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Surveillance Capitalism: Origins, History, Consequences

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Abstract: This article investigates the early history and recent development of what is now termed surveillance capitalism. It argues that an underappreciated aspect of the surveillance of people and intensive data collection is a regularization of behavior that attempts to erase uncertainty. This process has been ongoing for more than a century, but its expansion through increasingly sophisticated digital technology and the widespread adoption of data gathering as a business strategy has the potential to stifle and inhibit the innovative entrepreneurship that is crucial to the capitalist system. How this will play out remains unclear, but history argues that we should look for ways to mitigate the potentially negative consequences of complex technological systems such as these.

Keywords: surveillance capitalism; innovation; information; uncertainty; infrastructure; algorithm; inequality; data-driven systems; digital commons

1. Introduction

> *It was like walking among matrices of a great digital computer, the zeroes and ones twinned above, hanging like balanced mobiles right and left, ahead, thick, maybe endless.*
> *—Oedipa Maas*

In recent years, there has been a growing fascination with a concept known as "surveillance capitalism". (Figure 1). The term itself is not new. It had been floating around for about a decade (Zuboff 2019, 2022; Foster and McChesney 2014; Mosco 2014; Lauer and Lipartito 2021, pp. 1–26).[1] But it gained significant traction thanks to Shoshana Zuboff's 2019 bestseller, *The Age of Surveillance Capitalism*. Different thinkers have their own takes on what the term means, but there is a common thread that runs through all of them: the rise of new digital technologies that do not just serve us—they observe us, and they find ways to manipulate us into surrendering our information. These technologies collect vast amounts of data about our behaviors, preferences, and interactions, which are then sold, packaged, and repurposed for profit.[2]

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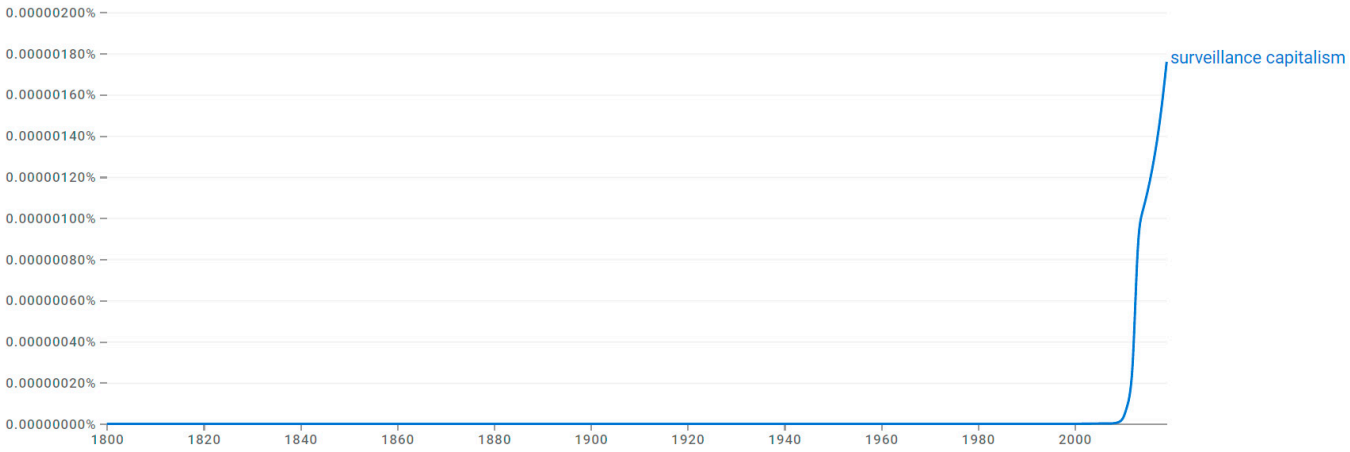

Figure 1. Growth of the Term Surveillance Capitalism. Source: Google Ngram.[3]

What makes surveillance capitalism uniquely capitalist is the way private entities—primarily large corporations in the tech, information, and social media sectors—systematically dispossess us of our personal data and claim ownership over it. As we navigate the digital realms of the internet—and increasingly, the physical world through the spread of facial recognition and other tracking technologies—fragments of our lives are captured, analyzed, and commodified.[4] While we might think of all this information as producing transparency (as we will see some economists do), transparency is a two-way glass where each party sees the other equally. Surveillance calls attention to inequality, whereby one side sees but the other side does not.

