented happened during the accident. The complicated self-driving system failed to respond to an unexpected complex (accidental) situation, and none of the involved humans were able to reverse their unpredictable behavior to get the situation under control. In other words, the machine set up probably did not err more than a human driver would do in the moment, however its preparedness to solve such a complex situation still has considerable gaps, which to overcome would require more than just respecting the current traffic rules in Arizona. It will be necessary to include some degree of coincidence, despite the paradox that in achieving the randomness inherent in human action, we will start to turn back; machines will suddenly be as unreliable as humans.

However, from the position of architecture, there is one striking circumstance related to the whole event. Except the absence of relations between humans and the machine leading to their individual failures, the architectural scene of the tragic accident has also completely failed. I mean, above all, the architecture and landscaping of the road median. Although it is an officially inaccessible area, at first glance it looks like a part of public space. The brick landscaping in the X shape, which intersects the surface of the median planted with several shrubs and trees, really looks like a sidewalk, even seemingly made on site of the popular desire lines. And this feeling would not change even if an entry ban was installed on all of the accesses from the roadway, referring pedestrians to use the nearby crosswalk. The fact that the pedestrian was shortening her path just along part of this pavement could be a serious enough argument to charge the architecture of the site with involvement in the accident. The architecture of the public space constituting the scene of the event has given up all of its possible relational meanings – to navigate, communicate, or create meeting places – and has become a mere decoration of the utilitarian transportation solution.

For a happy coincidence the term 'serendipity' is used which refers to the story of a Persian fairy tale in which the princes were always making discoveries, by accident and sagacity, of things which they were not in quest of. Serendipity means an unexpected discovery or more precisely the ability to make such an unexpected discovery. The opposite of serendipity could be the 'Swiss cheese model'. This term from the field of risk management refers to slices of Emmental cheese stacked side by side, whose mass is perforated with holes. If the holes in these slices are adjacent, a risk at the beginning may result in irreversible losses at the end. The Arizona accident would be not only a precedent, but serendipity as well if the self-driving system averted it. However, it is just another model of Swiss cheese whose irreversible passage has already begun thanks to the architecture of the site of this unfortunate event.

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The Uselessness of Big Brother

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Keywords

Big Brother
Orwell
Medium
Telescreen
Digital device
Hierarchy
Dividuum
Anthropomorphization
Technology

This paper presents three arguments opposing the usage of the 'Big Brother' narrative, which is used for describing current surveillance (or tracking) practices in the digital environment. Instead, it is argued, that the Big Brother narrative is an insufficient and misleading concept which – however ingenious the original Orwell story may be – might hide the complex and more or less autonomous technological dynamics of non-human actors, bringing us to the point of fighting against a fictional image of our own.

It is almost incredible that the fictional figure of *Big Brother* still plays an important role in describing today's technological shift (Botsman, 2017). No doubt this is certainly caused by the brilliant and captivating novelty by George Orwell in 'Nineteen Eighty-Four' (2000) where such a figure was introduced in 1949. Despite this unprecedented social and cultural impact and with all due respect to Orwell's mastery, I would like to propose that we think of *Big Brother* as nothing more than a lazy doorman in an old-fashioned institution or factory who is (perhaps) watching us. Moreover, I would suggest that *Big Brother* is not only useless in describing today's digital landscape, but such a theoretical practice may also be risky.

In support of the claim above I will construct in the following chapters three arguments based on the analysis of the crucial parts of both 'Orwell's medium' and today's digital medium in respect of their consequences to the social order, self-perception, power, and vice versa.

1 The Medium of Big Brother

Although Alan Turing introduced his mathematical model of computation in 1936 and the very first Turing-complete computer was completed in 1945 and moreover, the theory of cybernetics was developed in 1948, there is no indication that the *telescreen*, an ubiquitous medium in *Oceania*, was digital and as such gifted the ability to process its inputs more or less autonomously in any way. On the contrary, it seems that the *telescreen* was derived from common mediums of the time (1949) such as the television and the telephone, however inventively.

Winston, the main character in *Nineteen Eighty-Four*, was faced with a medium described as such

> The telescreen received and transmitted simultaneously. Any sound that Winston made, above the level of a very low whisper, would be picked up by it, moreover, so long as he remained within the field of vision which the metal plaque commanded, he could be seen as well as heard. There was of course no way of knowing whether you were being watched at any given moment. How often, or on what system, the Thought Police plugged in on any individual wire was guesswork. It was even conceivable that they watched everybody all the time. But at any rate they could plug in your wire whenever they wanted to. (Orwell, 2000, p.5)

Even if the reader, along with Winston, is left in doubt about a system of watching, the word watching is crucial here. Today's digital medium has little in common with watching, however it can process image or video. There are no eyes behind it, and the processing of images is rather the automatic processing of text or characters and as such it is better to describe the process of surveillance using the word *tracking* here.

Today *Big Brother* is not watching us but rather *Big Brother* is capable of tracking. That's for sure, if any *Big Brother* exists at all. I will leave this question open considering the next chapters and will try to suggest the answer at the end of this paper. There are other differences to be considered before we can jump to any conclusions.

