The Social & Economic Implications of Artificial Intelligence Technologies in the Near-Term
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WORKSHOP PRIMER: LABOR & AI

Contents

Brief overview

Artificial intelligence (AI) systems are set to transform labor in the 21st century.[1] Although AI technology is in its early stages, powerful systems are already at work across an array of sectors, allowing researchers ample opportunities to investigate current and expected impact. Too often, discussions of labor and AI have focused only on the fear of a jobless future. Current research demonstrates that more complex and more immediate issues are at stake, affecting not only labor markets in the abstract, but also employer-employee relations, power dynamics, liability and responsibility, and the role of work in human life.

[1] As Russell and Norvig point out, the history of artificial intelligence has not produced a clear definition of AI but rather can be seen as variously emphasizing four possible goals: "systems that think like humans, systems that act like humans, systems that think rationally, systems that act rationally." In the context of this primer on labor, we are relying on the emphasis proposed by Russell and Norvig, that of intelligence as rational action, and that "an intelligent agent takes the best possible action in a situation." Stuart J. Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Englewood Cliffs, NJ: Prentice Hall, 1995: 27.

Economists disagree

The role of automation[2] in the economy is far from a new subject of inquiry, and considerations of the impact of AI emerge from within long-standing debates. We do not aim to summarize the full scope of economic arguments on this topic here, but simply to review key points and areas of contention within a much broader discourse. A key topic of contention is whether automation decreases the demand for human labor as it increases productivity, or not. While intuitively it may seem the demand for labor would decline as automation increases because there would be only a finite amount of work to be done – and some economists argue this – others don't see it this way, referring to this assertion as the "lump of labor" fallacy.[3] These dissenting economists suggest that as productivity rises in one industry (due to automation or other factors), new industries emerge along with new demand for labor. For example, in 1900 agriculture comprised 41 percent of the United States workforce. By 2000, agriculture comprised only 2 percent. Labor economists David Autor and David Dorn point out that even with this dramatic change, unemployment has not increased over the long-term and the employment-to-population ratio has in fact grown.[4] Nonetheless, Autor and Dorn, among others, point out the rise of "job polarization," in which middle-skill jobs decrease and leave some high-skill and more low-skill jobs. Other economists, such as James Huntington and Carl Frey, are more dire in their prediction that AI will dramatically reduce the number of jobs available.[5]

There are also economists debate whether the transformations and fluctuations in labor markets are related to technology at all, or instead caused by economic policy. Such arguments focus on what how and when institutions and regulatory mechanisms should be brought to bear on AI technologies. Robert Gordon, for example, argues that the current waves of innovation are not as transformative as they seem.[6] But many economists are beginning to concur that labor markets are undergoing a consequential transformation due to technological change. These include Joseph Stiglitz and Larry Mishel, who argue that a keen focus must be maintained on regulation and other policy

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2 Automation is defined here as "a device or system that accomplishes (partially or fully) a function that was previously, or conceivably could be, carried out (partially or fully) by a human operator." At this broad level, technologies of automation and artificial intelligence are interconnected. Raja Parasuraman et al., "A Model for Types and Levels of Human Interaction with Automation," *IEEE Transactions on Systems, Man and Cybernetics* 30(3) (2000).

3 Tom Standage, "Artificial Intelligence: The return of the machinery question," *The Economist*, June 25 2016. http://www.economist.com/news/special-report/21700761-after-many-false-starts-artificial-intelligence-has-taken-will-it-cause-mass.

4 David Autor and David Dorn, "How Technology Wrecks the Middle Class." *New York Times* April 24 2013, http://opinionator.blogs.nytimes.com/2013/08/24/how-technology-wrecks-the-middle-class/?_r=0.

5 Carl B. Frey and Michael Osbourne, "The Future of Employment: How Susceptible Are Jobs to Computerization" Oxford Martin School Programme on the Impacts of Future Technology Working Paper, (September 17, 2013).

