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Embodied Algorithmic Optimization

How Our Bodies are Becoming a Product of Code

Evolution itself is and has been a constant battle to create a better onset for each and every organism on this planet—from the earliest multicellular organisms to modern forms of intellectual life. Cells have found ways to solve problems of growth with strategies of maximizing cellular diffusion for energy consumption[1] and animals have developed patterns to prolong life and escape predators by blending in with nature or other defense mechanisms developed through natural selection. Biological evolution of individual species has been driven by reproduction and survival, instilling goals and yearnings to procreate and grow. That system continually evolves to regulate growth, increase diversity and complexity, and enhance its own resilience, adaptability, and sustainability.[2] Humans themselves have come a long way from their early beginnings. Naturalists and biologists like Darwin (mistakenly[3]) claimed that we are are driven by what he called the survival of the most adaptable. This is disputed and for example Dutch author and historian Rutger Bregman proclaims in his recent novel 'Humankind: A Hopeful History'[4] that it is rather the most kind and decent beings. If we listen today to the media buzz of companies like 'GOOP', 'FitBit', 'People Unlimited Inc.', and other ventures that deal with physical health and prolonging of life, the goal of evolution seems to be focused on those individuals living the longest, healthiest, and most optimized life, a definition that currently seems to take the lead in Western techno-capitalistic societies. And it fits the general belief system: Maximization is engrained in the core of everything and mainstream measures of progress are mostly based on technical developments and the endless increase in productivity. Everything seems possible and solvable by technology and financial leverage. So why stop at our own bodies especially when the rapid developments of technology and algorithms promise to hold the key to the long awaited desire to transform our bodies and make them eternal?

1 Kurzgesagt: In a Nutshell: How Large Can a Bacteria get? Life & Size 3, Youtube 2020.

2 Nowak, Martin: Evolutionary Dynamics—Exploring the Equations of Life, Cambridge 2006.

3 Darwin Correspondence Project: The evolution of a misquotation, https://www.darwinproject.ac.uk/evolution-misquotation (January 20, 2021).

4 Bregman, Rutger: Humankind—a hopeful history, London 2020.

Transhumanism or the Longing to Transform Our Bodies

The quest for immortality and longevity is neither new nor exotic: Throughout the history, people have searched for the elixir of life and retained a fascination in designing, shaping and optimizing their bodies through various means of potions or other science.[5] Today we are not looking for a single elixir of life anymore, but try to reverse or even stop aging through a multitude of different approaches. We are living in a decisive time where technology, medical science, and interconnected knowledge allows us to modify our bodies in dimensions never known before and push the human body to unchartered territories. "All the techniques of the artificial body that were once advanced medical experiments have steadily normalized. Even the doubling of the average life expectancy over the last century (with the greatest increases occurring in the poorest parts of the world, like Africa) is evidence of a whole new body. The human is simply not what it used to be."[6] These days there are tons of options available promising to prolong life and

5 The idea of creating living beings from inanimate materials can be found already in creation stories in Sumerian, Chinese, Jewish, Christian, and Muslim traditions. In Ancient Egypt for example it was common to use "various techniques such as masquerading, tattooing and mummifying as ways to fashion bodies and to preserve them from inevitable decay". (Velsinger, Antje: On Bodies and the Need to Appropriate Them. In: Hildebrandt, Paula; Evert, Kerstin; Peters, Sibylle; Schaub, Mirjam; Wildner, Kathrin; Ziemer, Gesa (Eds): Performing Citizenship. Performance Philosophy. Cham 2019, p. 77–89, here p. 77) During the Roman empire, techniques of care of the self were practices to aid one's ability to face any challenge and the goal of invulnerability has been ever-present. The ancient Greeks already had the idea of creating artificial humans, and in the famous myth of Pygmalion it eerily resembles a modern narrative for artificial companions: "[A] sculptor falls in love with the ivory statue of a woman he's made. He wishes that she would come to life, and the goddess Aphrodite grants his wish: her lips become warm and her body soft." (Voegeli, Fabian: Techniques of the Self in View of Potentiality, Belgrade 2015, p. 217) In our more recent history, practices of eugenics emerged through racially motivated ideology disguised as genealogy with the idea of improving the human species genetically, while singling out who can be optimized. Forms of eugenic practice have varied widely and the recently emerged vision of an evantropic body (Misseri, Lucas E.: Evantropia and Dysantropia. In A Possible New Stage in the History of Utopias. In: Olkusz, Ksenia (Ed.): More After More: Essays Commemorating the Five-Hundredth Anniversary of Thomas More's Utopia, Krakow 2016, p. 26–43, here p. 38) highlights the ultimate goal of immortality followed by eternal youth and the maximum use of our capacities.

6 Colomina, Beatriz; Wigley, Mark: are we human? notes on an archaeology of design, Zurich 2021, p. 224.

good health: Anti-aging therapies, health and fitness-tracking devices, technological implants or even cryonics, the process of freezing a human corpse or severed head at ultra-low temperatures with the speculative hope that resurrection may be possible in the future. In line with those developments the term 'Transhumanism' has been coined not too long ago with similar ideas in mind—to describe a state where humans overcome the limitations of their own body and eternity. With the help of technology and artificial intelligence (AI), our bodies could become smarter, less vulnerable to diseases, live longer, and potentially even become a transcendence machine that promises immortality. Belgian philosopher Mark Coeckelbergh for example describes transhumanist and posthumanist ideas concerning the body as a constant need of upgrades or humans risk remaining the slow and increasingly inefficient part of AI:

> Whereas transhumanists think we should move on to a new type of human being that is enhanced by means of science and technology, humanists defend the human as it is and stress the value and dignity of the human, which is said to be threatened by transhumanist science and philosophy. [...] Posthumanists such as Donna Haraway offer a vision in which living together with machines, and even merging with machines, is seen no longer as a threat or a nightmare, as in humanism, or as a transhumanist dream come true, but as a way in which ontological and political borders between humans and nonhumans can and should be crossed.[7]

Extremists and some tech personalities such as the American engineer Elon Musk or the inventor Ray Kurzweil even go as far as predicting AI Singularity: an algorithm that will supersede humans with its exponential growth rendering everything we have done until now and are currently doing insignificant.[8] Israeli historian Yuval Noah Harari writes in his book 'Homo Deus' about a world, in which humans no longer dominate but worship data and trust algorithms to make their decisions "going where no human has gone before—and where no human can follow".[9] Some even fear that machines with emergent intelligence have discernibly different goals and as we

7 Coeckelbergh, Mark: AI Ethics, Cambridge 2020, p. 47f.

8 Ito, Joichi: Resisting Reduction: A Manifesto, https://doi.org/10.21428/8f7503e4 (January 22, 2018).

9 Harari, Yuval Noah: Homo Deus: A Brief History of Tomorrow, London 2015, p. 393.

introduce machines into the system, they will not only augment individual humans but complex systems as a whole. On the contrary, there is plenty of potential to be optimistic about: While threatening human autonomy and agency, artificial intelligence and smart algorithms will amplify human effectiveness and positively contribute to broad public-health programs built around big amounts of data. They already do and will increase capabilities in tasks such as complex reasoning and learning, sophisticated analytics, visual acuity, speech recognition and language translation, augmenting human capacities and disrupting eons-old human activities.