2 The Uselessness of Hierarchy

There is no doubt that the social order in *Oceania* was strictly hierarchical (Orwell, 2000, p. 249). At the top of the pyramid was *Big Brother* (Orwell, 2000, p. 262), the lower level was constituted by the *Inner Party*, under this level was the *Outer Party*, and the base was made up of the *prolets*. This structure plays an important role here in two ways. The first, more fundamental, is the question of computational power within the hierarchical organisation and within so called free-scale networks on the contrary.

According to an analysis made by John H. Miller and Scott E. Page in their 'Complex Adaptive Systems' (2007, pp. 204 - 206), via a hierarchical type of organisation at most 6,25% of all possible given (mathematical) problems can be solved (calculated). This is not that much, I would say. This calculation is based on the simplified and general hierarchical model consisting of three nodes with binary (boolean) functions (*3n2bH* – three nodes, two bits, hierarchical). Moreover, the 6,25% figure is the upper bound of any *3n2bH* organisation (with specific decision rules defined) (Miller and Page, 2007, p. 206). On the contrary, in the case of scale-free networks, rather visible in the real world and the 'in-between' of digital devices, the solvability of given problems is defined by the power law (Miller and Page, 2007, pp. 154 -155) and the internal network structure. The simplest network of three nodes can establish up to 6 connections and 16 possible configurations. The structure of scale-free networks is substantially more powerful in problem solving than the hierarchical one.

As I've pointed out above, thanks to its analog character, there has to be someone behind the *telescreen* who is watching (even if the video can be recorded, the analog time to watch it is required). *Big Brother* is watching *Inner Party*, *Inner Party* is watching *Outer Party* and *Outer Party* is apparently no longer able to watch *prolets*.

This description draws an excellent comparison between the *telescreen* and today's digital environment. If the 'problem' to be solved is to keep the existing hierarchical order forever (Orwell, 2000, p. 273), the *telescreen* would not help. Moreover, the question is, if the order of the hierarchical organisation, with its poor capability to 'solve problems' is desired to be kept by anyone who longs for power. I don't believe so.

Based on this conclusion, one may say, that the hierarchical organisation is the lapsus. On the other hand, we can still witness the tension to establish a strict hierarchy all around. Nevertheless, one more thing can be mentioned disputing the superimposition of *Big Brother's* order being superimposed over the present. The transition between the models of disciplinary society, society of sovereignty and the most recent model of society of control during the last century as it was described by Gilles Deleuze in his 'Postscript on the Societies of Control' (1992).

Deleuze situates the full transition to the society of sovereignty (from the disciplinary society – the environments of enclosure where '[t]he individual never ceases passing from one closed environment to another' (Deleuze, 1992, p. 3)) after World War II and describes this by a few differences such as "to tax rather than to organize production, to rule on death rather than to administer life" (Deleuze, 1992, p. 3). However, the novel *Nineteen Eighty-Four* is situated at the end of the twentieth century, George Orwell wrote it not long after WWII was over and it seems that he has made a brilliant introspection into his own time and social order, to the transition between disciplinary society and the society of sovereignty. Nowadays we experience rather the model of society of control – 'ultrarapid forms of free-floating control that replaced the old disciplines operating in the time frame of a closed system' (Deleuze, 1992, p. 4).

In *Oceania*, the production has only one goal, to keep the existing order forever. The method of doing so was warfare (Orwell, 2000, p. 239). In addition, the lives of each *Party* member, or proles were not administered in any way at all, life was rather ruled by the ideology of the *Party* and the threat of vaporisation hung over every *Oceania* citizen constantly. On the contrary the citizen (maybe the netizen) of the society of control lives in

> [...] a city where one would be able to leave one's apartment, one's street, one's neighborhood, thanks to one's (dividual) electronic card that raises a given barrier; but the card could just as easily be rejected on a given day or between certain hours; what counts is not the barrier but the computer that tracks each person's position-licit or illicit-and effects a universal modulation. (Deleuze, 1992, p. 7)

It could be such a different behaviour when Winston tries to hide himself from the *telescreen* behind the corner that envisions the line between the foundations of the aforementioned orders.

3 The Uselessness of Individuum

What is also very important here, is the assumption of the individuum throughout Orwell's story. The system would rather vaporize the people than to carefully construct the living conditions to adjust their behaviour. The explanation we can see again through the difference between the 'old-fashioned' models of society and the society of control described by Deleuze as such:

> The numerical language of control is made of codes that mark access to information or reject it. We no longer find ourselves dealing with the mass/individual pair. Individuals have become "dividuals," and masses, samples, data, markets, or "banks." (Deleuze, 1992, p. 5)

Winston has a number – 6079. In Deleuze's words, "the number or administrative numeration that indicates his or her position within a mass" (Deleuze, 1992, p. 5). Winston's number is an identification of the individual in the 'central database' of the *Party* and as such he has to be led to obedience (Orwell, 2000, p.286). The experience of the 21st century is a rather 'free-float' control and the digital medium plays an important role in this. The *telescreen* was designed to control subjects by subjects. On the contrary, the digital device is designed to control objects by objects. Faced with the digital medium there is no subject, no individual anymore. Everything is divided into attributes, parameters, or features, and their relationships. No matter what the entity it is. There is no difference between the figure and the background anymore, everything plays a role, and everything counts.

