AI in the Workplace

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I. Introduction

Artificial intelligence (AI) is everywhere – in the home (Alexa), on the road (autonomous cars), and now, increasingly, in the workplace. AI likely will disrupt every context it touches. In the workplace, for example, it will eliminate broad categories of jobs, create broad categories of new ones, and transform others.[1]

To say that AI will transform the workplace[2] -- and the world – as we know it is a significant understatement. A report from the International Bar Association calls it the fourth industrial revolution.[3] An equally apt description might be a fourth era in production.[4]

The law has not yet even begun to catch up.[5] Employers already are using AI to screen job applications, interview and assess applicants, track the physical movement of workers, assess performance and recommend promotions and pay rates, and monitor workers' emails and phone calls and non-worktime social media activity.[6] But the laws governing the workplace largely predate the digital age.

This article provides an overview of the ways that AI will transform the workplace and the myriad ways it will test and stretch existing law. It is intended to provide a starting point – not an end – to discussion. Part II of the article describes the explosion in AI and the types of technology it entails. Part III describes the myriad ways AI will transform the workplace and the legal implications raised. Part IV concludes.

II. The Explosion in AI

AI can loosely be defined as "A branch of computer science dealing with the simulation of intelligent behavior in computers."[7] AI gathers and analyzes huge troughs of data and uses it

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[1] *See generally* AJAY AGRAWAL, JOSHUA GANS, & AVI GOLDFARB, PREDICTION MACHINES: THE SIMPLE ECONOMICS OF ARTIFICIAL INTELLIGENCE (2018); PAUL R. DAUGHERTY & H. JAMES WILSON, HUMAN + MACHINE: REIMAGINING WORK IN THE AGE OF AI (2018).

[2] *AI-spy*, THE ECONOMIST (March 31, 2018) at 13 (*AI-Spy*); *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 7-8.

[3] INTERNATIONAL BAR ASSOCIATION GLOBAL EMPLOYMENT INSTITUTE, ARTIFICIAL INTELLIGENCE AND ROBOTICS AND THEIR IMPACT ON THE WORKPLACE (April 2017) ("IBA"). The first was industrialization; the second was electrification; the third was digitalization. *Id*.

[4] *See* Katherine Van Wezel Stone, *Rupture and Invention: The Changing Nature of Work and the Implications for Social Policy*, in RICHARD BALES & CHARLOTTE GARDEN, EDS., THE CAMBRIDGE HANDBOOK OF U.S. LABOR LAW: REVIVING AMERICAN LABOR FOR A 21ST CENTURY ECONOMY (forthcoming). The first was artisanal production; the second was industrial production; the third was digital production; the fourth is a new era of workplace production.

[5] *AI-Spy*, *supra* note 2, at 13 ("Few laws govern how data are collected at work…").

[6] *See infra* Part III.

[7] Merriam-Webster, https://www.merriam-webster.com/dictionary/artificial%20intelligence.

to sense, comprehend, act, and learn.[8] It includes machine learning, pattern recognition, problem solving, and adaption to changing circumstances.[9]

Key to the recent explosion of AI is rapidly increasing computer power and the decreasing cost of harnessing it.[10] As the cost of processing data decreases, the ability to use existing data to create new data – predictions – increases. These predictions can be used to control autonomous cars, manage supply chains, and monitor peoples' abilities, actions, and proclivities.

From 2015 to 2017, AI-related mergers and acquisitions increased about 26-fold, to $22 billion.[11] The corporate market for AI software, hardware, and services is forecast to grow from $12 billion in 2017 to $58 billion in 2021.[12] This investment money is being channeled into data mining and deep learning, robotics, computer vision, and speech recognition.

A. Data Mining and Deep Learning

The volume of stored data is huge and growing exponentially. By one estimate, the worldwide volume of data is expected to be more than 100 zettabytes (100,000,000,000,000,000,000,000) in 2020, ten times the volume in 2006.[13] This data is collected from multiple sources[14] – from social media, internet searches, trial-and-error (think of an autonomous vacuum cleaner mapping a room), and electronic payment transactions. It can be aggregated (e.g., Google using data on millions of past searches to predict what you are looking for on a current search) or individualized (e.g., Amazon predicting from past purchases what you will want to purchase – the next step, coming soon, is Amazon shipping items to you before you even have ordered them[15]).