This data collection is not incidental but vast, creating the conditions for powerful algorithms and machine learning systems to predict our behaviors—what we might buy, where we will go, who we may vote for. These predictions are not just valuable to the companies that generate them, like Amazon and Facebook, who use them to target us with personalized marketing. Their real value lies in their sale to third parties—companies and organizations that participate in data auctions to target us with ads, political messages, financial products, and anything else that can be bought and sold.

The genius—and the danger—of this system lies in its market logic. The more our actual behavior conforms to these data-driven predictions, the more valuable those data become. This creates a feedback loop where the system refines itself, making us more visible and predictable, which further enhances its economic power. Zuboff sounds the alarm about the broader consequences of this process as well. She warns of the erosion of personal choice and free will. As our lives become more algorithmically managed, our autonomy begins to diminish.

While the ethical implications of this loss of agency are significant, I want to focus on its economic consequences: the possible loss of creativity, innovation, and entrepreneurship. In a system where behavior is managed and predictions dominate, the space for creative disruption shrinks. When everything is designed to conform to data-driven expectations, the opportunity for unexpected breakthroughs—the kind that drive real innovation—narrows. Surveillance capitalism does not just control individuals; it may also stifle the very entrepreneurial spirit and creative innovation that has traditionally driven economic growth.

2. The Social Origins of Surveillance

One of the ironies of living with surveillance capitalism is that whatever its dangers and ill effects, it proliferates because it also makes positive contributions. We have seen over the past few decades, for example, how information technology can be used to empower

consumers and citizens by giving people more information and more control over their own lives. It is by the growth of information in the form of credit scores that financial instruments such as credit cards, mortgages, and insurance have become more widely available to many groups, notably women and minorities, who might have been excluded earlier by poorly informed risk judgments. Likewise, consumers now have immediate access to goods and services through online retailers, putting pressure on traditional outlets to cut prices or to expand their own online presence. The same positive benefits can be found in online travel platforms that have both facilitated travel arrangements and also allowed consumers to shop for the best deals quickly and easily. Politically as well, the proliferation of outlets for discussion, debate, and investigation have often been used to call governments to account and increase citizen oversight on bureaucracies. Admittedly, each of these examples can be met with a negative counter example, as we shall see, but the presence of these positives makes it difficult to simply eliminate all surveillance.

Perhaps the most general reason why surveillance has become so embedded in our lives, despite the potential downsides, is that we live in complex, geographically extensive societies. The word surveillance itself arose around the French Revolution, a new coinage for a new concept for a dramatically new time. In a world of subjects bound by tradition and fixed roles in steeply hierarchical societies, people do not need to be known, studied, identified, and cataloged. In a world of free citizens, however, people lose these fixed identities. If capitalism is in part the process of removing or melting into air all the traditional structures and restrictions of the closed, ethnically, geographically, and economically circumscribed past, it has also left us living in what the famed sociologist Georg Simmel called "a society of strangers" (Simmel [1903] 1950).[5] We are free but unknown to each other, and in such a world there needs to be methods and mechanisms for establishing trust and connecting people who otherwise have no fixed or prior relationships. By gathering information about people and verifying identities, surveillance performs these functions.

So, if surveillance were wholly bad, it might be easy to get rid of. Unfortunately, there seems to be no simple way to disentangle its positive contributions from its negative consequences. Once information is out, it spreads quickly in the digital age and is almost impossible to remove, as anyone who said or did something that appeared on Facebook that they now regret knows. Stronger privacy laws cannot shield us either (Duncan and Wong 2022). While I might be able to protect my information, what I do and who I am can be inferred from the people I connect to and can be parsed out from large data sets. Surveillance is more than an individual matter. It is like an externality that spills over onto us from others.