Winston has nothing expect his own life. His own individuality to care about and to retain. Even if the "[p]ower is in tearing human minds to pieces and putting them together again in new shapes of your own choosing" (Orwell, 2000, p.336), it is still the individual who has to be disassembled and re-assembled again.

In the 21st century each of us has many accounts to care about. Not only privacy matters to our lives. We need e-mails, bank accounts, clouds, social sites, chats and all of them are constantly at risk of being lost or falling prey to fraudulence. And all of them are parts of our own and constitute our 'dividuality' at the same time.

In the words of Gerald Raunig from his excellent analysis 'Dividuum: Machinic Capitalism and Molecular Revolution' (2016, p.192): "[n]othing is related to the whole, multiplicity moves with singularities. Nothing is partition, limiting, and detaching the parts."

4 The Uselessness of Anthropomorphization

Even if the figure of *Big Brother* is fictional in the sense it being a character of a fictional story, its fictionality is doubled altogether. The second level of its fiction is that *Big Brother* is never present in the story. It is just a symbol. The anthropomorphization of a non-human system. Although, this 'trick' can be useful to maintain the hierarchical order and to system deification in *Oceania*, the present should be freed of such trickery.

As Eliana Herera-Vega pointed out in her recent study (2015, p.25): "the anthropocentric theories of technology cannot fully apprehend the mode of functioning that current technology has, neither can it fully understand the risks that it entails." She argued, based on theories of technological determinism and critical realism, that "[i]n the place formerly occupied by human intentionality and because of the (n) time consideration that belongs in the making of complex technologies, human intentionality has to cope with the autonomous and unexplored field of technological agency." (Herera-Vega, 2015, p. 32).

Raunig (2016, p.101) explains "[e]nvisioning the dividual machinization of social relationships as individual petrification is marked by the hierarchy of the therapeutic situation, by profound gender stereotypes, but also by the classically humanist preconception that the human person stands at the center of all relations."

Herera-Vega shows the risk of the anthropomorphization of technology using the example of the Deepwater Horizon oil spill in 2010 as a consequence of misunderstanding technology as something that is fully operated by human agents. Incomprehension of the fact that technological agency, economic system, and a level of organisation at BP autonomously played its own role in this disaster. Raunig (2016, p. 107) goes further and by the analysis of the 'dividuum' concludes human agency as a floating part of the machine and as such generates qualitatively new dependencies (Raunig, 2016, p. 108) which had to go unnoticed by Orwell's story.

To sum up, anthropomorphization of the present practices of surveillance based on digital technology lead us not only to theoretical incomprehension but also to the blindspot from where we cannot fully forecast the risk that it entails. *Big Brother* must not be given space in the contemporary technological narrative.

5 The Uselessness of Big Brother

Through the arguments above I did not want to express that the *Big Brother* narrative is useless because no tracking or surveillance practice exists at all. That would not be the truth (Christl and Spiekermann, 2016, pp. 76). I also did not want to say that Orwell's story is not an important text of euro-atlantic culture. This would also not be the truth. What I wanted to express is that the *Big Brother* narrative is far from capable of describing the nature of complex and interconnected structures established by contemporary digital technologies. Facing these technologies we are not 'Winstons' anymore and our behaviour and approach should be adjusted based on this fact. Moreover, using the *Big Brother* narrative nowadays is very risky because it leads us to the wrong theoretical and practical point of view. The power of human agency should be seen in the process of establishing new, improbable connections between the nodes derived from its features which are more likely rather than maintaining the status quo based on sentiment.

> “Enclosures are molds, distinct castings, but controls are a modulation, like a self-deforming cast that will continuously change from one moment to the other, or like a sieve whose mesh will transmute from point to point. (Deleuze, 1992, p. 4)

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How Generative Adversarial Networks (GANs) Changed the Way we Look at the World

Or the necessity of Visual Scepticism in the Post-truth Era

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This paper compares the manipulation of visual media before and after the rise of AI-generated synthetic media, taking the breakthrough of GANs (Generative Adversarial Networks) as an essential landmark. It evaluates the accessible tools and strategies for detecting manipulated visual media and the authentication of information. An argument that there is currently no viable technological solution for detecting synthetically produced media, that would reverse the state of visual scepticism, in which unrestricted access to information paradoxically leads to a new dark age of confusion and communication chaos. The solution, for now, lies in supporting critical thinking, engaging in offline public discussion and most importantly–familiarizing oneself with the production tools of synthetic media.

1 Introduction

Liberalisation and proliferation of image-production tools combined with advanced computational methods such as deep learning and artificial intelligence are causing the rapid expansion of AI-generated synthetic media circulating the Internet, including random fake information such as deepfakes and other purposely altered visuals. The high quality of AI-generated synthetic media makes it hard to evaluate the authenticity of portrayed information, its origin and trustworthiness. To rely on believing in what is seen is not enough, and incorporating new technological tools for validating the truth will be necessary. What does this mean for human visual perception, and how is this visual uncertainty going to influence the future of visual communication? As a society, we find ourselves in a very paradoxical situation when the credibility of data we produce rapidly devalues and the information revolution shifts to an era of visual scepticism and general disinformation.

2 Manipulation of the Visual Media Before GANs

2.1 Analogue Techniques and Cases

Recently, we have witnessed significant advances in artificial intelligence - neural networks capable of generating photorealistic human faces, animals, objects, or natural scenery (GANs - Generative Adversarial Networks) (Goodfellow, et al., 2014).