Dataquakes & the Cult of Dataism

While we might not be aware of every use case, algorithms are more and more structuring our world and they are at the forefront of shaping and enhancing our current and future bodies. As we are becoming increasingly optimizable in surface and depth, modern self-tracking systems can not only measure our bodies and movements but can also mine data concerning our habits and whereabouts. Given the exponential growth of computer power and the availability of big data due to billions of smartphones, algorithms are at the core of producing, managing, analyzing and interpreting massive data sets—and interpreting us. We are generating an innumerable amount of data each and every day, and some researchers already speak of 'dataquakes.'[10]

As we are using services and devices that are increasingly generating private data—like blood pressure, sleep cycles, reproductive health status, and exact locations, to name a few—we are becoming more and more a transparent user who in return is being greeted by an algorithmically designed life. Our bodies inform the functioning of the systems we use and vice versa. And with all cameras in public places recognizing and labeling people as well as the rise of so-called smart city projects around the world, the AI NOW Report of 2019 notes that we are "consolidating power over civic life in the hands of for-profit technology companies, putting them in charge of managing critical resources and information."[11] With the sheer amount of data being collected paired with modern algorithms the real-life effects on our bodies in return become quite tangible: Identifying the perfect employee, correctly classify-

10 Alpaydin, Ethem: Machine Learning. The New AI, Cambridge 2016, p. 16.

11 Crawford, Kate et al.: AI Now 2019 Report, New York: AI Now Institute 2019, p. 11.

ing feelings of customers, or tracking student attentiveness in class[12] are just the beginning. While these development are mind-blowing on a technical level, they are also packed with a lot of social implications as Coeckelbergh puts it quite trenchantly:

> Darwin and Freud dethroned our beliefs of exceptionalism, our feelings of superiority, and our fantasies of control; today, artificial intelligence seems to deal yet another blow to humanity's self-image. If a machine can do this, what is left for us? What are we? Are we just machines? Are we inferior machines, with too many bugs?[13]

Tracking regimes that we would once have thought bizarre are slowly becoming normal,[14] challenging us to re-evaluate what normal means. And challenging us to adapt a new form of wariness towards the technology and algorithms we use. Even if we can assume that modern AI programs like the word-generating AI GPT-3[15] are today not only pretending a real understanding of a conversation like the 1964 computer program ELIZA[16] by the late German American computer scientist Joseph Weizenbaum did, the data the algorithm relies on is still prone to manipulation, racism and often sourced with dubious tactics. Corporations and state agencies often use communication networks and digital surveillance to collect huge amounts of information on the activities of everyone using digital services. Calculative devices transform the nature of human subjectivity, pushing at the limits of what can be read, analyzed and thought about[17] and with new forms of data aggregation come also more advanced forms of profiling human behavior, fueling the emergence of often poorly regulated business models and new forms of 'dataveillance'.

Because right now, data aggregation is often hidden in plain sight and just mentioned vaguely within the fine-print. Or did you know that you al-

12 Ibid., p. 50.

13 Coeckelbergh 2020, p. 13.

14 Wolf, Gary: The Data-Driven Life, https://www.nytimes.com/2010/05/02/magazine/02self-measurement-t.html (December 12, 2020).

15 Maldonado, Adran; Pistunovich, Natalie: GPT-3 Powers the Next Generation of Apps, https://openai.com/blog/gpt-3-apps/ (March 27, 2021).

16 See Wikipedia: ELIZA, https://en.wikipedia.org/wiki/ELIZA (March 05, 2021).

17 Amoore, Louise; Piotukh, Volha: Algorithmic Life, Oxford 2015, p. 37.

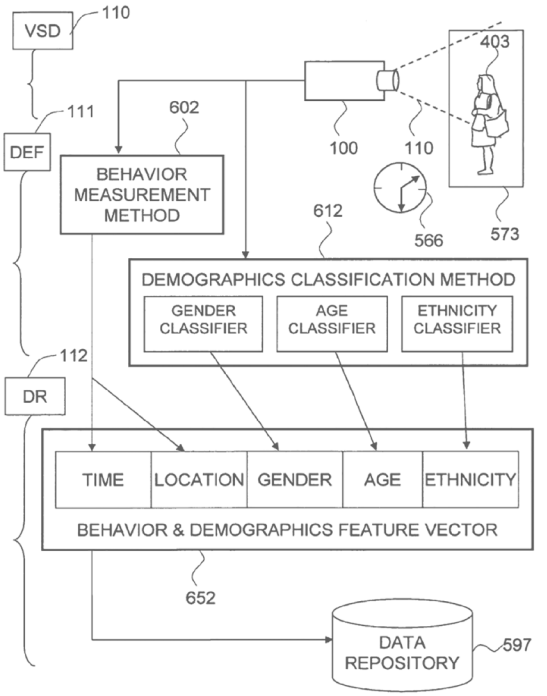


Figure 1—'Automatic detection and aggregation of demographics and behavior of people', a patent for a system that includes Automated Gender Recognition. Available at: Google Patents, https://patents.google.com/patent/US8351647B2/

lowed FitBit to collect and share even your female health with third parties,[18] that your outdoor activity gets uploaded into a global map where everyone can see exactly where people go actually running, swimming, or cycling,[19] or that racial and ethnic origins will be shared with others by the app Tinder?[20] A lot of companies and even governments seem to grab as much data as they can like in a modern age gold rush before legislation or citizen protests can actually catch up and make the act of doing so illegal. Sometimes it is mind-boggling how much data is collected and merged about a single person as French journalist Judith Duportail had to witness firsthand when she turned to Tinder asking what information has been collected about herself:[21] What she got was a collection of 800 pages of all of her activities using the app—including Facebook likes and friends, links to where her Instagram photos where taken, her education, the age-rank of men she was interested in, when and where every online conversation with every single one of her matches happened, and many other very private details.[22] In many cases, this information doesn't stay only with the company collecting it, but is being packaged neatly to sell it to whoever is interested in, mostly through middle men like data-brokers.