Though data can be valuable in their own right[16] (consider Facebook's sale of data to mobile phone and other device makers[17]), the highest-level value is in analyzing that data to

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[8] DAUGHERTY & WILSON, *supra* note 1, at 3.
[9] Bernard Marr, *The Key Definitions Of Artificial Intelligence (AI) That Explain Its Importance*, FORBES (Feb, 14, 2018), at https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/#75c54dbf4f5d.
[10] AGRAWAL ET AL., *supra* note 1, at 11-17.
[11] *AI-Spy*, *supra* note 2, at 13.
[12] *Leave it to the Experts*, THE ECONOMIST (March 31, 2018), Special Report at 10.
[13] IBA, *supra* note 3, at 99 (citing Bitkom, Big Data im Praxiseinsatz – Szenarien, Beispiele, Effekte (2012) at 12).
[14] IBA, *supra* note 3, at 99.
[15] AGRAWAL ET AL., *supra* note 1, at 16.
[16] *Id*. at 44-51 (characterizing data as "the new oil").
[17] Gabriel J.X. Dance et al., *Facebook Gave Device Makers Deep Access to Data on Users and Friends*, New York Times (June 3, 2018), at https://www.nytimes.com/interactive/2018/06/03/technology/facebook-device-partners-users-friends-data.html.

make predictions.[18] This is accomplished by using data to create a set of algorithms that attempt to model high-level abstractions.[19] For example, feeding a computer a million images of cats with the label "cat", and a similar number of other animals without the "cat" label, and the machine will "learn"[20] through trial-and-error to distinguish cats from other four-legged animals.[21] Feed enough medical images to a computer and the job of radiologist may become obsolete.[22]

B. Robotics

Robots are hardly new on the factory floor. From assembly-line conveyor belts to robotic arms, they have been a staple of factories for more than a century.[23] Robots enabled with AI, however, can "learn" new tasks in ways that their predecessors could not. Traditionally, engineers have programmed robotic arms to accomplish discreet, precise tasks (such as riveting a panel on the door frame of a car); if the task changes even minutely (such as if a new car model with slightly different specifications is introduced), the arm must be reprogrammed.[24]

AI, however, allows a robotic arm to adapt on its own. "Deep reinforcement learning" occurs when a robot is "told" (perhaps with a photo) of a desired outcome and then uses trial and error to find a solution.[25] Moreover, robots can use "distributed learning" to learn from one another, so eight arms working together for an hour can "learn" what one arm could learn in one hour, and then can instantly share that knowledge with all the other robots on the factory floor.[26]

Moreover, this ability to "learn" makes it possible for humans and robots to work together on the factory floor. A robotic arm can be equipped with sensors allowing the arm to recognize various objects and avoid unsafe contact with humans.[27] This permits humans and robots to complement each other on the factory floor – for example, the robot could do the heavy lifting and repetitive tasks while the person does intricate work requiring independent judgment or a high degree of manual dexterity.[28] Such complementarity is expected to spread

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[18] AGRAWAL ET AL., *supra* note 1, at 23-51.
[19] IBA, *supra* note 3, at 10.
[20] *See* DAUGHERTY & WILSON, *supra* note 1, at 60-63 (describing different types of machine learning).
[21] AGRAWAL ET AL., *supra* note 1, at 38.
[22] *Id*. at 145-48.
[23] DAUGHERTY & WILSON, *supra* note 1, at 23.
[24] *Id*. at 21.
[25] *Id*.
[26] *Id*. at 22.
[27] *Id*.
[28] *Id*. at 22, 148.

far beyond factories and into, for example, health care, where robots could move people from wheelchairs into beds or help blind persons find their way.[29]

Examples of such "cobots" abound.[30] A "Lowebot" wanders the aisles of Lowe's stores, "answering shoppers' questions and checking stock levels on shelves."[31] A cobot at a Mercedes plant lifts heavy components, and then a human worker uses a console with buttons and a visual display to guide the component into its proper place.[32] Amazon warehouses are full of cobots that deliver merchandise to humans for packaging and shipment.[33]

C. Computer Vision, Amplification, and Speech Recognition

Computer vision "teach[es] computers to identify, categorize, and understand the content within images and video, mimicking and extending what the human visual system does."[34] Now-familiar examples include teaching autonomous cars to distinguish pedestrians from inanimate objects, or to recognize wildlife that might dart onto the road and create a hazard. Computer vision also, as described above, enables factory robots to detect human workers and avoid injuring them.

AI can amplify a human worker's physical or sensory abilities, allowing the human to do something she otherwise couldn't do, or to do it better. For example, a designer can use Autodesk's Dreamcatcher software to create alternative design systems based on parameters set by the human designer such as functional requirements, material type, manufacturing method, performance criteria, and cost restrictions.[35] Upskill's augmented reality program Skylight uses smart glasses to visually overlay precise instructions over a worker's natural field of vision, significantly reducing training time and mistakes.[36] Applications include jobs in field service (such as servicing wind turbines), manufacturing (such as wiring the electrical systems in airplanes), and materials handling (such as picking and kitting in warehouses).[37]

Much as AI is enabling computers to "learn" from "visual" inputs, AI also is progressing rapidly in speech and audio recognition. Computers can be used to analyze audio signals in

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[29] IBA, *supra* note 3, at 54.

[30] Cobots are "[r]obots that operate at slower speeds and are fitted with sensors to enable safe collaboratioin with human workers." DAUGHERTY & WILSON, *supra* note 1, at 65.