Concurrently with the academic AI research, there have appeared various grass-roots visuals-generating tools available online responsible for the spread of so-called deepfakes.[1] The popularity of GANs and free software for creating deepfakes have substantially opened up the possibility of manipulating video and audio to the general public, thereby challenging the existing methods of verifying the authenticity of audiovisual information.

1 Deepfake is an AI-based technology used to produce or alter video content so that it presents something that did not, in fact, occur. The term is named for a Reddit user known as Deepfakes who, in December 2017, used deep learning technology to edit the faces of celebrities onto people in pornographic video clips.

Every new media initially brings some level of initial insecurity and communication chaos with it. This temporary state of confusion is always fertile soil for various malicious attempts to manipulate information and reap the benefit from it. The fear of AI-generated synthetic media shares the same background in distrust in new technologies as was in the case for photography in the mid-19th century when multiple attempts to deceive the public with manipulated photography emerged. One such example is the case of Spirit Photography.

2.1.1 Spirit Photography

Spirit Photography was a successful forgery method created by William H. Mumler in the 1860s. Mumler tricked his customers into thinking he was able to catch and reveal the spirits of the dead in his photographs, turning this service into a profitable business. Looking at the photographs today, it is quite clear (to a person who is familiar with how photography development works) that he achieved this effect through a double exposure technique. He might have achieved this by inserting a previously prepared positive glass plate, featuring the image of the deceased, into the camera in front of a prepared sensitive glass plate, which was then used to photograph Mumler's client. The novelty of the photographic medium and limited access to information on the process of developing made it possible to manipulate people using this simple trick.

Figure 1
Unidentified elderly woman seated; three “spirits” in the background

As ownership of cameras grew in the 1880s, even more ghost photographers appeared taking advantage of wide-spread spiritualism and charlatanry in the society. These conditions were truly fertile soil for various scammers experimenting with the medium of photography.

2.1.2 Cottingley Fairies

One of the most famous photographic frauds is the Cottingley fairies hoax. In 1917 two young girls convinced the public that they took pictures of small fairies in their garden. Photographic experts examined the pictures and declared hem to be genuine. Spiritualists promoted them as proof of the existence of supernatural creatures, and despite criticism by sceptics, the pictures figured among the most widely recognized photographs in the world. It was only decades later, in the late 1970s, that the photos were definitively debunked. The fairies were, in fact, paper cutouts from the children’s book Princess Mary’s Gift Book and were held in place with hatpins (Magnússon, 2006).

Figure 2
Frances Griffiths
with Fairies

2.1.3 Tall-tale Postcards

While the previous two examples were made intentionally as a hoax, the case of Tall-tale Postcards we see that a novel visual technique can create misunderstanding in visual communication. The postcards were a relatively new messaging medium at the beginning of the 20th century. Since they were used in addition to sending holiday wishes as a surrogate for travel, the photographic images depicting a geographic location engendered a particular myth about that town or region - affirming the American myth of abundance (Wisconsin Historical Society, 2012). The specialities of the region were depicted in the postcards on a larger scale to stress their importance, which unfortunately led to the spread of legends about giant vegetables, giant frogs, and other monsters. To the untrained eye, not used to seeing composite images consisting of objects of a different scale, these photographs must have seemed reasonably real. However, the postcards were made just by skillfully cutting out portions of an image of a different scale, positioning it onto another photograph and re-shooting it.

Figure 3
Tall-tale Postcard:
Kickers without Frogs

2.1.4 Retouching History

The various post-process retouching techniques in photography allowed for altering visual documents and re-writing history backwards. Such visual censorship was wide-spread in the Soviet Union, especially during Joseph Stalin's political purges. A large group of photo retouchers cut Stalin's enemies out of supposedly documentary photographs. One certain candidate for erasure was Nikola Yezhov, a secret police official who oversaw Stalin's purges. Yezhov fell from Stalin's favour in 1939. Afterwards he was denounced, secretly arrested, tried in a secret court, and executed. Stalin's censors then removed Yezhov from the photographic record, including cutting him from a photograph in which he and Stalin take a walk next to a waterway. The photo retouchers removed Yezhov from the photo and inserted new water to cover up space where Yezhov would have been.

Figure 4
Nikolai Yezhov with Stalin and Molotov at the Moscow-Volga Canal Embankment

Stalin did the same with scores of party officials who had been photographed next to him at various events. Sometimes official censors had to retouch photographs over and over again as the list of political enemies grew longer. For example, in a photograph from the year 1929, Stalin is depicted with a group of three of his deputies (Nikolai Antipov, Sergei Kirov and Nikolai Shvernik). As each deputy fell out of his favour, they were clipped out of the photograph until only Stalin remained. (Blakemore, 2018)

At that time, the general public had no real possibilities how to authenticate the visual information they were given. Therefore it was easy for those in political power to spread only their version of reality. Propaganda was blooming, brains were being washed and soon enough, with the rise of mass-media, these practices were overruled by the more sophisticated practice of "public relations". Intentional manipulation with the masses, often employing retouching of photography, was used widely for both political and commercial purposes. The methods of retouching and altering visual media were known only to the privileged few, until the advent of personal computers and image-editing software.