One of such data-broker companies was brought to light in 2017 by artist Joana Moll and the Tactical Tech collective, as they obtained one million online profiles from USDate, a U.S.-based company that trades dating profiles from all over the globe—for only 136 Euros! The batch of purchased profiles included "pictures (almost 5 million of them), usernames, e-mail addresses, nationality, gender, age and detailed personal information about all of the people who had created the profiles, such as their sexual orientation, interests, profession, thorough physical characteristics and personality

18 See FitBit: FitBit Privacy Policy, https://www.fitbit.com/global/us/legal/privacy-policy (November 18, 2020).

19 See for example Suunto 'Movescount' (https://www.movescount.com/map) or Strava 'Global Heatmap' (https://www.strava.com/heatmap).

20 See Tinder: Privacy Policy, https://policies.tinder.com/privacy/intl/en/ (January 17, 2021).

21 Duportail, Judith: I asked Tinder for my data., https://www.theguardian.com/technology/2017/sep/26/tinder-personal-data-dating-app-messages-hacked-sold (September 26, 2017).

22 Ibid.

traits."[23] If unlucky, such data is being used to feed systems like the in Figure 1 (**page 76**) depicted patent for 'Automated Gender Recognition' or other questionable undertakings like it happened with the purchase of Ancestry.com last year: The private equity firm Blackstone now owns the DNA data of 18 million people and is currently ramping up efforts to monetize the data amassed among the companies it owns.[24] But these two examples are not alone: Microsoft, IBM, Apple, Amazon, and Facebook, as well as a wide range of healthcare start-ups have all made data partnership agreements with healthcare organizations to gain access to health data for the training and development of AI-driven systems.[25]

The Code that Dictates Our Bodies

We are increasingly intertwined with algorithmic calculative devices as we consume information, inhabit space and relate to others and to the world around us. People we see and communicate with through our screens and networks are being altered and optimized, shifting our perception of how we see other humans—sometimes even shifting how we perceive ourselves. Norms and standards are being influenced by algorithmic alterations and even leading to change in our physical world as teenagers increasingly turn to plastic surgery in order to look like their alter egos online, just to mention one example. Louise Amoore, Professor of Political Geography at Durham University, and author Volha Piotukh sum up this current state of intertwined connection: "Just as being human may also be closely enmeshed with being algorithmic, these calculative devices also alter perception, filtering what one can see of big data landscapes, how one makes sense of what can be perceived."[26]

Like a horrifying prediction of the Black Mirror episode 'Nosedive'[27] turned into reality, Google's Sidewalk Labs[28] project even promoted the cre-

23 Moll, Joana: The Dating Brokers – An autopsy of online love, https://datadating.tacticaltech.org/viz (November 14, 2020).

24 Ponsford, Matthew: IS YOUR DNA DATA SAFE IN BLACKSTONE'S HANDS? https://neo.life/2021/01/is-your-dna-data-safe-in-blackstones-hands/ (January 28, 2021).

25 Crawford et al. 2019, p. 53.

26 Amoore; Piotukh 2015, p. 24.

27 See Nosedive, https://www.imdb.com/title/tt5497778/ (August 26, 2020).

28 See Sidewalk Labs, https://www.sidewalklabs.com/ (January 13, 2021).

ation of a Google-managed citizen credit score. Our bodies nearly cannot escape some sort of measurement, identification, and data generation driven by algorithms anymore and American journalist Rob Horning sums up this impossibility to hide: "Short of a total renunciation of the now routine conveniences of contemporary life and voluntary exile from the spaces where almost all social belonging and recognition takes place, you cannot escape."[29]

Officials in China have even gone a step further by not only using AI surveillance on the Uighur minority alone anymore, but slowly rolling it out for the entire population. With the help of a new 'health-code' they now even restrict access to certain areas if people are not living healthily. The code is implemented in most of the major Chinese transactional apps like AliPay (a payment platform) or WeChat (the number one app in China to do anything from blogging, instant messaging, ordering food, booking a flight, paying bills, etc.) and can only be obtained after the government has acquired your full name, ID and phone number. The code itself is then informed by a multitude of factors with most of them being produced by the app itself: The number of steps taken each day, the hours of sleep, or the proximity and time spent close to a Covid-19 positive person. It then adds the number of cigarettes smoked and the amount of alcohol consumed by scanning your shopping list when paying with the app[30] as well as the time spent playing video games through interconnected services.[31] Only with a green code you can then enter certain areas like public transport, public events, or even premises of bigger companies. Through that, personal data produced by our body in combination with algorithms is becoming a massive decentralized and panoramic power model informing the do's and don't of millions of people already today. The system not only investigates behavior—it steers it away from purchases and activities the government does not like, making people in a Foucauldian sense the object of information, not a subject of communication. The less obvious the mechanism, the more powerful the disciplinary function of surveillance.[32]

When we leave behind the notion of dystopian surveillance and focus on the benefits for human bodies, algorithms can achieve many long-sought

29 Horning, Rob: Hide and Seek—The Problem with Obfuscation, https://lareviewofbooks.org/article/hide-and-seek-the-problem-with-obfuscation/ (March 16, 2021).

30 Zhao, Yiran: [BigDataSur-COVID] When Health Code becomes Health Gradient: Safety or Social Control? https://data-activism.net/2020/10/bigdatasur-covid-when-health-code-becomes-health-gradient-safety-or-social-control-2/ (December 03, 2020).