Many of the consequential decisions that affect us are made through algorithms at this more aggregate level. Surveillance depends on fitting people into categories. Almost any category of identity or behavior can be relevant, though in the economy categories of risk, consumption habits, and desires, or for workers skills, training, personality, and identity are often commonly deployed. In these ways, surveillance helps decision makers discriminate among people, in the neutral sense of knowing the differences and making decisions accordingly. Nonetheless, it is hard for this discrimination to remain neutral, since the needed data come from the past and thus may bring forward, or literally encode, past inequalities and prejudices (Benjamin 2019; Noble 2018; Sombetzki 2024). For example, employers seeking to target job advertisements to the most likely group of candidates use algorithms that draw from the existing profile of employees working in that sector. When those jobs are mainly held by men, advertisements and notices on social media will simply skip over women. For victims of past employment, housing, or financial discrimination, the algorithms may end up "automating inequality" rather than eliminating it (Eubanks 2018). Newer forms of surveillance are subject to their own versions of inequality. Facial recogni-

tion technologies, for example are tuned to the faces of Caucasians and often misidentify African-Americans and others with different skin tones. Such misidentification can have distressing consequences when facial recognition is linked to policing, for example, and misidentifies a person as a suspect in a crime they did not commit (Johnson and Johnson 2023; Lee and Chin-Rothmann 2022).

Some countries have tried to contain these discriminatory effects. The European Union (EU) in 2018 implemented a comprehensive framework of privacy and data protection. In the United States, by contrast, few federal laws exist to limit data gathering or to protect those subject to it such as workers (Rogers 2023). Individual states, such as California, Virginia, and Utah, among others, have fairly comprehensive privacy and data protection regulations, while other states such as New York, Michigan, and Nevada, have narrower laws (Bloomberg Law 2024). In general, these state laws follow historic patterns that, as we will see, were first expressed in consumer credit and credit reporting legislation. They are designed to give people certain rights to know what data are collected about them, to opt out of certain data collection practices, and to correct or challenge inaccuracies in these data. For the most part, this patchwork of legislation, some of which is more business-friendly than consumer- or worker-friendly, has had little impact on limiting surveillance in the workplace or marketplace. Even the transnational EU laws are designed to both protect people from data intrusiveness but also to harmonize these rules across the member states and encourage internal data exchange (GDPR n.d.). In many ways, the emphasis on accuracy and opting in or out of surveillance practices can end up reinforcing surveillance itself by making it more accurate and consensual.

Whether used for good or ill, surveillance proliferates through a powerful logic, an iron law: the answer to the problems of surveillance is more surveillance. When it is deemed biased or unfair, the answer is to obtain more information and more exacting surveillance. If, for example, facial recognition technology tends to misread certain faces or skin tones, then we need better, sharper facial recognition technology.

This same logic operated in the earliest days of surveillance systems. One of the first examples of data gathering in the capitalist economy is credit reporting, with roots stretching back to the 19th century. Credit agencies collected information about people, performed evaluations, and sold those data and those evaluations for profit to lenders and creditors. From the start, they were accused of "spying and surveillance" but at the same time were faulted for not having enough, or enough accurate information about their subjects or defaming those they surveilled with inaccurate or biased data (Lauer 2017; Lipartito 2013; Anon 1873; Baker 1959). Starting after World War II, the Federal Housing Administration, which underwrote home mortgage loans, required a credit report be attached to each mortgage application. In this way, it also reinforced the racial division of "redlining", making some groups, notably African-Americans, ineligible for mortgages based on their lower levels of wealth and lower paid jobs and employment history due to racial discrimination (U.S. House of Representatives 1968). In the late 20th century, credit agencies were also accused of bias in how information was gathered and assessed. Women and minorities as well as anyone living a non-conformist lifestyle were carefully scrutinized for personal behavior that did not match the expected white male norm (Igo 2018; Bunker 2021).

Responding to concerns that credit agencies made arbitrary and discriminatory evaluations of people based on limited data collected through unstandardized methods, the United States passed fair credit laws in the 1970s that regularized the type of data that could be used to evaluate people. These laws encouraged both more and more systematic data gathering and eventually the replacement of subjective narratives of credit worthiness with the new statistically based scores (Lauer 2017). Unlike the discarded narrative methods where a lender might read a life history and decide whether to extend credit, statistical

methods did not have the inherent subjectivity that worked against anyone not conforming to a narrow norm. Credit agency files went from a hodge podge of public documents, gum shoe investigations, and gossip from neighbors to what seemed like objective information such as ledger data on people in the files of stores and people's past credit habits. Eventually, this information was gathered in machine readable form and, through the application of statistical techniques of correlation and prediction, led to the modern credit score pioneered by Fair Isaac, the FICO Score (U.S. House of Representatives 1968).[6]