2.2 Digital Manipulation

2.2.1 Adobe Photoshop

The Adobe program Photoshop, first released in 1990, caused extreme democratization of image-production tools, popularizing image manipulation that used to be reserved to professionals among self-educated amateur users. This gave the resources to retouch and manipulate photographs to practically everyone. The more people became familiar with Photoshop, the more retouching methods became known and hence, there was more significant awareness about image forgery and the manipulation of visual media. The fact that the name of the software began to be used as a verb "to photoshop" implies the popularity and general understanding of what the software was capable of achieving.

However, the prevalent habit of people noticing the so-called "wrong pixels" - the suspicion of a digitally altered photographic image based solely on observing an area of unusual looking pixels - often leads to groundless distrust in visual media. Such areas of pixels can be just a result of lousy JPEG compression of an image and have nothing to do with photo-manipulation. This example tackles the complicated issue of visual scepticism that might have a significant influence on misinformation of the general public in the upcoming years, fueled primarily by the presence of synthetic media.

2.2.2 Methods for Detecting Digitally Manipulated Visual Media

There are established methods and tools for detecting the digital manipulation of images: from simple and obvious ones, accessible to anyone who has an Internet connection, to more sophisticated tools that require advanced knowledge of image forensics. If we exclude the professional tools and focus on the strategies that are available for the general public, most of them have to rely on a service of large companies, such as Google. Image-reverse search - searching the Internet and finding images similar to the uploaded one - is one handy tool thanks to which many fake news stories were debunked. Every uploaded image circulating the Internet leaves a trace of its context and date of upload, which makes it possible to compare the suspicious image with everything that has been uploaded and indexed so far.

Checking the photo's metadata is another way to attain more information about the origin of a visual medium, such as the time, location and camera used. Photo metadata allows the information to be transported with an image file, in a way that can be understood by other software, hardware, and end-users, regardless of its format. It is possible to check them locally or upload an image to one of the online metadata visualising tools such as Get-Metadata[2] (not limited to visual media). Metadata can, however, be modified or erased, thus leaving little space for trust in them.

2 Available at: < https://www.get-metadata.com>.

In order to be able to verify the origin of an image, the Canon company released an authentication algorithm in Canon digital cameras in 2007. Using the OSK-E3 toolkit (special software and a smart card), one could reliably check the originality of photos by reading the Original Decision Data (ODD) digital signature, which was recorded in the EXIF block of JPG files and contained encrypted information about the date and coordinates of the survey. The service was widely used by criminologists and lawyers, as well as to prepare evidence for presentation in court. Three years later, it was hacked by the famous Russian hacker Dmitry Sklyarov, who proved it is possible to calculate a digital signature for any camera using a known KeyID/BoardID/KBoardID triplet (Sklyarov, 2010). Photographs with a forged digital signature were published afterwards to demonstrate the act of hacking, including pictures of the Soviet flag on the moon, a UFO over Mount Fuji, Stalin with an iPhone and the Statue of Liberty holding a sickle.

Figure 5
The Statue of Liberty With a Sickle in her Hand

2.3 Verifying Online Video Content

Web 2.0 has brought user-generated content online causing difficulties for researchers and journalists to verify the sources of information, especially from social networks and file-sharing platforms, such as YouTube, Facebook, and Twitter.

It is much harder to authenticate a video than static imagery. It involves more necessary steps and a time-consuming tracking of the source. For example, Google image-reverse search does not support video files. The workaround would include taking several screenshots of the video and searching for a match with them instead. However, the chances that the screenshots were taken from the same video timeframes are small. Using an automated tool that captures the best thumbnails from a video can increase the chance of better image-reverse search results. In 2014 Amnesty International launched a video verification tool called YouTube Data Viewer[3] to help human rights activists and journalists in the process of video verification. The tool enables non-technical users to enter the URL of a YouTube video and automatically extract the correct upload time and all thumbnails associated with the video. These two elements are essential when verifying a YouTube video, as it is difficult to gather from YouTube.

3 Available at: <https://citizenevidence.amnestyusa.org/>.

Nevertheless, using digital tools to verify materials is innately limited, as algorithms can be fooled. The analysis of video manipulation on YouTube made by the channel SmarterEveryDay shows visual strategies that can confuse YouTube algorithms and avoid detection of generated video content (SmarterEveryDay, 2019). Strategies include mirroring the content, zooming in or out, changing the colour scheme, adding an animated layer of indistinguishable “snow”, and so on. For humans, being able to spot these subtle changes means having a good eye for detail and high concentration - skills associated mostly with special agents and detectives. Without an extra dose of creativity, patience, and plenty of time, it is hard to say whether video content is genuine or generated, original, or manipulated. Videos are much more complex and layered visual media, compared to photography, which makes their validation significantly more difficult.

There are concerns about online videos becoming the primary source of information for Internet users - especially the fake news videos being shared on social networks and reposted numerous times. It is still not a common habit to check the source and validity of reposted content on social media. For the purpose of journalism education, UNESCO published “Journalism, fake news & disinformation: a handbook for journalism education and training” in 2018 (Ireton and Posetti, 2018). The handbook’s primary goal is to support critical thinking about “how digital technology and social platforms are conduits of information disorder; to fight back against disinformation and misinformation through media and information literacy; for fact-checking 101; social media verification and combating online abuse (UNESCO, 2018, no pagination). The European Journalism Centre under its Emergency Journalism initiative published a similar useful guide “The Verification Handbook” (Silverman et al., 2013), which among others offers guidelines on how to verify online videos.