[31] *Id*. at 91, citing Harriet Taylor, Lowe's introduces LoweBot, a new autonomous in-store robot, CNBC (Aug. 30, 2016), at https://www.cnbc.com/2016/08/30/lowes-introduces-lowebot-a-new-autonomous-in-store-robot.html.

[32] DAUGHERTY & WILSON, *supra* note 1, at 148-49.

[33] *Id*. at 150.

[34] *Id*. at 64.

[35] https://autodeskresearch.com/projects/dreamcatcher.

[36] https://upskill.io/skylight/how-it-works/.

[37] https://upskill.io/skylight/functions/material-handling/.

high-noise environments like factory floors.[38] They are becoming increasingly adept at recognizing speech and converting it to text, translating it into different languages, and using it to control other machines or devices.[39] AI can use both audio and video inputs to analyze, for example, a person's honesty, sentiment, and personality.[40] As described below, AI is increasingly being used this way to conduct job interviews.[41]

III. AI in the Workplace

AI permeates the workplace, from the hiring process to evaluating performance to monitoring an employee's likelihood of terminating the employment relationship. Each application is fraught with legal implications.

A. Hiring

1. Recruiting and Sorting Applicants

Johnson & Johnson, a consumer products company, receives 1.2 million applications each year for 25,000 open positions, a ratio of nearly 50:1,[42] and is hardly alone.[43] Most applicants are unqualified on one or more criteria.[44] AI systems, like the one provided by talent-acquisition company HiredScore,[45] can use keyword searches to scan and sort applications much faster than a human can.[46] Even if an applicant is unqualified for a job for which s/he has applied, that applicant may be a perfect fit for a different job at the same company. AI systems can re-direct applicants to job openings for which the applicant might be a better fit, or keep the application "on file" and notify the applicant when a suitable job later becomes available.[47] HiredScore, for example, maintains a database of applicants and, when a vacancy opens, automatically creates a shortlist of previous applicants who would be a good fit for the new opening.[48]

AI systems also can go beyond an applicant's resumé and cover letter to discern patterns that might predict performance. Nvidia, for example, created an in-house applicant-

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[38] DAUGHERTY & WILSON, *supra* note 1, at 64.
[39] *Id*.
[40] *See infra* Part ___.
[41] *See infra* Part ___.
[42] *Hire Education*, *supra* note 2, at 7.
[43] *See* sources cited in David D. Savage & Richard Bales, *Video Games in Job Interviews: Using Algorithms to Minimize Discrimination and Unconscious Bias*, 32 ABA J. LAB. & EMPLOY. L. 211, 215 nn. 37-42 (2017).
[44] *Id*.
[45] https://hiredscore.com/.
[46] *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 7.
[47] *Id*. at 8.
[48] *Id*.

tracking software package, and found that applicants submitting particularly long resumés tend to underperform on the job compared to their more concise peers.[49] Other measurable factors might correlate with job tenure, upward advancement, disciplinary record, or personality fit with the company.

2. Interviewing and Evaluating Applicants.

Paper applications and job interviews alone are not particularly effective methods of evaluating job candidates, often because the persons responsible for gathering and interpreting information related to the hiring process may have poor judgement or preferences that poorly align with company objectives.[50] Data analytics can augment the pool of information and produce better results, often by eliminating various forms of bias.[51] AI using data analytics typically do so using any of three different sources of information: job tests, video-recorded interviews, and videogames.

a. Job Tests

Paper-and-pencil (or, more often today, online) measuring job-skill aptitude or personality have existed for decades and, so long as they don't ask personal questions, are relatively uncontroversial.[52] What's new today, however, is the ability of AI to match applicants' scores on such tests – or even answers to particular questions – to their job performance down the road, and then to use the resulting data to predict the performance of new applicants.

For example, Mitchell Hoffman, Lisa Kahn, and Danielle Li studied hiring at fifteen companies who employing workers in the same low-skilled service sector.[53] Because of the low-skilled nature of the work and high turnover, a particularly important criterion in the hiring process was the likelihood that the applicant would remain on the job for as long as possible.[54] Hoffman et al. found that when the companies used an objective and verifiable test along with normal interviews, managers conforming their hiring decisions most closely to the test results yielded a 15% increase in tenure as compared to the managers conforming the least to the test

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[49] *Id*. at 7-8.
[50] Mitchell Hoffman, Lisa B. Kahn, & Danielle Li, *Discretion in Hiring*, National Bureay of Economic Research Working Paper 21709 at 1, http://www.nber.org/papers/w21709.
[51] *Id*.; *see also* Josh Bersin, Big Data in Human Resources: Talent Analytics (People Analytics) Comes of Age, Forbes (Feb. 17, 2013), https://www.forbes.com/sites/joshbersin/2013/02/17/bigdata-in-human-resources-talent-analytics-comes-of-age/#7a2dc5dd4cd0.
[52] Get cite from Understanding book. _________________
[53] Hoffman et al., *supra* note __ (3 up), at 1.
[54] *Id*. at 6-7.