While credit reporting can be seen as more just and equalitarian now, the result has been to make the FICO score a badge of admission to many parts of life: credit, mortgages, apartments, even employment (Poon 2007; Leyshon and Thrift 1999). At the same time relevant non-financial but contextual data grew more widely available—zip codes, census tracts, employment histories, residential histories, all of which could locate and track individuals. Credit scores relied on correlations among different variables related to income, employment, residence, and the like. These correlations, however, could map onto contextual data and thus reconnect to race, gender, ethnicity, or other categories of identity. This would let bias in through the back door (Hyman 2011). Likewise, even seemingly objective credit histories were not immune to structural inequality, building as they did on past behavior. They did not consider the historic conditions such as the lack of wealth, employment, and housing that have left some groups in far worse financial condition than others (Blattner and Nelson 2021; Hao 2020).

In short, decision-making algorithms embed current social relations; they reflect the data that exist regardless of its source or history. Although we can see the roots of this issue in the history of credit reporting and other assessment systems for services like insurance, one difference today is that our more complex decision-making algorithms are given over to private entities not required to be transparent or reveal how the algorithms work, making it harder to detect bias, inequalities, or racialized effects.

3. The Surveillant Infrastructure

These examples give a sense of how the same data and technology can be deployed for multiple purposes beyond what might have been the original intention. One does not need to posit an "evil actor" view of surveillance to see how it may grow and ramify in unexpected ways with unforeseen consequences. Surveillance is best understood not as an activity but as an infrastructure that has been built up over the past century and more.

Infrastructures are more than material artifacts. They embody laws, rules, norms, labor, politics—in short, a host of institutional factors both human and non-human (Edwards 2002; Edwards et al. 2009). They acquire a certain momentum, taking advantage of economies of scale and scope to spread and make themselves ubiquitous in our lives. As such, they shape and even constitute certain activities. The infrastructure of automobility, for example, includes cars, roads, signs, gas stations, garages, traffic laws. All of these interact to make the automobile an efficient, effective, and ubiquitous form of everyday transport. Indeed, one would hardly want cars on the road if we did not have a well-regulated system and support mechanisms to make them easy to use. Such an infrastructure, though, makes other forms of transportation either less likely or more difficult. One can choose to be a bike rider in a car city, but it will be difficult. Roads and surfaces, rules and expectations are built for the car, not the bicycle. Likewise, public transport will be less likely as voters who have cars see no reason why they should pay taxes for public transit as well. They will want better roads, not buses and trains.

In the same manner, it has become more difficult to "opt out" of the surveillant infrastructure. We need to be seen and recognized to participate in society—to land a job, obtain a mortgage, receive welfare benefits, see a doctor, rent a car, open a bank account,

travel across borders. Of course, the momentum of any infrastructure can be overcome with enough political will. The car need not win in every city with enough counterforce from voters. Still, overcoming an established infrastructure is difficult and expensive, especially as it grows, proliferates, and becomes more functional and more efficient. Engineers and entrepreneurs work out the kinks restricting the efficient operation of the system, overcoming what Thomas Hughes called "reverse salients" (Hughes 1983; Latour 2007). As the infrastructure grows, it draws in more investors, employs more workers, and serves more functions. Our reliance on it encourages a division of labor. We do not write our own code; we do not create our own decision algorithms. Others do it for us. Meanwhile protecting privacy by using VPNs, non-tracking search engines, and advertisement and cookie blockers requires work and constant attention. Infrastructures are meant to alleviate us from such chores, but by turning over more work and more functions to the system, we create a black box. Doing so makes design and operations invisible to us. And in this way, we lose the ability to control or even question those operations.

One reason we may misapprehend the consequences of infrastructure dependence is that we often draw conclusions from design alone, missing the unintended or emergent features. Take the internet for example. It was deliberately designed to be open and flexible. Coming out of a milieu of shared knowledge, engineers Vinton Cerf and Robert Kahn in the 1970s devised the internet's IP/TCP protocol to be decentralized, adaptable, and capable of handling multiple different networks. By contrast, traditional telephone carriers pushed the X.25 standard, which envisioned a handful of public data carrier networks. With its ability to handle multiple users and network designs, the IP protocol won out and the internet rather than public data networks became the primary path for data transfer. This open design in turn allowed multiple other actors to develop programs and applications, culminating in the HTML language responsible for the World Wide Web and a enormous transformation of data and communications in a global internet with a vast, diverse population of websites (Abbate 2000; Russell 2014).