6 Robert J. Gordon,"The Demise of U.S. Economic Growth: Restatement, Rebuttal and Reflections," National Bureau of Economic Research Working Paper, (February 2014), http://www.nber.org/papers/w19895.

changes concerning AI and automation in order to protect workers.[7] Economic researchers are closely tracking national labor markets and institutions as a means to examine the social and economic impact of AI in the near term.[8]

Beyond a purely economic lens, one could also approach these issues by examining local communities and individual lives. In recent years, researchers have begun to examine how automated systems relying on big data (from Uber to automated scheduling software used in large retailers) are destabilizing traditional dynamics between employers and employees.[9] Findings suggest that while these systems could be designed to empower workers, there are substantial ways in which these technologies as currently designed disempower workers, entrench discrimination, and generate unfair labor practices.[10]

AI as management

We now turn to examine the increasing use of AI technologies to replace and augment employee management. Shift scheduling is one of the ways in which AI technologies are used in such a way. While scheduling has always been a part of managing labor, AI technologies change the scale and precision of this task. Kronos,[11] one of the most widely used "workforce management" platforms with customers like Starbucks and Target, offers a suite of services including just-in-time scheduling. This kind of scheduling relies on the analyses of large datasets (from weather patterns to past sales) in order to predict peak hours of consumer demand and schedule employees accordingly. The fewer employees on the clock during slow periods, the more the employer saves on labor.

With many companies in the retail and service industry using just-in-time scheduling, it is now normal to demand that workers be available (proximate to the workplace, with the ability to receive a call or text) during all "open" hours, but only to assign short, four-hour shifts to workers on the clock. Often, these assignments are made at the last minute. Those not able to accommodate this kind of uncertainty (those with children, second

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7 Lawrence Mishel, John Schmitt and Heidi Shierholz, "Assessing the Job Polarization Explanation of Growing Wage Inequality," EPI Working Paper Paper (January 2013). http://www.epi.org/publication/wp295-assessing-jobpolarization-explanation-wage-inequality/. See also Joseph Stiglitz, *The Price of Inequality: How Today's Divided Society Endangers Our Future*, New York: W.W. Norton and Co, 2012.

8 Roosevelt Institute. "Technology and the Future of Work: The State of the Debate," White paper. Open Society Foundations Future of Work Project (April 2015), https://www.opensocietyfoundations.org/publications/technology-and-future-work-state-debate.

9 For a review of recent work, see Min Kyung Lee et al., "Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers," *CHI 2015 Proceedings* (April 2015), https://www.cs.cmu.edu/~mklee/materials/Publication/2015-CHI_algorithmic_management.pdf. For a clear case study, see Alex Rosenblat and Luke Stark, "Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers, " *International Journal of Communication* 10 (2016): 3758-3784.

10 See, for instance: Julia R. Henly, H. Luke Shaefer, and Elaine Waxman, "Nonstandard Work Schedules: Employer- and Employee-Driven Flexibility in Retail Jobs," *The Social Service Review* 80(4): 609-634 (2006); Leila Morsy and Richard Rothstein, "Parents' Non-Standard Work Schedules Make Adequate Childrearing Difficult," Economic Policy Institute Issue Brief (Aug. 6, 2015), http://www.epi.org/files/pdf/88777.pdf. Additional research and examples are discussed below.

11 http://www.kronos.com/

jobs, or other duties of care), are less employable. And, of course, uncertainty about hours necessarily means uncertainty about finances. According to a 2014 national survey of workers aged 26-32, three-quarters of hourly workers reported fluctuations in the hours they worked during the previous month, with hours fluctuating on average by 49 percent. For part-time workers, hours fluctuated by 87 percent. Moreover, 41 percent of hourly workers reported that they learn what their work schedule will be a week or *less* in advance.[12]

Though a few researchers have found that just-in-time scheduling provides valuable flexibility, far more researchers have documented the strain and precarity experienced by workers subject to these systems.[13] The adverse experiences of workers managed by such systems include chronic underemployment, financial instability, insufficient benefits and protections that are traditionally granted full-time employees, as well as the structural inability to plan for family or self-care (or even search for another job given the round-the-clock availability that such jobs demand from workers). Moreover, the workers most likely to be affected by these practices are disproportionately women and minorities.[14]

Companies using automated scheduling systems argue that efficiency gains achieved through such systems allow them to offer lower consumer prices. However, management researchers like Zeynep Ton have argued that the perceived trade-off between low prices and investment in labor is a false dichotomy. Her research shows that companies like Costco and Trader Joe's have been able to implement programs that invest in their employees while delivering low-cost goods and increased customer satisfaction.[15]

It is important to emphasize that any AI technology requires both the use of big datasets (such as past sales, email or call pattern data, etc.) and algorithms to optimize for specific goals, be they profitability or other discrete quantitative metrics, such as fuel consumption or job retention. In the examples above, minimizing labor costs appear to be the goal, outweighing all other considerations. Across the board, these goals are being set solely by employers.