2.4 Synthetic Media

Previous chapters discussed ways of manipulation within visual media before the rise of AI-generated synthetic media. The term “synthetic media” indicates the artificial origin of image (or video, or sound, or text) synthesis made (or entirely generated) by neural networks - especially GANs (Generative Adversarial Networks).

This advancement has already had significant consequences on the transparency of visual communication and the authentication of visual information. We are currently witnessing a significant paradigm shift in media creation and consumption that will likely change the equation for entire industries. The concept of genuineness and authenticity in media content is being redefined along the way, as we see more and more examples of creative uses of synthetic media. In particular, since the first mostly malicious uses of such partially or fully-generated content (for example celebrity porn deepfakes) started to be balanced with actually useful examples like synthetic dubbing or synthetic news reporters, the understanding of what's truth entered a vast grey zone of ambiguity. What does it mean to see something in the era of AI-generated synthetic media? We can no longer rely on something that has been a self-evident truth for thousands of years: believing that "what we see is real." The visual communication, which relied so far mostly on a historical consensus and collective visual experience of the world outside, has to face new compromised reality and we will have to re-evaluate the out-dated definitions of manipulation, disinformation and mal-information. At the same time, we will need to find new strategies for detecting fake information and authenticating the real ones, or alternatively, we may try to embrace state of permanent visual scepticism.

3 Evolution of Visual Synthetic Media

Since the beginning of 2018, we have seen a high number of visual fakes causing distrust in visual media and a legitimate fear of (dis)information warfare (Schwartz, 2018). The first wave of newspaper articles covering the topic of AI-generated visual fakes were mostly fear-spreading click-baits with shocking titles such as “What do we do about deepfakes videos?” (Chivers, 2019), or “A reason to despair about the digital future: Deepfakes” (Editorial Board of the Washington Post, 2019) and offering just a little information about the actual technology. Especially at the beginning of the year 2019, much of tech news focused on trend predictions, using deepfakes as the biggest game-changer in the coming year. Many included bold statements about a nightmare scenario in which a world leader could appear to declare war or spread damaging propaganda, with potentially devastating results: “2019 will be the year that a malicious ‘deepfake’ video sparks a geopolitical incident” (Wall, 2019). Later the narrative changed to general apprehension from realization that deepfakes positioned us in post-truth times when everything becomes a matter of believing instead of knowing. An article at C|Net titled “Deepfakes may ruin the world. And they can come for you, too” tries to balance the alarming news with some reassuring facts; nevertheless, it ends with a philosophical question about the uncertain nature of truth: “But the ultimate threat of deepfakes is not how sophisticated they can get. It is how willingly the public will accept what’s fake for the truth -- or believe somebody’s false denial because who even knows what’s true anymore?” (Solsman, 2019).

However, some media dedicated more space to produce more in-depth reports explaining a broader range of currently available tools for altering or generating fake visual information (O’Sullivan, 2019). These kinds of reports opened up a general discussion about the future of synthetic media and the need for updating the laws on spreading and producing deepfakes, various deepfakes detection and authentication methods and serious concerns about the possible threat of a manipulated US presidential election in 2020. However, such discussion is predominantly spreading damaging fear and is often lacking any guidelines for the general public on how to approach the media critically in order not to get manipulated. It would be beneficial to include simple resistance strategies that everyone can use and thus de-escalate the panic of being powerless. In general, a helpful report on deepfakes and synthetic media could include these topics:

1. The awareness of manipulation techniques and general media literacy.
2. The basics of image-forensics strategies: which can still be applied to synthetic media and which are, on the contrary, not valid anymore.
3. A report on the latest research in the field of cryptography, detection, and authentication tools.
4. How AI-generated synthetic media are produced with tutorials on how to create new examples.[4]

4 This point might sound dubious and counteractive – sharing the knowledge with the general public might lead to an even more significant number of deepfakes produced. However, on the other hand, affiliation with the process of AI-generated synthetic media production intensifies the suspicion against possibly manipulated media and strengthens critical thinking.

The following examples are approaches to the production of synthetic media. Some originated from underground internet forums, some are parts of computer science research projects, and some are already becoming a regular asset of image-editing software. However difficult it might seem, the proliferation of tools for the production of synthetic media already made it possible for average computer-users to take part in experimenting with it.

3.1 Deepfakes

The beginning of 2018 was when deepfakes were established as a recognizable term. Since anonymous Reddit user with the nickname Deepfakes released FakeApp (a software tool kit that allowed anyone to make synthetic videos in which a neural network substitutes one person's face for another's), followed by Deepfacelabs software becoming freely accessible on GitHub, the Internet has seen a wide range of face-swap videos from fake celebrity porn videos to the face of actor Nicolas Cage in countless film scenes in which he never played. Celebrities and public figures happened to be victims of deepfake production for a simple reason: the large number of face photography necessary for training the algorithm to work correctly. This raises concerns about the potential of all the selfie photos circulating the Internet at the moment. Nevertheless, recent academic experiments have proven that fake synthetic visuals can be produced without a large dataset from a wide range of original input sources.