31 Benjamin, Ruha: Race After Technology, New York 2019, p. 115.

32 Benjamin 2019, p. 181.

dreams concerning health and longevity. An AI developed by researchers at Houston Methodist Research Institute in Texas for example can already today diagnose a cancer risk 30 times faster than a human with 99 percent accuracy,[33] at the Beth Israel Deaconess Medical Center, an artificial intelligence is used to diagnose potentially deadly blood diseases at a very early stage,[34] the Framingham Heart Study used self-learning algorithms to predict future onset of Alzheimer's disease through automated linguistic analysis,[35] and AI is capable to predict schizophrenia or even diabetes years before it manifests in the body. Relating to recent events, a new study from Mount Sinai researchers even found out that wearable hardware can effectively predict a positive COVID-19 diagnosis up to a week before current PCR-based nasal swab tests.[36] Our bodies give away signals that can be read by algorithms and new technologies much better than humans have ever been able to. With bigger and better training sets, subtle nuances are already enough to give hints on ongoing problems in our body. Our breath changes with the level of stress, our iris changes with the activity of our brain, and our language changes with the status of our health. Advocates for AI like Poppy Crum, American neuroscientist at Dolby Laboratories, get very excited about these signs for a healthier future:

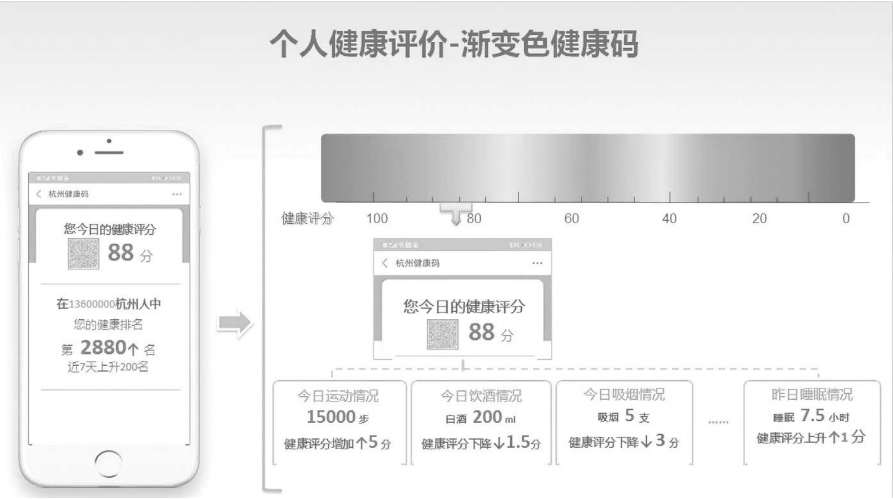
> I believe it is the era of the empath. And we are enabling the capabilities that true technological partners can bring to how we connect with each other and with our technology. If we recognize the power of becoming technological empaths we get this opportunity where technology can help us bridge the emotional and cognitive divide. [...] Imagine a high school counselor being able to realize, that an outwardly cheery student really was having a deeply hard time. [...] Or authorities

33 Griffiths, Sarah: This AI software can tell if you're at risk from cancer before symptoms appear, https://www.wired.co.uk/article/cancer-risk-ai-mammograms (February 03, 2021).

34 Daley, Sam: 32 Examples of AI in Healthcare That Will Make You Feel Better About the Future, https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare (February 17, 2021).

35 Eyigoz, Elif; Mathur, Sachin/Santamaria, Mar/Cecchi, Guillermo/Naylor, Melissa: Linguistic markers predict onset of Alzheimer's disease, https://doi.org/10.1016/j.eclinm.2020.100583 (March 20, 2021).

36 Etherington, Darrell: Mount Sinai study finds Apple Watch can predict COVID-19 diagnosis up to a week before testing, https://techcrunch.com/2021/02/09/mount-sinai-study-finds-apple-watch-can-predict-covid-19-diagnosis-up-to-a-week-before-testing/ (February 10, 2021).



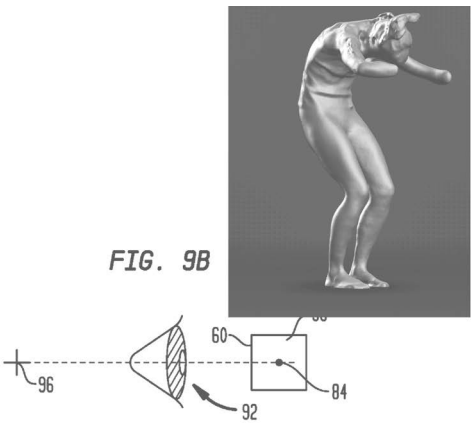


Figure 2—In this picture the individual health code value states a 88/100 grade corresponding to a green health code, calculated on a value resulting from the number of steps taken, the number of cigarettes smoked, the amount of alcohol assumed and the hours of sleep reached in one day by its owner. Available at: https://data-activism.net/2020/10/bigdatasur-covid-when-health-code-becomes-health-gradient-safety-or-social-control-2/

Figure 3—'Ideal Self #23—Naked Scanner', from the series 'Ideal Self' (2020) by Fabian Weiss.

> being able to know the difference between someone having a mental health crisis and a different type of aggression, and responding accordingly.[37]

Also in our everyday life, algorithms are more and more deployed to improve our lives. Through smartphones or wearable activity trackers, we are having a lot of options at hand to measure vital functions in order to gain insights into our personal wellbeing. The image on the last page (**Figure 3**) shows for example a 3D model of a human body created with Naked Labs' body scanner called 'Naked Scanner', where not only weight and body fat is being collected over a period of time, but different areas of the body and their extent can be compared and analyzed as well. But options of analyzation give also way to modification: It is not only our digital alter ego anymore that can be altered by algorithms (imitating speech, recreating body movements, applying filters, or swapping our face in real time)[38], but our physical bodies as well. Algorithms are being inscribed into our physicality and have already far more control over our bodies than we might believe. Online dating platforms (and their matching algorithms) have fundamentally changed people's day-to-day practices of sex and love and screening algorithms are deciding already today over who gets a phone contract, a bank account, a loan, an employment or even which court sentence. Chance is being replaced by the technique of probability which is only as good as the data it is being trained on, resulting in outcomes that are determined in the worst case by historical notions of bias, racism, and sexism. As nearly every detail of our lives—financial transactions, online search terms, real-world movement, communication and many more—gets logged, digital technologies extend the reach of this structural surveillance, making it persistent for some and nearly invisible to those with enough power to escape its gaze.[39]

37 TED: Technology that knows what you're feeling | Poppy Crum, Available at: https://www.youtube.com/watch?v=HW2SSoYtels (March 14, 2021), 09:40.