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12 Susan J. Lambert, Peter J. Fugiel, and Julia R. Henly, "Precarious work schedules among early career employees in the US: A national snapshot," Employment Instability, Family Well-being, and Social Policy Network, University of Chicago (2014), https://ssascholars.uchicago.edu/sites/default/files/work-scheduling-study/files/lambert.fugiel.henly_.precarious_work_schedules.august2014_0.pdf.

13 Farhad Manjoo, "Uber's Business Model Could Change Your Work." *New York Times* 28 June, 2015, http://www.nytimes.com/2015/01/29/technology/personaltech/uber-a-rising-business-model.html?_r=0.

14 Carrie Gleason and Susan Lambert, "Uncertainty by the Hour," Position paper. Open Society Foundation Future of Work Project (2014), http://static.opensocietyfoundations.org/misc/future-of-work/just-in-time-workforce-technologies-and-low-wage-workers.pdf.

15 Zeynep Ton, "Why Good Jobs Are Good for Retailers," *Harvard Business Review*, (January 2012), https://hbr.org/2012/01/why-good-jobs-are-good-for-retailers.

Logistics by AI

Instant delivery is already augmented by automated and intelligent systems, and in the near future, possibly drones as well. Amazon's Prime Delivery, for example, has conditioned consumers to expect that anything they order can arrive at their doorstep in a matter of days, even hours. Fulfilling these expectations requires immense socio-technical systems that coordinate, sort, transport and track vast numbers of packages from one physical location to another. At every step of this process, from warehouses to distribution centers to trucks on local streets, this logistics work is often structured by AI systems.

For instance, UPS uses a proprietary analytics system, called a "telematics" system, to track, measure and manage UPS delivery truck drivers.[16] This system wirelessly transmits data from remote sensors, including RFID chips and GPS devices, to centralized computers, where the data is analyzed. In addition to the handheld devices drivers carry, there are over 200 sensors on any given truck, tracking and recording specific information about the movement, location, and speed of the truck, as well as monitoring specific actions, like fastening a seat belt. All of this information is transmitted, often in real time, to the computer screens of supervisors remote from the driver and truck. In this case, workforce management is centralized and the capabilities are vastly expanded. Meanwhile, the autonomy of frontline workers and managers is greatly reduced.

These systems are celebrated by those who sell and implement them as promoting safety and increasing efficiency regarding fuel, maintenance, and labor. Investigative journalist Esther Kaplan, who wrote about the conditions of UPS workers in 2014, pointed out that UPS corporate filings during the time the telematics system was introduced showed daily domestic package deliveries growing by 1.4 million between 2009 and 2013, while the total number of employees was reduced by 22,000.[17] Fewer workers doing more work means higher profit margins and happy shareholders. However, Kaplan found that driver safety and overall working conditions were reduced when these systems were implemented. This finding is supported by academic research from Karen Levy, who found that increased digital surveillance of long-haul truck drivers did not necessarily promote safety, but rather created new conditions of economic hardship for truck drivers who in turn developed workarounds that often made their work more dangerous.[18]

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16 Esther Kaplan, "The Spy Who Fired Me," *Harper's Weekly* (March 2015): 31-40.

17 Ibid, 32.

18 Karen Levy, "To fight trucker fatigue, focus on economics not electronics." *The Los Angeles Times*, June 28 2015, http://www.latimes.com/opinion/op-ed/la-oe-levy-trucker-fatigue-20140716-story.html.

A boss without a face

Over the last decade, monitoring and tracking of employees has become common in a variety of industries from retail to logistics (as in the UPS example) to office administration. This monitoring provides a primary source of "big data" used by complex algorithms and AI systems to make just-in-time decisions. These decisions are not just about scheduling, but about resource allocation and perceived job performance, among others. Remote and disembodied management can effectively shift power from frontline managers (people who can be approached face-to-face and who may understand nuanced situational context) to executives whose view is shaped by more impersonal aggregate employee data. In addition, power and control are also significantly shifted to engineers and those who design the systems, in which possible actions and reactions are structured in code months or even years in advance, potentially without knowledge of local context.