results.[55] When discretion was removed entirely and hiring corresponded exclusively to the test results, tenure increased further.[56]

b. Video-recorded Interviews

Prehire video-recorded interviews recently have become a commonly used tool in the recruiter's toolbox.[57] Interview questions are specifically designed for the particular open position.[58] Candidates digitally video-record their answers, usually online from home or their current office, using their desktop or laptop computer. The video is then transmitted online to a company such as HireVue[59] which uses AI to analyze the video. HireVue claims to provide such services for 700+ companies,[60] including Intel,[61] Accenture,[62] and Unilever.[63]

HireVue then analyzes the applicant's language patterns, verbal skills, and emotion[64] by, for example, identifying facial expressions, intonation, gestures, and word choice.[65] HireVue then uses its machine learning algorithms to, evaluate the candidate's work style, ability to work with others, and general cognitive ability, and uses this to prioritize applicants.[66]

The questions asked in a video-recorded interview are indistinguishable from the types of questions asked in a typical job interview, at least for now. And employers have used in-person job interviews for centuries to evaluate an applicant's body language and word choice for characteristics such as personality and cognitive ability. What is different about video-recorded interviews is that they can be stored and analyzed indefinitely.

In ten years, the applicant analysis HireVue is now able to provide its clients probably will be seen as rudimentary and crude. As with job tests,[67] HireVue's real ability to add value to the job-application process will come down the road, after it has tracked the success or failure of the applicants its clients have hired and used AI to correlate the interview idiosyncrasies of

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[55] *Id*. at 21.
[56] *See*, *e.g.*, *id*. at 2.
[57] *See* DAUGHERTY & WILSON, *supra* note 1, at 51; *Bartleby: Get with the program*, The Economist 55 (June 23, 2018); *Hire Education*, *supra* note 2, at 8.
[58] DAUGHERTY & WILSON, *supra* note 1, at 51.
[59] https://www.hirevue.com/.
[60] https://www.hirevue.com/products/video-interviewing/ondemand.
[61] *Id*.
[62] *Hire Education*, *supra* note 2, at 8.
[63] DAUGHERTY & WILSON, *supra* note 1, at 51.
[64] https://www.hirevue.com/products/assessments/pre-employment-video-assessments.
[65] *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 8; *Bartleby: Get with the program*, The Economist 55 (June 23, 2018) (explaining that successful applicants maintain eye contact with the camera throughout the interview, sound confident, sit up straight, and avoid thrashing gesticulation).
[66] https://www.hirevue.com/products/assessments/pre-employment-video-assessments.
[67] *See supra* Part III.A.2.a.

millions of video-recorded applicants with their success or failure on the job, and then to use the resulting data to predict the performance of new applicants.

This raises a host of legal and practical issues. Under current law, HireVue presumably owns the videos, much as Facebook owns the user-generated data supplied by its users or Google owns the data it has gathered from online searches on its platform. If an applicant interviews for a job through HireVue, can she demand, after the job search is over, that HireVue delete her video-recorded interview? The answer probably is yes under European data privacy laws,[68] but there is no equivalent data privacy law in the U.S. If she interviews through HireVue for a second job, can HireVue access the video from her first application to refine its analysis of her? Can it create an "applicant profile" of her that will follow her throughout her life? Again, probably not under European law, but there is nothing in current U.S. law that would stop HireVue from doing so. One bad interview day could mar an applicant's job prospects for life.

c. Videogames[69]

Employers and companies providing job-application-processing services are increasingly using videogames to screen and sort applicants.[70] Videogames usually are used at the early stage of the search process.[71] Companies such as Knack,[72] Deloitte,[73] Pymetrics,[74] and HireVue[75] (through its acquisition of MindX[76]) have applicants play a video game for about 20 minutes, then analyze the applicants' risk appetite, mental agility, persistence,[77] and the ability to read emotional versus contextual clues.[78] For example, "Wasabi Waiter", designed by Knack, places the job applicant in the role of a server at a sushi restaurant who must figure out which dishes to recommend to customers. The designer of the game, Guy Halfteck, explains:

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[68] The EU General Data Protection Regulation (GDPR) Article 17 provides a "right to be forgotten" (also known as "data erasure"). It entitles a person to require an entity holding data on the person to erase his/her personal data, cease further dissemination of the data, and potentially have third parties halt processing of the data. The conditions for erasure include the data no longer being relevant to original purposes for processing (in this context, the original job interview), or the person withdrawing consent.

[69] For a comprehensive discussion of using video games in the applicant-screening process, and the legal implications of the same, see Savage & Bales, *supra* note __. Portions of this section have been taken from that article.

[70] *See* DAUGHERTY & WILSON, *supra* note 1, at 51; *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 8.

[71] *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 8.

[72] https://www.knack.it/.

[73] Rob Davies, *Everything to Play for as Employers Turn to Video Games in Recruitment Drive*, GUARDIAN (Nov. 28, 2015), at https://www.theguardian.com/money/2015/nov/28/psychometric-tests-games-recruitment-interview.