This might seem a triumph of freedom over control, which it was on one level, but it also enabled the collection of data from users of the internet that led us to surveillance capitalism today. Even Google did not fully realize the profit potential of the data it was scraping from searches until about 2001, when it concluded that there was far more money to be made using and selling those data than simply trying to sell access to its search engine. The established information infrastructure created latent potential for surveillance not anticipated in the original design (Zuboff 2015).

4. Information, Risk, and Uncertainty

Although not centrally planned and often unintended, this surveillant infrastructure encodes a powerful logic that is part of the larger history of information, particularly the relationship between information, risk, and uncertainty. Uncertainty, of course, is a lack of information. If we had perfect information, there would be no uncertainty. We would also have no risk since risk is a probability calculation based on partial but incomplete information. Partial information is a resource to turn blank uncertainty into calculable risk.[7] And with risk, all sorts of economic activities become possible—exchange, investment, and innovation to name three.

Uncertainty exists because the future cannot be perfectly known. We simply cannot be sure of things that have not happened. We may have some clues, some predictions, which is partial information filling in blanks and allowing us to take risks—that is, to make probabilistic calculations of the future. The further out in time we go, the lower our probabilities and the greater the degree of uncertainty. Is uncertainty, then, a certainty in our lives?

Economist Kenneth Arrow thought so. Although he had elaborated in sophisticated mathematical terms the conditions for a stable general equilibrium in an economy, he also carried out pioneering work on information asymmetry and uncertainty. Uncertainty, he argued, was an existential feature of life and it could render an equitable, Pareto optimal equilibrium unstable or impossible. We do not have markets for future goods and their prices, Arrow pointed out. Capitalist economies rely on price information, which is missing for the future. Agents might have theories or guesses based on the information at hand, but Arrow believed there was no reason to think these predictions would converge in a way that made for a stable economy (Arrow 1963, 1974).

Uncertainty can thus have detrimental economic consequences. As social theorist Jens Beckert has noted, investment and innovation can only proceed in a capitalist system if there is some mechanism to overcome uncertainty and calculate the future payout from the expenditure of time and resources in the present. How, in short, can innovation and future-oriented investment occur under capitalism given the unavoidable reality of uncertainty? The answer, Beckert maintained, was a combination of information and analysis to make rational, probabilistic predictions, but also something beyond the purely rational. Here, Beckert made the case for narratives of the future as filling the gap between what we could know and what we could not know about things that had yet to occur (Beckert and Bronk 2018; Beckert 2013). In this, he follows Keynes, who feared that uncertainty could impede investment and bog down the economy into a depression. Keynes called on the entrepreneur's "animal spirits" to lift us out of the mire. Beckert looks to narratives that tell us what to do and how to go forward. Such narratives may drive irrational exuberance or may construct a trajectory of economic or technological development, a paradigm, which directs further research and development (Schiller 2015; Dosi 1982). We can see such examples in the trajectory of electric vehicles or the exploration of space. Both have benefited from powerful narratives of the future to stimulate action. In other cases, such narratives may be more culturally specific. Corporations in the United States seem especially vulnerable to the assumption that innovation should lead to the replacement of labor by machines, to the point that justifying investment in robots and AI systems almost requires a calculation of the amount of labor saved by removing workers.

Although narratives are not perfect predictions of the future, or even in many cases very reliable ones, they can nonetheless help make the future by coordinating action and thus reducing the inhibiting effects of uncertainty. Narratives alone will not guarantee the success of an innovation, and they need to be tempered and disciplined by information and analysis, as Beckert argues. At the same time, they can be said to "reduce" informational needs by focusing on one meaning, eliminating the multiple possible interpretations that can be placed on raw data. Uncertainty puts a premium on obtaining information, but also on finding ways to parse, interpret, and give a clear meaning to that information. This reduction, as we shall see, is a crucial solution to the fundamental problem of information and uncertainty, though one with not always happy consequences.