38 See for example Ockenden, Sasha: Skin Deep: Deep Fakes and Misinformation, https://medium.com/digital-diplomacy/skin-deep-deep-fakes-and-misinformation-3c2f-9cc59045 (December 16, 2020).

39 Benjamin 2019, p. 251.

More Than Colorblind: Imitating and Reinforcing Inequalities

The given consequences mostly reinforce power structures, inequalities or biases that are already preexistent in society. American sociologist Ruha Benjamin argues in her book 'Race After Technology' that algorithms even speed up and deepen discrimination while appearing neutral or benevolent. As the input for most algorithmic systems stems from historical data, it also carries the burden of our society—for example racism or chauvinism. The system doesn't have to be built to intentionally prefer certain outcomes, but a lot of algorithms do not work fairly just because of unconscious biases. Let's take for example the COMPAS system, an algorithm that informs judges based on a 137-point questionnaire filled out by arrested people over their likelihood of becoming reoffenders. "Seven criminogenic needs, or risk factors, are identified. These include 'educational-vocational-financial deficits and achievement skills,' 'antisocial and procriminal associates,' and 'familial-marital-dysfunctional relationship.' All of these measures are outcomes of poverty. It's positively Kafkaesque"[40] argues the American data journalism professor Meredith Broussard in her book 'Artificial Unintelligence'. As a result, black defendants were 77 percent more likely to be flagged as a higher risk of committing a future violent crime as journalist Julia Angwin uncovered in a report for ProPublica.

Algorithms are erecting new digital caste systems structured by inequalities that are not just colorblind: "When these technical codes move beyond the bounds of the carceral system, beyond labeling people as 'high' and 'low' risk criminals, when automated systems from employment, education, healthcare, and housing come to make decisions about people's deservedness for all kinds of opportunities."[41] Due to the fact that both programmers and datasets[42] are still predominantly stemming from Western countries, the flaws in the algorithms have far-reaching consequences for non-white users. The result can be simply as annoying as it happened to Asian-American blogger Joz Wang: Her (ironically Japanese) Nikon camera had a feature built in for detecting a blink of a person as a gesture for capturing a selfie. When being tested by herself, it was triggering all the time when she was looking at the

40 Broussard, Meredith: Artificial Unintelligence: How Computers Misunderstand the World, Cambridge 2018, p. 347.

41 Benjamin 2019, p. 25.

42 Most facial recognition algorithms for example are being trained on the ImageNet dataset that has an overwhelming majority of white faces.

camera as the software had been trained on Caucasian faces and therefore often falsely detected a blink with more narrow eyes.[43] Going further, there have been incidents where the picture sorting app Google Photos misrecognized a Black man's face as a gorilla when labeling images within categories. Even until 2018 and presumably today, the solution was not to fix the algorithm, but to simply ban the label 'gorilla' altogether,[44] a workaround and not a real solution to the problem. Joy Buolamwini, an Ghanaian-American coder and activist working with facial analysis software, was even unable to use some software as it didn't detect her face at all[45] and she frequently uncovered other incidents concerning Black employees being "unable to use the elevators, doors, and water fountains or turn the lights on,"[46] as the systems would just not work with non-white faces.

But algorithmic bias doesn't stop at skin color, it also affects gender. In the beginning, voice recognition services like Apple's Siri, Google's Assistant or Microsoft's Cortona had problems understanding queries like 'I was raped'. This has been solved for most cases but even now, gender bias is still present: the default settings of audio assistants are nearly always set to female voices by default. American journalist Adrianne LeFrance explains this with the deep rooted prejudice as to first and foremost expect women, not men, to be in administrative roles[47]—either a willful neglect or a profit imperative that makes money from racism and sexism, arguably a key ingredient in the IT world of Silicon Valley.

43 Lum, Jessica: "Racist" Camera Phenomenon Explained—Almost, https://petapixel.com/2010/01/22/racist-camera-phenomenon-explained-almost/ (January 22, 2010).

44 See Simonite, Tom: When It Comes to Gorillas, Google Photos Remains Blind, https://www.wired.com/story/when-it-comes-to-gorillas-google-photos-remains-blind/ (November 17, 2020).

45 See Buolamwini, Joy: How I'm fighting bias in algorithms, https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms (November 01, 2016).

46 Benjamin 2019, p. 163.

47 LaFrance, Adrienne: Why Do So Many Digital Assistants Have Feminine Names? Hey Cortana. Hey Siri. Hey girl., https://www.theatlantic.com/technology/archive/2016/03/why-do-so-many-digital-assistants-have-feminine-names/475884/ (April 02, 2021).

Becoming Mechanical Body Turks

Whereas modern data collection might have started as a byproduct to provide better services for each individual, now it often seems that services are being created in order to harness as much data as possible in order to distribute and sell it, using humans to achieve an overarching goal: Displaying relevant ads and increase income with the collected data. Our bodies are becoming modern slaves performing labour in exchange for services, hidden neatly in the fine-print of the Terms Of Service. We tag our friends on social media helping to create a massive database of people, upload tons of images that are frequently being used or misused to train algorithms in object recognition, let our phones track our movement for better traffic prediction, or just solve other little tasks (like solving CAPTCHAs[48]) that help companies to increase data and wealth, arguably making us modern Mechanical Body Turks, a term borrowed from a fake 18th-century chess-playing 'computer' that was actually driven by a small chess master hidden inside a case, utilizing the embodied chess playing skills of a human. In the industry, this kind of work is nothing new and a lot of development around artificial intelligence has actually been disguised as technical development. Micro-tasks have just been outsourced to cheap human labour, such as labelling a photo, transcribing a fragment of text or performing a small calculation. Amazon and its service 'Amazon Mechanical Turk (MTurk)' is in this realm the most notorious crowdsourcing marketplace to outsource processes and jobs to a remote workforce to perform these tasks virtually.[49]

What might sound promising to companies and startups at first should be treated very carefully and David M. Berry, Professor of Digital Humanities at the University of Sussex, already argued that "this notion of not only aggregating human beings through software, but also treating them as components or objects of a computational system is indicative of the kind of cybernetic thinking that is prevalent in computational society".[50] In that way you could see the warning of the American mathematician Norbert Wiener from over 60 years ago already as a prediction of how we are today turning into Mechanical Body Turks when being interweaved too closely with big corpo-

48 Kobie, Nicole: Google's reCAPTCHA test has been tricked by artificial intelligence, https://www.wired.co.uk/article/google-captcha-recaptcha (April 02, 2021).