[74] https://www.pymetrics.com/employers/.

[75] https://www.hirevue.com/blog/7-things-you-need-to-know-about-game-based-cognitive-assessments.

[76] https://www.mindx.co/.

[77] Davies, *supra* note __.

[78] DAUGHERTY & WILSON, *supra* note 1, at 51.

> "[t]he player has to engage in multiple micro-decisions, think about prioritizing, about [the] sequence of taking actions, about persisting when the game becomes more challenging … The game collects all the data points about the entirety of the behavior during the game … Then we analyze that data to extract insight into the intellectual and personal makeup of that person."[79]

The primary argument against the use of videogames in the job application process is the possibility of discrimination. They might, for example, incorporate or even amplify the biases of the programmers creating the game, or be based on past hiring data that may have been discriminatory, or disparately impact older applicants less accustomed to playing video games than their younger counterparts.[80] On the other hand, a well-designed game, re-examined tweaked regularly to remove any signs of bias, could be less discriminatory than traditional hiring techniques by removing the biases of human interviewers and helping candidates without traditional qualifications.[81] Because these arguments can be made, to one degree or another, about all algorithms used in the hiring process, they will be addressed in the next section.

3. Discrimination Concerns

Critics of using AI in the hiring process have argued that it can amplify or mask discriminatory prejudices and disproportionately exclude underrepresented groups of workers.[82] Proponents of AI argue that it can reduce discrimination by minimizing or eliminating human judgment, which arguably has more discriminatory tendencies than AI, and by identifying hiring practices that are unintentionally exclusionary.[83] Regardless, using AI in the hiring process raises issues that as of yet are largely unaddressed by existing caselaw.

a. Creating Bias

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[79] *Could Video Games Be the Next Job Interview?*, ALL TECH CONSIDERED (Dec. 1, 2013, 8:13 AM), http://www.npr.org/sections/alltechconsidered/2013/12/01/246999632/playing-the-game-to-get-the-job (quotations in original).

[80] Catherine Rampell, *Your Next Job Application Could Involve a Video Game*, N.Y. TIMES MAGAZINE (Jan. 22, 2014), http://www.nytimes.com/2014/01/26/magazine/your-next-job-application-could-involve-a-video-game.html.

[81] *Hire Education*, THE ECONOMIST (March 31, 2018), Special Report at 8.

[82] *See*, *e.g.*, Jennifer Alsever, *Is Software Better at Managing People Than You Are?*, FORTUNE (Mar. 21, 2016, 9:00 AM), http://fortune.com/2016/03/21/software-algorithms-hiring/; Solon Barocas & Andrew D. Selbst, *Big Data's Disparate Impact*, 104 CALIF. L. REV. 671 (2016); Allan G. King & Marko J. Mrkonich, *"Big Data" and the Risk of Employment Discrimination*, 68 OKLA. L. REV. 555 (2016); Kevin McGowan, *Big Bad Data May Be Triggering Discrimination*, BLOOMBERG LAW (Aug. 15, 2016), https://bol.bna.com/big-bad-data-may-be-triggering-discrimination/; Dustin Volz, *Silicon Valley Thinks It Has the Answer to Its Diversity Problem*, THE ATLANTIC (Sept. 26, 2014), http://www.theatlantic.com/politics/archive/2014/09/silicon-valley-thinks-it-has-the-answer-to-its-diversity-problem/431334/.

[83] *See*, *e.g.*, Savage & Bales, *supra* note __, at 213-14.

AI can create hiring bias in several, often non-obvious, ways. First, algorithms are "garbage in, garbage out" (or "bias in, bias out").[84] If the humans providing the search criteria or input data, or the programmers creating the algorithm, are themselves biased, and that bias infects the algorithm, the output likely will reflect that bias. Algorithms analyzing video-recorded interviews, by flagging certain voice intonations or speech patterns or hand gestures, might disproportionately certain groups of applicants based on race, ethnicity, geographic origin, or socio-economic background.

More subtly, the creators of algorithms tend to rely on an employer's past hiring data to build predictive formulas.[85] Companies want to replicate their best workers, so they will use algorithms that will statistically match job applicants with these workers. If a company does not have a history of hiring a certain class or classification of individuals, the algorithms that are built using past hiring data will systematically exclude these individuals from being considered for the open position. For example, if a fire department is comprised almost exclusively of men, past hiring data might emphasize the importance of physical relative to endurance. Likewise, Silicon Valley has long been criticized for its white-male-dominated workplaces;[86] a hiring algorithm based on current workplace demographics likely will replicate and entrench past hiring practices.[87] Similarly, using AI in hiring can result in "classification bias", which Pauline Kim defines as "the use of classification schemes that have the effect of exacerbating inequality or disadvantage along the lines of race, sex or other protected category."[88]