Figure 6
It Means Hope | Deepfakes Replacement

3.2 University Research

Several months before FakeApp, "Synthesizing Obama", a paper published by a research group at the University of Washington, showed that a neural network could create believable videos in which a person of interest appeared to be saying words that were spoken by someone else. The target video clip was made by morphing the facial area from a reference video according to new audio footage (Suwajanakorn, Seitz, and Kemelmacher-Shlizerman, 2017). For this case study, the researchers chose former US president Barack Obama, because of an abundance of consistent, forward-facing video footage from his presidential campaign in the public domain. Although the intentions might look malicious, the researchers Suwajanakorn, Seitz, and Kemelmacher-Shlizerman mention the practical uses of video synthesis for the future: “the ability to generate high-quality video from audio could significantly reduce the amount of bandwidth needed in video coding/transmission (…). For hearing-impaired people, video synthesis could enable lip-reading from over-the-phone audio. And digital humans are central to entertainment applications like film special effects and games.” (2017).

The evolution of video synthesis progresses very quickly, and within months researchers from Samsung AI Center, Moscow proved such talking head videos can be generated without a large dataset of one’s videos. Instead, researchers propose lengthy meta-learning on a large dataset of videos of random human faces, and after that, the model is able to frame few- and one-shot learning of neural talking head models of previously unseen people. The synthesis is based on using face landmark tracks extracted from a different video sequence of the same person and applying them onto a different person. (Zakharov et al., 2019).

The introduction of Generative Adversarial Networks - GANs (Goodfellow et al., 2014) accelerated experiments in video and image synthesis and is responsible for the massive increase in the quality of generated media. The novelty of this approach lies in two neural networks (generative and discriminative network) contesting one another - given a training set of photographs of cats, for example, it learns how to generate realistic-looking new photographs of cats. The generator’s training objective is to increase the error rate of the discriminative network, to “fool” the discriminator by generating new images that the discriminator thinks are not synthesized. In the last year, the applications of GANs have heightened significantly, gaining popularity outside of the science world, mostly in creative fields including fashion, advertising, and media production.

One of the best applications of GANs, that raised interest in experimenting with generative models outside of universities is StyleGAN, introduced by Nvidia researchers in December 2018 (Karras et al., 2018), and open-sourced in February 2019. The model was trained on the Flickr-Faces-HQ (FFHQ) dataset, and it contains 70,000 high-quality PNG images of human faces at 1024x1024 resolution (aligned and cropped). StyleGAN enables the intuitive, scale-specific control of image synthesis and, based on the dataset, is able to generate human faces, animals, cars, rainbows, living-rooms, or whatever else is in the training dataset. The website This Person Does Not Exist[5] is based on StyleGAN and over time shows how the quality of generated faces progresses.

5 Available at: <https://thispersondoesnotexist.com/>.

NVIDIA continued to push their research further and shortly after StyleGAN their research department introduced another viral model dubbed GauGAN (Park et al., 2019). GauGAN is able to generate hyper-realistic nature scenery based on simple hand-drawn segmentation maps, using a new conditional normalization method called SPatially-Adaptive (DE) normalization (SPADE). Although GauGAN's output is far from a perfect photo-representation of nature at the moment, it can surprise with advanced operations like adding reflections or changing the hue of the sky according to weather, which adds a more realistic feel to the scenes. These days, it is mostly used by artists to experiment with styles, but the day its outputs improves, it can cause a dramatic change to many industries that depend on the time-consuming production of visuals or the usage of stock-footage. Producing stock photos or skillfully photoshopping nature scenes to achieve a desired visual look is suddenly absurd, when it can be generated.

Figure 7
GauGAN

3.3 Synthetic Media Production Tools

The examples of synthetic media production mentioned in the previous chapters are not, in fact, very accessible for people without coding skills or a computer-science education background. NVIDIA published online demos[6] for StyleGAN and also GauGAN that users can interact with, but these demos do not allow for modification of the code. Being able to access the code, understand it and alter it, is an essential prerequisite to experiment with synthetic media and to create one's own content. This is, however, rapidly changing. Many new start-up companies are developing new products built on AI technologies, some of them explicitly focusing on building a bridge between the latest computer science research and non-programmers interested in incorporating AI-driven tools in their practice.

6 Available at: <https://www.nvidia.com/en-us/research/ai-playground/>.

Runway ML[7] is an application that works as an undemanding gateway to the number of pre-trained generative models within an interface similar to popular image-editing software. The possibility to train and upload one's own model was announced as a new feature that will be added in the following months. A stable community has grown around Runway ML already, including various creatives with no coding skills. The

7 Available at: <https://runwayml.com/>.

company's founder, Cristóbal Valenzuela, finds a historical parallel in Runway ML to the invention of the collapsible paint tube in the mid 1800s, which unleashed an explosion of creative innovation: "Suddenly artistic experimentation became accessible to creative individuals previously shut out by their lack of training and connection to master craftsmen, ushering in a democratic new era in art history."(Cristóbal Valenzuela, 2018). Runway ML has since become a valuable tool for workshops or in class-rooms, attracting more and more users every month.