49 For further information see https://www.mturk.com/

50 Berry, David M.: Against infrasomatization: towards a critical theory of algorithms, London 2019, p. 50.

rations and their tools: "When human atoms are knit into an organization in which they are used, not in their full right as responsible human beings, but as cogs and levers and rods, it matters little that their raw material is flesh and blood."[51] Through all the gadgets and tools we are using on a daily basis, we often forget that we do not only pay with our money for the services we receive, but with our data, too.

It has not only become an aggregation of humans knowingly working for machines, but essentially aggregating the 'work' of human bodies and their output without really informing people about the use of their data in full. Following American-German philosopher Herbert Marcuse's argumentation about the different forms of domination of the so-called free and non-totalitarian societies, "AI may lead to new forms of manipulation, surveillance, and totalitarianism, not necessarily in the form of authoritarian politics but in a more hidden and highly effective way: by changing the economy in a way that turns us all into smartphone cattle milked for our data."[52] These developments are slowly being addressed by researchers, developers and activists worldwide, but change is happening slowly. While many governments like the Communist Party of China even (secretly) promote data collection of Chinese companies,[53] awareness in other parts of the world like Europe and America is rising and some companies are slowly changing towards a more transparent and ethically sustainable approach towards data aggregation. Nevertheless, it needs the effort of artists and activists to touch unerringly on sore points of the de facto hidden collection and redistribution of bodily data.

Algorithmic Disobedience and Data Activism

It is often difficult to grasp the possible implications each and every step we take could have, as a lot of the actions taken by companies are illegal and unforeseen. A negative example is the 2020 case of the 'Clearview AI' scraping billions of images from social media sites and compiling them

51 Wiener, Norbert: The Human Use Of Human Beings, London 1989, p. 185.

52 Coeckelbergh 2020, p. 103.

53 Human Rights Watch: China—Big Data Program Targets Xinjiang's Muslims, https://www.hrw.org/news/2020/12/09/china-big-data-program-targets-xinjiangs-muslims (April 02, 2021).

into a facial recognition dataset in an unprecedented case of data theft.[54] Algorithms are being fed more and more data produced by us and our bodies, rendering our biometric data essentially what late German filmmaker Harun Farocki described as operational images—images that are being generated and used by machines only as part of an operation, "images without a social goal, not for edification, not for reflection."[55] We humans are increasingly excluded from the observation of code and the use of our own images feeding millions of databases, and mechanisms incorporated in algorithms and machine vision often remain opaque. If rendered visible, we are confronted with what the American sociologist Benjamin Bratton called "The Inverse Uncanny Valley"[56]: The feeling of unease we encounter when seeing ourselves through the eyes of an algorithm and being freaked out, because we don't recognize ourselves and how we are seen by the machine.[57]

The suppression of ethics and the management of everyday experience in favor of commercial logics based on politics of satisfaction and normalization of the average[58] has been discussed, but user agency is often neglected. As algorithms assume a dominant role in the mediation of power, it becomes increasingly important to consider to what extent and in what ways we can resist their power and become disobedient.[59] There are several ways to either question those mechanisms or actively respond to them, either by means of activism or art. Known examples of the later include the Italian artist–re-

54 Hill, Kashmir: The Secretive Company That Might End Privacy as We Know It, https://www.nytimes.com/2020/01/18/technology/clearview-privacy-facial-recognition.html (February 11, 2021).

55 Pantenburg, Volker: Working images: Harun Farocki and the operational image. In: Image Operations: Visual media and political conflict. Manchester 2017, 49–62, p. 49.

56 Coined by the robotics professor Masahiro Mori in 1970, the Uncanny Valley Effect describes the hypothesized relationship between an object's resemblance to a human being and the emotional response. The concept claims that humanoid objects which imperfectly resemble real human beings provoke uncanny feelings of eeriness and revulsion in the observers.

57 Fine Arts Museums of San Francisco: The Inverse Uncanny Valley—What We See When AI Sees Us | Benjamin Bratton, https://www.youtube.com/watch?v=2E3kQqrHwqo (February 14, 2021), 26:49.

58 See Ananny, Mike: Toward an Ethics of Algorithms: Convening, Observation, Probability, and Timeliness. In: Science, Technology, & Human Values 41, no. 1 (January 2016), Newbury Park 2016, p. 93–117.

59 Velkova, Julia; Kaun, Anne: Algorithmic resistance: media practices and the politics of repair. In: Information, Communication & Society, Volume 24, 2021 — Issue 4. Oxford 2021, p. 523–540, here p. 524.

searcher–activist Paolo Cirio, who illustrates the potential of art to construct new truths by producing digital instruments for an operational and participatory aesthetic.[60] His works address the 'black box' of algorithmic processes by either turning the view on the people in power itself or by making visible problems such as the erosion of digital subjects' privacy through algorithmically based surveillance systems. Another good example is the American artist Adam Harvey. His multi-year research project "MegaPixels" for example looks at the use of unconstrained and non-consensual data sources in AI systems.[61]

Whilst in the 1990s and 2000s scientists generally worked with volunteers to pose for operational images to train algorithmic systems,[62] in the last decade they started to harvest data that is available freely on the internet, beginning with the dataset 'Labeled Faces in the Wild'.[63] This practice is continuing with no or just little oversight until today like it was recently seen with the 'Yahoo Flickr Creative Commons 100 Million' dataset (YFCC100M),[64] and dozens of datasets with millions of images and identities feed into commercial facial recognition systems. Adam Harvey creates awareness by extracting modified data and making visible the extent of the privacy intrusion as seen above in the example of the Duke MTMC dataset. One recent sub-project includes the work 'Researchers Gone Wild' (**Figure 4**), where he investigated a dataset from researchers at Duke University in Durham, North Carolina, who released more than two million video frames of footage of students walking on the university campus.

Another example of art creating awareness is the author's body of work 'In the heat of the day' (2021) where he used geolocation-data generated by thousands of wearables illustrating the paths and whereabouts of the users of these services—shown on the following page in form of aggregated location data of people engaging in water-sports activities in Lake Müggelsee close to Berlin, Germany (**Figure 5**). With this work he wants to sound the alarm about

60 Manghani, Sunil: The art of Paolo Cirio. In: Theory, Culture & Society 34(7–8), Thousand Oaks 2017, p. 197–214, here p. 205.