Remote management via AI system can make it harder to hold employers accountable for decisions made by "the system" that immediately and materially impact employees. For example, platforms like Uber (powered by big data and basic AI) serve to remotely control routes, pricing, compensation, and even interpersonal norms -- determinations and decisions that would traditionally be in the hands of human management.[19] Beyond simply obscuring the face and reasoning behind a given decision, this type of remote management is very often not recognized as "employee management" at all. Because these new technologies do not fit neatly into existing regulatory models, companies like Uber see themselves as technology companies, not managers of employees. Following this, such companies view their role as providing a marketplace only to facilitate connection, not an employer of workers, and not responsible to workers as a traditional employer would be. In this configuration, workers end up assuming the risks of employment without guaranteed benefits (such as decreased tax burdens, healthcare, and other workplace protections) or potential modes of redress.

AI as the door to opportunity

Hiring is an important domain where AI-driven processes are already being deployed in the workforce. This is an area for special scrutiny. As scholars have demonstrated, there are good reasons to assume that discrimination in hiring practices is a widespread occurrence, and this discrimination disproportionately affects women and minority applicants.[20] AI hiring systems have the troubling potential to encode, and perhaps

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[19] Min Kyung Lee et al., "Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers." *CHI 2015 Proceedings* (April 2015), https://www.cs.cmu.edu/~mklee/materials/Publication/2015-CHI_algorithmic_management.pdf.

[20] Solon Barocas and Andrew Selbst, "Big Data's Disparate Impact," *California Law Review* 104 (2016), http://ssrn.com/abstract=2477899.

amplify existing biases against historically disadvantaged groups. For instance, Cornerstone (formerly Evolv),[21] a "talent management" company, found a correlation between job retention and the distance an applicant lived from her workplace. However, the firm also realized that including this correlation in making hiring assessments might unfairly advantage people who were able to live near work (which might be in a high-rent neighborhood, or a neighborhood far from a given ethnic community), disparately impacting disadvantaged socio-economic groups. Considering the potential for discrimination, they did not include the metric in their system.[22] This example underscores that correcting bias and protecting workers does not happen without keen attention, and sometimes a metric needs to be discarded altogether. Such systems must be closely examined and audited to assess disparate impact, analyzing who is getting hired, who is not, and why.

AI's human caretakers

AI systems require more than computer code and human creativity. They require physical infrastructures to store, process, and transmit data. They require vast libraries of ancillary code (on which they along with most Internet technologies are dependent). They also require humans to maintain these infrastructures and tend to the "health" of the system. This labor is often invisible, at least in the context of the popular stories and ideas of what AI is and what it does. It includes custodial staff that clean data centers, maintenance or repair workers who fix broken servers, and what one reporter termed "data janitors," those who "clean" the data and prime it for analysis.[23] While most media discussions elide this kind of work or frame it as an obstacle that will soon be performed by computers, scholar Lilly Irani has pointed out that this kind of work is integral to AI systems, describing it as "the hidden labor that enables companies like Google to develop products around AI, machine learning, and big data."[24]

Taking a closer look at one of the roles that make up this class of "hidden labor," a 2014 *Wired* article by Adrian Chen described a day in the life of content moderators. In this article Chen followed workers in the Philippines, where much content moderation is done, as well as workers in the United States.[25] Sitting in front of screens, staring at a rapid stream of images or videos (think of a modern factory assembly line), a content moderator must quickly decide whether the content is objectionable given a particular set of policies. Much of this work is outsourced at low wages. However, because

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21 https://www.cornerstoneondemand.com/

22 Dustin Volz, "Silicon Valley Thinks It Has the Answer to Its Diversity Problem," *National Journal*, Sep 26 2014, http://www.theatlantic.com/politics/archive/2014/09/silicon-valley-thinks-it-has-the-answer-to-its-diversity-problem/431334/.

23 Steve Lohr,"For Big-Data Scientists, 'Janitor Work' is Key Hurdle to Insights." *New York Times* August 17 2014, http://www.nytimes.com/2014/08/18/technology/for-big-data-scientists-hurdle-to-insights-is-janitor-work.html.