Second, using AI in hiring can replicate or amplify real prejudices that already exist in society. For example, a study by Latanya Sweeney, at the time the chief technology officer for the United States Federal Trade Commission, found that when a Google search is performed on a person's name, Google AdSense is much more likely to generate ads suggesting an arrest record for persons with names given primarily to Black babies (DeShawn, Darnell, Jermaine) than for persons with names given primarily to White babies (Geoffrey, Jill, Emma).[89] The mere suggestion of a possibility of an arrest record – even if such a record does not in fact exist – might well persuade a hiring manager to choose the "less risky" candidate.[90]

Third, algorithms can adopt facially neutral criteria to create bias where none existed before. For example, in a different study, Anja Lambrecht and Catherine Tucker placed ads for

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[84] DAUGHERTY & WILSON, *supra* note 1, at 121.
[85] Much of this paragraph is taken from Savage & Bales, *supra* note __, at 218.
[86] Stacy Jones & Jaclyn Trop, *See How the Big Tech Companies Compare on Employee Diversity*, FORTUNE (July 30, 2015, 9:00 AM), http://fortune.com/2015/07/30/tech-companies-diveristy/.
[87] Saul Hansell, Google Answer to Filling Jobs Is an Algorithm, N.Y. TIMES (Jan. 3, 2007), http://www.nytimes.com/2007/01/03/technology/03google.html?_r=1.
[88] Pauline T. Kim, *Data-Driven Discrimination at Work*, 58 WM. & MARY L. REV. 857, 857 (2017).
[89] Latanya Sweeney, *Discrimination in Online Ad Delivery*, 56 COMMUNICATIONS OF THE ACM 44 (2013), available at https://arxiv.org/abs/1301.6822.
[90] AGRAWAL ET AL., *supra* note 1, at 195-96.

jobs in STEM (science, technology, engineering, and math) subjects.[91] Facebook was significantly more likely to show such ads to men than to women, not because of conscious bias of Facebook algorithm-writers, but because young women, who control a high proportion of household spending, are a more valuable demographic than men.[92] Ads targeting women were more expensive, so the algorithm targeted the ads toward men, where the return on investment would be higher.[93]

Fourth, using AI in the hiring process can have unintended effects on certain groups. For example, using a video game to screen applications may disadvantage older applicants if, as a group, older applicants do not perform on the games as well as younger applicants.[94] However, at least one study[95] has found that "older"[96] players compensated for slower reaction times by more effectively planning and employing a successful strategy.

These potential sources of bias all raise issues of disparate impact discrimination.[97] Disparate impact discrimination occurs when a facially neutral hiring criterion (e.g., success on a videogame) has the unintended effect of disproportionately excluding members of a protected classification such as race,[98] sex,[99] or age.[100] A person claiming this type of discrimination generally must point to a specific employment practice that causes the discriminatory impact – which, as described below, may be difficult to do if the particular practice is buried in the "black box"[101] of an algorithm. However, if the person can show that the elements of the employer's decisionmaking process cannot be separated for analysis, the entire decisionmaking process (presumably, the output of the algorithm) may be analyzed. Once discriminatory impact is

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[91] Anja Lambrecht & Catherine Tucker, *Algorithmic Bias? An Empirical Study into Apparent Gender-Based Discrimination in the Display of STEM Career Ads*, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2852260.
[92] *Bartleby: Get with the program*, THE ECONOMIST 55 (June 23, 2018).
[93] AGRAWAL ET AL., *supra* note 1, at 196.
[94] Rampell, *supra* note__; Taylor Casti, *Video Games Could One Day Replace Job Interviews*, THE HUFFINGTON POST (Jan. 23, 2014) http://www.huffingtonpost.com/2014/01/23/video-games-job-interviews-applications-startups_n_4647245.html; Anastasia Anashkina, *Will Video Games Replace Job Interviews?*, CNN MONEY, http://money.cnn.com/video/pf/2014/01/09/pf-job-search-video-game-tests.cnnmoney/. *See also* Jessica K. Sink & Richard Bales, *Born in the Bandwidth: "Digital Native" As Pretext for Age Discrimination in Hiring*, 31 ABA J. LAB. & EMPLOY. L. 521 (2016) (arguing that although digital proficiency may be a valid job criterion, using the phrase "digital native" in a job listing is an illegal age-based qualifier).
[95] Teresa Tanoos, *Brain Function Peaks at 24, But It's Not All Downhill*, EMAXHEALTH (Apr. 19, 2014, 5:01 PM), http://www.emaxhealth.com/11400/brain-function-peaks-24-its-not-all-downhill.
[96] Players in the study ranged in age from 16-44.
[97] For a specific discussion of applying antidiscrimination law to online job advertising, see Pauline Kim & Sharion Scott, *Discrimination in Online Employment Recruiting*, 63 ST. LOUIS U. L.J. ___ (forthcoming 2019).
[98] Title VII of the Civil Rights Act of 1964, 42 U.S.C. § 2000e-2 (2012).
[99] *Id*.
[100] Age Discrimination in Employment Act, 29 U.S.C. §§ 623-634 (2012).
[101] AGRAWAL ET AL., *supra* note 1, at 197.