61 See Harvey, Adam; LaPlace, Jules: MegaPixels: Origins and Endpoints of Datasets Created "In The Wild", https://megapixels.cc/megaface/ (December 14, 2020).

62 Van Noorden, Richard: The ethical questions that haunt facial-recognition research. In: Nature, November 2020, Issue 587, Basingstoke 2020, p. 354–358, here p. 355.

63 See 'Labeled Faces in the Wild', available at: http://vis-www.cs.umass.edu/lfw/

64 See 'Yahoo Flickr Creative Commons 100 Million (YFCC100m) dataset', available at: http://projects.dfki.uni-kl.de/yfcc100m/.

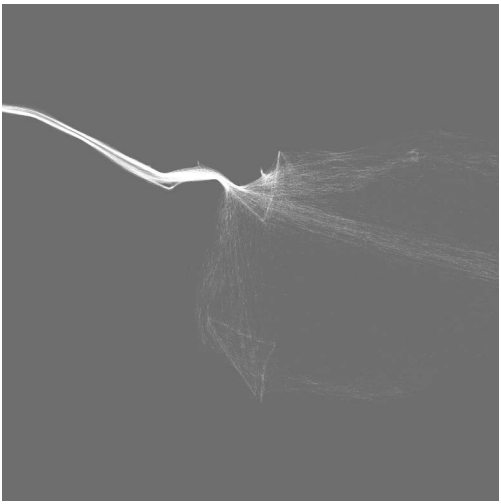


Figure 4—Adam Harvey, Datengeist. Visualization of camera 6 from the now revoked Duke MTMC dataset. Harvey, A. (2020) 'Face First: Researchers Gone Wild', Available at: https://ahprojects.com/researchers-gone-wild/.

Figure 5—'Müggelsee', from the series "In the heat of the day" (2021) by Fabian Weiss. Available at: https://phmuseum.com/fabianweiss/story/in-the-heat-of-the-day-4620f8a656.

possible unforeseen consequences such technology and the gadgets that we are using on a daily basis can have, as the data for example disclosed the locations of U.S. bases in the Middle East through uncensored data from soldiers' fitness watches.[65] Other artistic examples include the Austrian artist Margarete Jahrmann, whose installation 'The Artist is Measured'[66] combined face recognition, artistic interpretation and so-called breeding paintings to create awareness about the ongoing efforts of machine learning to recreate human bodies and faces.

The awareness created by artists and researchers does not necessarily lead to resistance and disobedience but has very much informed public discourse and even steered the course of political decisions in many instances. Positive examples can be observed for example with the work of the group Forensic Architecture, who is using artistic approaches and technical scrutiny to unveil security breaches, hidden observation and tracing, and government wrongdoings. Using methods of image recognition against state agents or companies themselves led in the case of a contact-tracing software in Israel even to a broad investigation into the case[67] and in other instances to the complete turnaround of a manufacturer against his own product amidst the use of tear gas grenades by police forces against Black Lives Matter activists across the U.S. in 2020.[68]

As algorithms are dependent on users for the queries that make them work, many activists and NGOs have started to recognize the role "they play in shaping the workings of algorithms, and they have begun to strategically intervene in political, commercial or playful ways in the algorithmic politics of attention".[69] What is being labelled as data activism explores how the vast amounts of data that is being generated not only results in new forms of con-

65 Scott-Railton, John: FitLeaking: When a FitBit blows your cover, https://www.johnscottrailton.com/fit-leaking/ (January 28, 2018).

66 Jahrmann, Margarethe: NEUROMATIC GAN PORTRAIT GAME—THE ARTIST IS MEASURED, https://neuromatic.uni-ak.ac.at/blog/eeg-stylegan-installation-at-parallel-vienna/ (February 15, 2021).

67 Whittaker, Zach: A passwordless server run by spyware maker NSO sparks contact-tracing privacy concerns, https://techcrunch.com/2020/05/07/nso-group-fleming-contact-tracing/ (May 07, 2020).

68 For details see: Forensic Architecture (2018) 'TRIPLE-CHASER', available at: https://forensic-architecture.org/investigation/triple-chaser

69 Velkova; Kaun 2019, p. 526.

trol, but also in new opportunities for citizenry.[70] Stefania Milán, Associate Professor of New Media and Digital Culture at the University of Amsterdam, and Miren Gutiérrez, director of the 'Data analysis, research and communication' program at the University of Deusto, understand data activism as a manifestation of citizen media, in which people and organizations give meaning to complex software central to civic actions aimed at social change, as well as reaction to new algorithmic control techniques that are challenging the very foundations of citizenship.[71] The umbrella term also embraces socio-technical practices that provide counter-hegemonic responses to the discrimination, social exclusion and privacy infringement that go hand in hand with big data. Data activism interrogates the politics of big data with an "action repertoire of data activists includes examining, manipulating, leveraging, and exploiting data, along with resisting and meddling in their creation and use"[72] involving individuals and organizations of civil society to promote social change and to broaden participation in decision-making.[73]

Take Hyphen-Labs for example, an U.S.-based afro-feminist group of women who work at the intersection of technology, art, and science. They have been experimenting with a wide array of subversive designs including "earrings for recording police altercations, and visors and other clothing that prevent facial recognition."[74] This field of clothing and gadgets used to prevent computer vision from detecting faces or other identifiable features—adversarial or camouflage fashion—is gaining a lot of traction. The same group also developed in cooperation with the aforementioned Adam Harvey the project HyperFace[75], a scarf that uses a scrambled pattern to obfuscate the data that cameras are receiving. Instead of the user's face, the algorithm sees 1200 faces that are printed on a scarf to camouflage the wearer (**Figure 6**). And a team of researchers from the Massachusetts Institute of Technology, the

70 Sastre Domínguez, Paz; Gordo López, Ángel: Data activism versus algorithmic control. New governance models, old asymmetries. In: IC—Revista Científica de Información y Comunicación 16, Sevilla 2019, p. 183–208, here p. 186.

71 Milan, Stefania/Gutierrez, Miren: Technopolitics in the Age of Big Data. In: Networks, Movements and Technopolitics in Latin America, London 2018, p. 95–109.

72 Milan, Stefania, Data Activism as the New Frontier of Media Activism. In: Yang, Goubin; Pickard, Viktor (Eds.): Media Activism in the Digital Age, Oxford 2017, p. 151–163, here p. 153.