24 Lilly Irani, "Justice for 'Data Janitors, " *Public Books,* (January 2015), http://www.publicbooks.org/nonfiction/justice-for-data-janitors.

25 Adrian Chen, "The Laborers Who Keep Dick Pics and Beheadings Out of Your Facebook Feed," *Wired*, October 23 2014, http://www.wired.com/2014/10/content-moderation/.

companies want moderators to have a deep cultural context informing many of these assessments (such as discerning pornography from art in a museum), there are also many workers within the United States who perform these jobs, which are also low-wage contract work. Beyond the paid labor, everyday users of platforms are encouraged to 'flag' and label inappropriate content, which helps to train underlying AI models.[26] This work is valuable but completely unpaid. The lesson here is that even the most sophisticated machine learning object recognition algorithms are still far away from automatically detecting the appropriate cultural meaning of such images, i.e. from appropriately classifying them for use in AI systems. These algorithms still need humans, checking and approving the data before it is entered into the system, even when they are unaware that this is what they are doing. This constitutive need for "artificial artificial intelligence" (the tagline for what is provided by Amazon's Mechanical Turk, a microtasking platform) is an example of the kinds of work that is newly necessary as an accompaniment to AI systems.

AI across the labor spectrum

Discussions about the future of AI and labor tend to focus on what are traditionally conceived of as low-wage, working class jobs such as manufacturing, trucking, and retail or service work. With justification, researchers have focused on these jobs because the vulnerability of workers in these industries appears to be most acute: with the decline of unions and collective bargaining power in conjunction with wage stagnation and increasing income inequality, the working class and working poor are increasingly finding themselves in difficult positions.[27]

However, research on the rapidly expanding deployment of AI systems demonstrates that the impact of this deployment will be felt across sectors, from so-termed "low skilled" or "semi-skilled" work that may not require specialized training or an advanced degree, to professional and expert work that requires advanced degrees and highly specialized experience.[28] Generalized repetitive work that is composed of basic tasks that can, in theory, adhere to a specific ruleset (e.g. accounting, law, and radiology) is the quality that invites the possibility of automation, irrespective of the education or expertise required of a human performing the work.

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[26] Kate Crawford and Tarleton Gillespie, "What is a flag for? Social media reporting tools and the vocabulary of complaint," *New Media & Society* 18(3): 410-428 (2016), http://nms.sagepub.com/content/18/3/410.abstract

[27] For example, see the speech by Jason Furman, Chairman of the Council of Economic Advisers, at *AI Now* on July 7, 2016: "Is This Time Different? The Opportunities and Challenges of AI," https://www.whitehouse.gov/sites/default/files/page/files/20160707_cea_ai_furman.pdf

[28] For instance, see Henry Siu and Nir Jaimovich, "Jobless Recoveries," Third Way, April 8 2015, http://faculty.arts.ubc.ca/hsiu/pubs/NEXT_-_Jobless_Recoveries.pdf. See also Tom Standage,"Artificial Intelligence: The return of the machinery question," *The Economist*, 25 Jun 2016, http://www.economist.com/news/special-report/21700761-after-many-false-starts-artificial-intelligence-has-taken-will-it-cause-mass.

Consider the legal profession. According to a variety of pundits, lawyers are in danger of being made obsolete by AI. Like many headlines, this claim is overblown, at least in the near-term. However, like the examples above, the implications of AI for lawyers are not so much about job *replacement* as they are about how AI restructures the job. AI is currently and will continue to change what lawyers do and what is perceived as "legal expertise." In a report released in early 2016, legal scholar Dana Remus and economist Frank Levy analyzed the actual billed hours by lawyers at two law firms.[29] What the researchers found was that only a modest portion of the activities billed would be able to be automated in the near future. AI technology would not be feasible for all the tasks, including reading and analyzing documents, counseling, appearing in court, and arguing in front of juries. In fact, while software programs that are meant to review and surface significant content in the context of a case document review exist, these software programs require a great deal of complex analysis and time-consuming work by humans, involving planning and structuring the program for each specific case. Moreover, many of the tasks that involved automated review or the automation of filling out forms (performed by companies like LegalZoom or Rocket Lawyer) are tasks that junior lawyers or paralegals perform, not senior level partners. This more fine-grained analysis of AI's impact on lawyers demonstrates that on one hand, claims of job replacement are often overstated, but that, on the other hand, professional work that requires advanced education will also be impacted *alongside* low-wage work.