established, the burden of persuasion[102] shifts to the employer who must show the employment criterion is job-related (i.e., that the characteristics screened for on a job test or video-recorded interview or video game correlate with success on the job) for the position and is a business necessity (i.e., that the characteristics screened for are important for the business, and not merely of peripheral concern).[103]

b. Reducing Bias

Though AI has the potential to create bias, it also has the potential to reduce it, in three ways. First, by removing or minimizing humans from the hiring process, AI can eliminate or reduce the tendency of humans to hire the applicants who most resemble themselves.[104] AI thus functions like a screen in a musician's orchestral audition – by hiding the sex of the auditioners, the screen takes sex out of the process, and results in a larger proportion of women being hired.[105] AI can funtion as a virtual screen, [106] reducing the opportunities for discrimination.

Second, AI can reduce bias by finding and eliminating exclusionary hiring practices, such as words in a job description that discourage applications from persons of color. For example, the company Textio uses AI to improve job descriptions.[107] It has found that corporate jargon like "stakeholders" and "synergies" tend to discourage applications from persons of color, and that a job description for a position "developing" a team tends to draw more female applicants than "managing" a team tends to discourage application from women than a job "managing" a team.[108] Similarly, AI can flag race- or sex-based differences in pay, and may even be able to find evidence of harassment or discrimination that human manager have overlooked.[109]

Third, AI can reduce or eliminate unconscious bias. Unconscious bias can infect the traditional hiring process both because human interviewers tend to prefer applicants most like themselves, and because humans often make unconscious assumptions about differences in abilities – such as that men perform better than women on mathematical tasks.[110] By reducing

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[102] In age discrimination cases, the burden is one of production, not persuasion. *See* Smith v. City of Jackson, 544 U.S. 228, 240 (2005).
[103] 42 U.S.C. § 2000e-2(k)(1)(A)(i).
[104] Hoffman et al., *supra* note __; Leigh Alexander, *Is an Algorithm Any Less Racist than a Human?*, THE GUARDIAN (Aug. 3, 2016, 2:00 PM), https://www.theguardian.com/technology/2016/aug/03/algorithm-racist-human-employers-work.
[105] Claudia Goldin & Cecilia Rouse, *Orchestrating Impartiality: The Impact of" Blind" Auditions on Female Musicians*, 90 AMERICAN ECON. REV. 715 (2000).
[106] *Hire Education*, *supra* note 2, at 8.
[107] https://textio.com/products/.
[108] *Hire* Education, *supra* note 2, at 8.
[109] *AI-Spy*, *supra* note 2, at 13.
[110] Shana Lebowitz, *3 Unconscious Biases that Affect Whether You Get Hired*, BUSINESS INSIDER (Jul. 17, 2015, 11:47 AM), http://www.businessinsider.com/unconscious-biases-in-hiring-decisions-2015-7.

or eliminating the human role in the hiring process, the opportunities for unconscious discrimination to infect the process should be reduced commensurately.[111]

This salutary effect will be for naught, however, if an AI hiring algorithm is itself infected by unconscious bias, such by from the programmers themselves or by using tainted input data. Two safeguards can reduce this possibility. First, algorithms created by multiple people with different backgrounds, perspectives, and biases can help identify and eliminate biases that might be present if programmers worked individually.[112] Second, an algorithm to identify and eliminate discrimination could be created and grafted onto the algorithm used in hiring.[113]

A discrimination concern that is unique to AI is that AI algorithms often seem to be a "black box" – if an algorithm is producing biased outcomes, it may be impossible to "drill down" into the algorithm to find out what is producing the bias and how to fix it.[114] This might potentially be a problem both in identifying and fixing the bias, and in any litigation that results from discriminatory hiring decisions based on the algorithm. Regarding litigation, if it is impossible to discover exactly how the algorithm is producing the bias, then under a disparate impact analysis the algorithm can be analyzed as a unitary whole for purposes of ascertaining discrimination.[115] Though this solution is imperfect, it is no worse than analyzing the discrimination produced by humans sorting through resumes.[116]

Analyzing an algorithm for possible bias usually starts by examining its output – does output differ based on race, sex, age, disability, or some other protected characteristic?[117] If so, an "AI neuroscientist" may be needed to create a hypothesis about what might be causing the differences, provide the algorithm with different data to test the hypothesis, and compare the resulting predictions.[118] Similarly, a "data hygienist" may be needed to ensure that the data used to train the algorithm is unbiased.[119] Finally, code may need to be re-written – which will be challenging if algorithm is owned and/or operated by an entity other than the employer[120] (e.g., the sex-based job ads on Facebook described above[121]).