73 Sastre Domínguez/Gordo López 2019, p. 191.

74 Benjamin 2019, p. 304f.

75 More details about the project is available at http://www.hyphen-labs.com/nsaf.html

Figure 6—HyperFace prototype by Adam Harvey / ahprojects.com. Most of these pieces have been initially designed for the 'Viola-Jones' face detection algorithm and don't work as well on newer recognition software that use deep convolutional neural networks (DCNNs). Harvey, A. (2017) HyperFace False-Face Camouflage, Available at: https://ahprojects.com/hyperface/. Rendering by Ece Tankal / hyphen-labs.com.

Northeastern University, and IBM teamed up to create a T-shirt that fools AI software into not detecting and classifying the wearer as a person with a pattern on the shirt designed to manipulate just the right parts of a detection system's neural network to make it misidentify the wearer.[76]

But evasion from an algorithm can also be achieved differently: Camouflage fashion also combines makeup and hair styling, facial painting or other "aesthetic modifications, to create effective interference that renders the face unrecognizable or undetectable even to advanced computer [systems]".[77] In face recognition algorithms, contour information is one of the key factors and camouflages that interfere with the contour make feature extraction more difficult and often inaccurate. General rules for obfuscation include avoiding makeup that is amplifying key facial features but using one that contrasts the skin tone in unusual tones and directions, obscuring the region where nose, eyes, and forehead intersect, and partially obscuring the ocular regions as position and darkness of eyes and the nose is a key facial feature. Developing an asymmetrical look may also decrease the probability of being detected,[78] but evasion of facial recognition stays a cat-and-mouse game between detection and obfuscation.

Since a couple of years, there have also been numerous regulatory attempts to address surveillance concerns associated with biometrics—the measurement of unique biological characteristics, including data used in facial and affect recognition. In Europe, the Swedish government for example fined a school for its facial-recognition attendance registry as a violation of GDPR, and in France, the data protection authority declared it illegal to use facial recognition in schools based on privacy concerns.[79] Even Tim Cook, CEO of Apple Inc., recently jumped on the bandwagon decrying the emergence of what he called the data-industrial complex, describing "a vast and opaque industry that has arisen around the capture of massive amounts of personal data, often without the knowledge of users, which is then aggregat-

76 Quach Katyanna: Boffins don bad 1980s fashion to avoid being detected by object-recognizing AI cameras, https://www.theregister.com/2019/11/04/tshirt_ai_cameras (April 02, 2021).

77 Feng, Ranran; Prabhakaran, Balakrishnan: Facilitating fashion camouflage art. In: Proceedings of the 21st ACM international conference on Multimedia (MM '13). New York 2013, p. 793–802, here p. 793.

78 Harvey, Adam: Computer Vision Dazzle Camouflage, https://cvdazzle.com (January 29, 2021).

79 Crawford et al. 2019, p. 32.

ed and monetized and—at times—used for nefarious ends".[80] Where such self-regulation and lawmakers fail, community activism and creating public awareness through art is crucial to escape the fetishization of the upgrade culture in every parts of our lives.

While gadgets and wearable devices are becoming the new normal and optimization of our bodies in one way or the other a part of our everyday lives, it is important to find a good balance between both extremes of complete denial or reckless surrender—both personally and within the surrounding community. Algorithmic systems are here to stay and will continue to support, optimize and modify our bodies, opening up exciting opportunities for wellbeing, health and treatment of diseases. But as most systems are relatively new and developed in an unprecedented pace, ethical and global codes of conduct concerning algorithms are yet far from being perfect and hence a certain wariness towards data collection and training is a good advice. On a personal level, a good practice is to read at least the privacy statement of the fine print or trust external services such as 'Privacy Badger'[81] to gain an overview on how personal data is being handled by the company in question. Complete disobedience of all algorithmic services affecting our body seems on the one hand nearly impossible and is often painstakingly difficult, but gaining an overview of what people in exposed positions like journalists or representatives of minorities recommend is on the other hand a good way to implement some measures that can prevent excessive and maybe even unlawful collection of data. Looking at additional sources like the 'Digital Defense Playbook'[82]—a workbook that presents strategies individuals and organizations can use to evade detection and tracing—or the 'AI Incident Database'[83] can help to steer towards a healthy use of services of trust and shy away from others that are not handling privacy of user data well. Learning from previous incidents of algorithms may in general be the most powerful way to regulate the systems that track and dictate our bodies, as it is a living proof containing cases where algorithms have been harming groups or individuals. Current entries in listings like the 'AI Incident Database' or the project 'Where in the World is AI?'[84] range from Google offering arrest ads

80 Baron, Zach: Tim Cook on Why It's Time to Fight the "Data-Industrial Complex", https://www.gq.com/story/apple-ceo-tim-cook-privacy-initiative (April 20, 2021).

81 See 'Privacy Badger': https://privacybadger.org/

82 See 'Our Data Bodies Tools', https://www.odbproject.org/tools/

83 See 'Artificial Intelligence Incident Database', https://incidentdatabase.ai/

84 See 'Where in the World is AI?', https://map.ai-global.org/

when searching for common names of Black people to Russia requesting Tinder to hand over data of the LGBTQ-community using the dating platform in Chechnya. With such activist projects, clear awareness of the possibilities and pitfalls of algorithmic control, and a healthy attitude towards algorithms, we can start to repress the great lie of individualist-consumerist culture to be able to improve our way to personal perfection and communal utopia, and contribute to consensual algorithmic data politics.[85] If we don't start now to think about the impact and possible consequences of the massively growing use of AI, our relationship with technology deployed for watching and analyzing us might stay a cat and mouse game, in which the ones deploying the code are always a step ahead. And if today's lawmakers don't protect the public against harmful AI, it will become increasingly difficult to catch up with such rapidly advancing technology as it can already be witnessed today in different parts of the world. Without a global consent and strategy about how we want to use and live with algorithmic control, we might face an increasingly tightened net of surveillance fed with data generated by our bodies day by day. In the wrong hands this could make our bodies soon become a product of code with people like Brad Smith, president at Microsoft, even warning that a "life as depicted in George Orwell's 1984 could come to pass in 2024".[86]

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85 Berry 2019, p. 48.

86 BBC News: Microsoft president—Orwell's 1984 could happen in 2024, https://www.bbc.com/news/technology-57122120 (June 01, 2021).

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