Expert AI will impact expert humans

Even as AI systems are called upon to perform rote tasks and immense calculations, they are also increasingly designed to augment or even replace human expertise. The example of law, above, is one such potential case. Expert-augmenting AI is also being developed in the medical field and has already shaped the current field of aviation. For instance, today, a modern aircraft spends most of its time in the air under the control of a set of technologies, including an autopilot, GPS, and flight management system, which govern almost everything it does, relatively autonomously. This has allowed aviation safety to advance tremendously in the past decades. Nonetheless, researchers have found that the ways in which these advances have developed have come at a certain cost. While automation is often assumed to relieve humans of menial tasks, freeing them to think about more important decisions, the field of human factors engineering research has proven this not to be the case.[30] Specifically, in aviation, pilot awareness has been documented to generally decrease with increased automation, leading to skill atrophy or

[29] Dana Remus and Frank Levy, "Can Robots Be Lawyers? Computers, Lawyers, and the Practice of Law," Working paper, December 30, 2015, http://ssrn.com/abstract=2701092.

[30] Laine Bainbridge, "Ironies of Automation," *Automatica* 19 (1983): 775-779; Raja Parasuraman and V. Riley, "Humans and Automation: Use, Misuse, Disuse, Abuse," *Human Factors* June 39(2) (1997): 230-253.

even deskilling.[31] A recent article also observed that a rising trend of physician burnout was linked to the use of electronic health records and computer-entry systems.[32]

Moreover, automation raises issues of professional responsibility. For example, the pilot and co-pilot may only be actively in control of the aircraft for a few minutes on any given flight; yet pilots are viewed as being in control and responsible, both by the general public and according to existing laws and regulations.[33] This distributed control raises questions about accountability in automated and AI systems as well professional identity and expertise. Beyond aviation, we can imagine how these kinds of augmented systems raise important questions. For example, a police officer might find herself in a similar situation when working with a predictive policing system: is she, or the system, ultimately responsible for determining an arrest? Alternatively, how should a healthcare professional negotiate when working with a diagnostic system? Which expertise is "most expert," in what contexts is "overriding the system" allowed, and how would this impact liability?

Questions to consider

Some questions to consider regarding the rapid introduction of AI systems into labor sectors:

- Does the development of AI mean a future with rapidly declining employment? If so, what would such a future look like and who will be hardest hit? How can we ensure equitable distribution of resources in the event of such a future?
- What impact does AI have on the power dynamics between employers and employees, and in which contexts?
- How might AI provide new mechanisms of control over workers and leave them more vulnerable to exploitation? Are AI systems already creating these dynamics, and if so, how can we best assess their impact?
- Alternatively, how might AI systems empower disadvantaged workers and effectively augment skill, expertise, and agency?
- What would AI systems used for worker management look like if their goals were set by workers or other stakeholders, as opposed to (or in collaboration with) employers? How might AI systems used for worker management introduce a more balanced way to set and evaluate goals between employers and workers?
- When AI systems are deployed, whose labor is required for computer software to appear 'intelligent' (e.g. when humans are used to 'perform' the last mile in AI systems)? How is this work valued if it is kept hidden?

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[31] Nadine B. Sarter, David D. Woods, Charles E. Billings, "Automation Surprises," in *Handbook of Human Factors & Ergonomics* 2nd ed., G. Salvendy, ed. New York: Wiley, 1997.

[32] Tait D. Shanafelt et al., "Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction," *Mayo Clinic Proc* XXX (2016): 1-13.

[33] M.C. Elish and Tim Hwang, "Praise the Machine! Punish the Human! The Contradictory History of Accountability in Automated Aviation," Data & Society Intelligence & Autonomy Working Paper, 2015, http://ssrn.com/abstract=2720477.

- How should professional discretion - such as challenging a decision - be exercised by experts whose work is partially automated, or augmented by AI? What social, economic and institutional pressures might come to bear?
- What will the shift to increasingly automated decision making mean for perceptions of expertise and the value of human capabilities? How will this change the imperatives of primary, secondary and postsecondary education? Further in the future, what role will work play in society and our constitution of identity and self-worth?