5. Information Inequality and Surveillance

With the explosion of what we generally call information technology, some information enthusiasts have argued that it may be possible to overcome the limits of uncertainty that skeptics like Arrow had identified fifty or so years ago. We now may be able to beat back the tides of ignorance sufficiently to move us to an actual Pareto optimal economy. If so, then the sort of gap-filling role of narratives identified by Beckert would not be necessary. We would have a clear, rational eye on the future. Hal Varian became chief economist at Google in 2002, joining the company just after what Zuboff has marked as the turning point when Google shifted to its present-day strategy of collecting and commodifying

information. Varian makes a case that we now have acquired sufficient information to write what he calls "perfect contracts" (Varian 2010, 2016). The technologies that will permit such contracts are varied; basically, anything that closely monitors behavior and collects data on people's activities. With rich real-time data, for example, rental car agreements can be enforced by on-board tracking technology that shows how drivers are driving and if they are either abusing the vehicle or creating unsafe situations. The same can be (and indeed is already) used for insurance contracts whereby rates are linked not only to the miles driven but how the car is used. Too many fast starts and rapid stops result in higher premiums as company algorithms predict such drivers to be greater accident risks (Hill 2024). To Varian, this sort of close monitoring, which he does not identify with the harder term surveillance, is mutually beneficial to all parties, as it can lower transaction costs and reduce the need for organizations and hierarchies, letting all exchange be market exchange. Each transaction and each wage and salary can be tailored down to the level of each unique customer, borrower, or worker (Dubal 2023).

A world of perfect contracts as imagined by Varian is also presumed a world of informational equality. In classic liberalism, contracts are meant to be struck between two parties that enter into them voluntarily with equal agency and power. Information, it is assumed, will enlighten both parties so the contracts can reflect their voluntary choices and self-interest. The assumption here is that information is a light shining into the otherwise dark and obscure corners of human existence. Such light brings forth transparency that allows both parties to see each other as clearly as they are seen. What this rosy scenario does not consider is that the same technologies that can be used for transparency and symmetry can also be deployed for the opposite effect. Varian argues that, theoretically, perfect price discrimination coupled with free entry could reduce profits to zero, a presumed benefit to consumers. He ignores the possibility that the very same technologies can be used to create barriers to entry and allow perfect price discrimination to erase consumer surplus (Bar-Gill 2019).[8] Likewise, he argues that informed consumers will be in a better bargaining position vis-à-vis producers, but again ignores the way information may accumulate on one side of the bargain and make such sophisticated insight less and less possible. The same is true with the labor market. Monitoring truck drivers makes routing and logistics more efficient. In theory, workers might reap gains from such improved efficiency, but much depends on how much control over that information workers have to force a division of revenue (Levy 2015, 2023).

These are the reasons why surveillance rather than the more neutral information or the more egalitarian transparency is useful. Surveillance, as noted above, is the strategic gathering of information in order to create or reinforce informational asymmetry, not to abolish it. Even as information-gathering technologies grow more powerful and more ubiquitous, not everyone has equal access to the tools, techniques, and data. Those with greater access to the "forces of surveillance" are better positioned to benefit at the expense of those who lack access to them. There are the surveilled, on whom information is collected, and there are the surveillers, who are opaque or invisible to those being surveilled.

The division of surveillance is not set in stone, of course. There can be counter surveillance as well, where people are able to make use of the same digital tools to track those in power, call politicians and corporations to account, seek out better economic bargains for themselves, access alternative news sources. Such a proliferation of options can help the marginalized fight back. Yet there is no reason to assume technology moves in only one direction at a time. Information infrastructures can underwrite many different activities moving in opposite directions. Information tools can both muster a rally against a dictator and send a mob after democratically elected congress. Widening channels of information and communication may stir democratic debate and disseminate useful knowledge while they also speed disinformation and misinformation on their way. What

direction, toward greater equality and democratic control or toward greater centralized control and unequal power, is the world of surveillance capitalism taking us? The future of course must be uncertain, but there are trends in the history of information and surveillance that suggest an answer.

6. Information, Entropy, and Uncertainty

More than seventy years ago, the architects of modern information theory, Bell Lab's Claude Shannon, the Rockefeller Foundation's Warren Weaver, and the father of cybernetics Norbert Weiner, defined the concept of information entropy. In their view, information meant learning something surprising or unexpected. The result of tossing a fair coin is a surprise—beforehand, the result could be equally heads or tails (probability of ½). But flipping a biased coin that always lands heads up yields no information since the result is known—probability of 1. Thus, for any set of data, the greater the amount of randomness or uncertainty, the higher the information load and also the higher the entropy. Information entropy was the amount of uncertainty (or noise) in a message. Shannon defined the smallest unit of information as a binary unit or "bit". Heads or tails? One bit of information, one coin toss, will suffice. Higher uncertainty meant higher entropy, requiring more information. Once the uncertainty was gone, there was no more "surprise" and both information and entropy would fall to zero (Brillouin 1951a, 1951b, 1952, 1964; Lutz and Ciliberto 2015).[9]