With just a few clicks, or by using a handy plug-in in Photoshop, Runway ML makes it possible to execute incredible modifications to visual media (for instance enlarge an image's resolution, transfer a style from another image, erase parts of an image and automatically generate the missing parts, and many more) or generate synthesized visuals based on various inputs (such as text, segmentation maps, another image or by simply using the latent space of a StyleGAN model). Currently, we could compare the reach of this software to where Photoshop was at the beginning of the 1990s, but if it follows the same pattern of success, the consequences will be far more staggering. The wide accessibility of synthetic media production tools will make synthetic media a regular part of social media communication, and we should prepare for it before it happens.

4 Visual Scepticism

With synthetic media merging with other forms of communication, it will be harder, if not impossible, to separate the two. The main concern is the difficulty to evaluate the authenticity of information and thus maintain the transparency of (visual) communication. Are we going to develop a technological solution, or are we going to adjust to this situation by embracing visual uncertainty in some way? What would such a state of permanent visual scepticism look like and what effect would it have on our society?

The technological solution looks like the easiest one, but we do not have a reliable tool for authenticating information, nor for detecting fake information yet. There are multiple attempts to create a “deepfakes antivirus” besides some more obvious strategies for spotting generated content, but they quickly become outdated as synthetic media improve in quality.

4.1 Strategies for Detecting Synthetic Media (so far)

Generated fake videos with talking humans can easily be debunked based on the frequency of eye-blinking. The first deepfakes did not have natural blinking patterns - the blinking was either very regular or not there at all, while real humans blink in an irregular pattern. (Li et al., 2018) However, this flaw did not take long to fix, and soon enough, the synthesized videos showed people appearing to blink naturally. Another such example is looking for the person’s pulse in their face. This subtle change is invisible to a naked human eye, but with the use of the MIT Video Magnification tool, it is possible to spot whether there is a pulse or not (Wu et al., 2012). Deepfakes do not have heartbeat incorporated in the synthesis. The question is, for how long?

4.2 Detection and Authentication Tools

Instead of trying to detect deepfakes, some companies work on creating a tool that would prevent fake generated videos from spreading online. One of the ways an algorithm would recognize a synthesized video would be missing metadata or the lack of any record of origin. The company Amber Video proposes a tool, that would upload live recorded video instantly to a blockchain in small parts, which could serve as digital proof of authenticity. If someone doctors the video and re-uploads it online, the altered parts of the clip will be missing the recorded information in the blockchain.

It is not clear, how this would work in practice. Would such a tool be open for public use or would it be an expensive licenced product? Is it going to have a visible user interface, or is it going to run unnoticed somewhere in the background? Are we going to be provided with this service via large companies like Google or Facebook, and rely on their trustworthiness? Or should we think of our own strategies?

4.3 The Permanent State of Visual Scepticism

If we do not answer the questions mentioned above for ourselves, the situation might lead to some version of a dystopian scenario in which the information revolution leads paradoxically to the debilitation of the educated society. Free access to information online that helped spread knowledge and education on a global scale loses its validity if it is not clear what information is valid. Remaining in a permanent state of visual scepticism could be considered as a critical approach to information, but in the long term, it might impair the ability to accept something as truth without substantial proof of authenticity - which might not be accessible to everyone equally. The society might become divided into those who have access to authentication tools and those who are left out of the luxury of a technological solution. Such inequality could pose a considerable risk for the manipulation of a large part of society, an unseen level of propaganda. Another concern is building an ambivalent position towards news - accepting both possibilities of the information as being genuine and false - which could generate Orwellian doublespeak in visual form. Indifference towards information and social participation is undoubtedly the fast road to the next dark ages.

5 Conclusion

There are several problems concerning the future of synthetic media, and more research is needed to find proper solutions. Visual communication, which relied thus far mostly on a historical consensus and a collective visual experience, is facing a new compromised reality. In the future, it can only maintain its transparency, paradoxically, when joining forces with technology, which brought us to this dystopia in the first place. However, to rely more on additional proofs enabled by cryptography and data analysis instead carries the risk of manipulation and inequality, if it is not open-source and adequately controlled.

In general, advancements in machine learning and AI-technologies will pose much more questions than those mentioned in this text. From the moral consequences of discriminating AI-driven algorithms deciding about human fate and biased training datasets, to the question of accessibility of AI tools - finding a way how to create a global discussion about these questions is crucial to re-evaluating the organisation of society, reviewing the concept of trust and control and re-imagining the future of information exchange.

Creating an open social discussion, however, is getting more and more difficult. Internet, as it began, used to be a free space for discussion, the exchange of ideas and information, connecting people across the globe. Internet, as it is today, generates separated users with individualised news feeds and tailor-made content based on their interests, which diminishes the chances to stumble across something unexpected, new and outside of their ideology bubble. The proposed first steps are to actively expose ourselves to opposing opinions and seek valuable first-hand information - preferably offline - as an addition to the online source of information. Even more importantly, becoming acquainted with new synthetic media production tools and contributing to its evolution is a great way to widen the available knowledge about it and to get rid of the counter-productive fear of deepfakes that the media is generating at the moment. The next steps are yet to be defined, however, to rely on someone else's definition instead takes away responsibility as well as self-sovereignty.

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