There is an irony here. We seek information that is new, not before known or predicted—non-redundant information. More information presents more possibilities and more possible meanings and interpretations of the data (Klapp 1986).[10] Contrary to popular myth, "pure data" do not yield clear, unambiguous outcomes. Data are hungry for categories of organization. They need mechanisms of reduction and meaning. There is pressure to resolve uncertainty, to reduce informational entropy, but the only way to do so is to eliminate possible meanings and bring them down to a single one. No more surprises. When it comes to surveillance, the goal is to gather information about people and at the same time to resolve uncertainties or ambiguities in that information. One way to do this is to make people themselves conform to the behavioral predictions about them derived from the information. For example, people are now expected to monitor themselves by continually examining their credit scores, taking cues and hints on how to alter their behavior to improve that score, making them more predictable and less risky. The same is no doubt true of car drivers under insurance monitoring regimes. To the extent that we conform to expectations and predictions, the data collected about us are more accurate and so more valuable in the information market (Curran 2023). But there is a social cost to this process as well.

Algorithms and artificial intelligence illustrate the potential loss incurred in the quest for certainty. The algorithm is essentially a code, encoded information. All codes, including language itself, reduce information and fix meanings (Borgmann 1999).[11] This is of course necessary, otherwise we would be overwhelmed in a cacophony of symbols breaking down into mutual unintelligibility and endless efforts to find meaning. Though the fixed code reduces uncertainty, with natural language at least there is always some slippage between the word and the world. For all the ire heaped upon post modernists, their point about the indeterminacy of language is actually a useful one—it reminds us that there is no fixed resolution for how we capture the world in our codes. The map of the world is never 1:1. Possibilities of new interpretations, new meanings, new things learned may always arise. But with the power of today's information systems, there is a danger of eliminating this crucial slippage. We end up substituting false certainty for the playful and creative uncertainty of life. In doing so, we eliminate the very conditions and possibilities where action, creativity, and innovation can occur.

7. Conclusions

The drive toward total visibility and predictability alters not just our economy but our very sense of self and agency. The bits and bytes of digital data are a new form of control, where algorithms shape what we can do rather than merely responding to our actions. Just as the printed word once reshaped our perception of space and time, algorithmic surveillance reshapes our self-perception and the possibilities available to us. This reduces the richness of human experience to quantifiable metrics, stripping away the organic innovation that arises from human creativity and improvisation.

The digital environment, once full of potential, now risks becoming a closed loop of reinforced behaviors and predefined outcomes. The quest for total certainty mirrors the old scientific dream of conquering nature, but this drive may lead to stasis—a world where everything is known, yet nothing new can happen. It is in the gap of uncertainty, where narratives of the future can flourish, that we find the motivation for the creative acts that drive capitalism, as Jens Beckert argued (Beckert and Bronk 2018). While overreliance on fanciful, ungrounded schemes and narratives not tempered by data and analysis can lead us astray, it seems if anything we may now go the opposite direction, toward continual prediction, analysis, and audit, leaving no space for creative uncertainty. Complexity is replaced with compression, individual variation by commensuration and categorization. The result, if taken to extreme, would be a fatally closed world, a virtual reality, which for some reason seems to be what so many Silicon Valley entrepreneurs think people want and society needs. But it is the actual engagement with what Philip Agre calls "the radical strangeness" of the real world that is the source of our creativity, and one might argue, our humanity (Agre 1999, 2000; Heffernan 2020; Curran 2023).

Both total surveillance and closed traditional communities are ways to limit and control human action and police non-conformity, at the expense of creativity and innovation. Surveillance was once meant to free us from many of the constraints of the circumscribed and homogenous communities of the past and let us live as a society of strangers. But now it may be locking us into a cage—maybe not an iron one, but one of bits and bytes (Varian 2010; Lipartito 2023).[12] In *The Crying of Lot 49*, novelist Thomas Pynchon feared that no matter how much information we accumulated, entropy would prevail. We would be left suspended in infinite matrices of zeros and ones like the book's main character Oedipa Maas, no closer to truth and meaning. Now, it seems that our endless fight against entropy is the greater danger. Blind in a black box, we no longer see how things occur, no longer understand the algorithms that herd us, no longer have the sense of our moral human agency at work, leaving us subject to rare "black swan" events such as nuclear reactor meltdowns and financial meltdowns as well (Perrow 1984; McKenzie 2011). It is not centralized state planning that threatens this freedom, as conservative libertarians once feared, but rather the corporate algorithms of surveillance capitalism built by those with an almost utopian faith in the beneficence of information technologies (Hayek 1945).[13]

In this regard, the surveillance features of our digital world also anticipate some of the potential risks and dangers that may emerge in the newer variants of digital information extraction through artificial intelligence and large language models. These too threatened to "colonize" our social life and render human agency and cognition appendages to the data collection these systems need. Indeed, they are so effective at prediction, particularly in the form of generative AI, that there is now concern they may propagate and "pollute" the data of real life to the point that they end up losing touch with that real-world radical strangeness. Trained recursively on the very language and information they generate, they may collapse due to their success at proliferation (Shumailov et al. 2024).

The risks to the future are not inevitable of course. History is littered with failed technologies of utopian promise, from AT&T's much touted "Picturephone" of video

communications that debuted at the 1964 New York World's Fair and crashed spectacularly barely a decade later, to the widely lauded "one laptop per child" program that was meant to equalize global education and has since sunk beneath the waves of history (Lipartito 2003; Ames 2019). It is possible that surveillance capitalism will, in retrospect, appear oversold. The risks may not even lie in its perfection but rather in the vulnerabilities to hacking, data breaches, and cybercriminals it introduces in our tightly integrated information systems (Curran 2023). As these examples remind us, while infrastructures may acquire a powerful momentum, they are not unstoppable. They can be overcome with concerted political effort to design a different future around different goals and values.

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Notes

1 By most accounts, the term "surveillance capitalism" was coined by (Foster and McChesney 2014).

2 The capitalism in surveillance capitalism means the focus is on the private sector, though there are various overlaps and "interoperability" between the surveillance systems of the state and of business. How one feeds off of and into the other is a topic that should be explored in further research.

3 Google Ngrams show the frequency of appearance of a word or phrase in books scanned by Google. As such, they provide a rough measure of the use of a word or phrase over time.

4 This paper focuses on capitalist economies, though a separate study could be carried out for the non-capitalist world, which also engages in similar practices of surveillance.

5 The word surveillance seems to have entered the French language at about the time of the French Revolution, a word related to supervise and survey, both with the roots of view or see and over. It moved into English somewhat after that period.

6 See the House Hearings testimony of Harry Jordan, Credit Data Corporation. Credit Data was already in the process of being acquired by aerospace and computer conglomerate TRW and would soon be TRW Credit Services, now Experian.

7 I am assuming we do not obtain perfect information, though on a very local level we may be able to reduce risk to a fraction of a percentage with enough good information.

8 Consumer surplus occurs because many buyers of goods and services pay a price less than they would be willing to pay, as prices are not set based on the willingness to pay of each and every consumer but only on the marginal consumer. The "infra marginal" consumers receive the same price as the marginal consumer, even though they would be willing to pay more if they had to. With enough information, a producer can figure out everyone's willingness to pay and set prices for each individual accordingly, erasing consumer surplus. This is a loss for the consumer and a gain for the producer.

9 Brillouin connected thermodynamic and information entropy in an equation showing the amount of energy that would be expended in acquiring information. Given that there is a finite amount of free energy in the universe, so too there is a finite amount of uncertainty we can ever resolve.

10 Shannon et al. did not concern themselves with meanings, or "semantic ambiguity", only the signal to noise ratio of the channel. Clearly information is valuable, however, because it is meaningful, and determining meanings (or conflicts over meanings) is key to the human use of information.

11 Recall that information entropy falls to zero when the meaning is certain while information itself is something you did not know before, whereas codes like language provide a standardized meaning that we can share with others who know the code.

12 The potential liberating aspects of surveillance technology is something that both the fiercest critic of surveillance capitalism, Shoshana Zuboff, and its biggest cheerleader, Hal Varian, agree on in part. Varian for example notes how cash registers provided a mechanism of financial surveillance that allowed stores to employ nonfamily members by obviating the need for personal ties of trust and widening the scope of employment.

13 Both Shoshana Zuboff and Friedrich Hayek argue that uncertainty is the source of our freedom.

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