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[111] Don Peck, *They're Watching You at Work*, THE ATLANTIC (December 2013), http://www.theatlantic.com/magazine/archive/2013/12/theyre-watching-you-at-work/354681/.
[112] Savage & Bales, *supra* note __, at 227; Alexander *supra* note __.
[113] Lauren J. Young, *Computer Scientists Find Bias in Algorithms*, IEEE SPECTRUM (Aug. 21, 2015), http://spectrum.ieee.org/tech-talk/computing/software/computer-scientists-find-bias-in-algorithms.
[114] AGRAWAL ET AL., *supra* note 1, at 197.
[115] *See supra* note __ and accompanying text.
[116] Savage & Bales, *supra* note __, at 223.
[117] AGRAWAL ET AL., *supra* note 1, at 197.
[118] *Id*. at 197-98.
[119] DAUGHERTY & WILSON, *supra* note 1, at 121.
[120] *See* Paul Harpur, *Collective Versus Individual Rights: The Able Worker and the Promotion of Precarious Work for Persons with Disabilities Under Conflicting International Law Regimes*, 41 LOYOLA LOS ANGELES INT'L & COMP. L. REV. 51, 69 (2018) (discussing the challenges of gig companies altering software sourced from other companies).
[121] *See supra* notes __-__ and accompanying text.

Notwithstanding these concerns, AI is probably, on balance, less likely than humans to result in discriminatory hiring.[122] A company using AI in its hiring process will need to invest not only in the AI hardware and software, but also in auditing for discrimination and proactively reducing any discrimination that results.[123]

B. Performance, Pay, & Promotions

After a company uses AI to hire an employee, AI often is used again to track performance, pay, and promotions. For example, the company Workday[124] provides a comprehensive "people analytics" product to analyze workforce demographics, monitor turnover trends, and track performance.[125] It can examine some 60 factors – such as pay, time between holidays taken, and management turnover – to predict which employees are likely to quit and how the employer might best retain them.[126] Arena,[127] a company that focuses on the healthcare industry, uses information from job applications and third parties to predict which applicants are likely to stay for more than a year. Twine Labs[128] tracks "hundreds of variables" which it uses to recommend internal candidates for promotion.[129] Infosys is considering using AI to identify employees for raises, based on their performance and their pay relative to peers.[130] Accenture's Job Buddy tells employees how vulnerable their job is to automation and recommends training to hone skills for the future.[131]

On the other side of the spectrum are gig-economy companies like Uber and TaskRabbit that have effectively outsourced "employee"[132] assessment to customers.[133] These companies typically rely on a "star" system, where customers rate the worker on a scale of (for example) 1-5. Five-star workers may get more work assignments; one-star workers may get "fired". If customer reviews are tainted with bias (e.g., Muslim drivers receive consistently lower ratings than white drivers), Muslim drivers may be negatively affected in very real and quantifiable ways. Gig-economy companies presumably would argue that antidiscrimination laws do not apply to their independent-contractor workers, but the issue remains open. These rating

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[122] AGRAWAL ET AL., *supra* note 1, at 198; Savage & Bales, *supra* note __, at 228.
[123] AGRAWAL ET AL., *supra* note 1, at 198.
[124] https://www.workday.com/en-us/applications/human-capital-management/people-analytics.html.
[125] *Id*.
[126] *Hire* Education, *supra* note 2, at 8.
[127] https://www.arenasolutions.com/.
[128] https://www.twinelabs.com/.
[129] *Hire Education*, *supra* note 2, at 8.
[130] *Id*.
[131] *Id*. at 9.
[132] There currently is considerable litigation over whether Uber drivers are "employees" or "independent contractor". *See* Christian Woo & Richard Bales, *The Uber Million Dollar Question: Are Uber Drivers Employees or Independent Contractors?*, 68 MERCER L. REV. 461 (2017).
[133] *Barely managing*, THE ECONOMIST (June 30, 2018) at 65.

systems – and the issues they raise – no longer are limited to gig-economy companies, as an increasing number of conventional companies are following suit.[134]

At companies using AI to enhance rather than avoid their assessment of employees, the role of managers and supervisors may change significantly. For example, technical supervision and disciplinary supervision may be disaggregated.[135] Moreover, the authority to give technical instruction may be given to individuals who are not employed by the same company or even in the same country.[136] This would permit more specialized supervision and facilitate cross-border activities and standard-setting, but at the risk of leaving employees feeling disconnected to their employer.[137]

An open question is how employers will use data collected on employees' performance. The assumption at the moment seems to be that data will be collected only in the aggregate rather than on individual workers – providing dashboard analytics that allow managers to monitor the performance of groups and division but not individuals.[138] In Europe, this assumption may be accurate because European data protection laws may restrict the collection of individualized data.[139] However, there are no such restrictions in the U.S., and services offered by companies such as Workday, Arena, and Twine Labs (described above) indicate they already are collecting and using individualized assessment data.[140]

This raises a slew of legal and practical issues. Are there any legal restrictions on companies' ability to collect and store data on individual workers?[141] Do workers have an ownership interest in data compiled about them? Even if not, do they have a right to access the data? Do they have any protection from this data being shared with others – such as to prospective employers? What recourse if any do they have if their data is incorrect and it is used in an adverse employment action or shared with others?

Individualized data collection also raises the ugly specter that it will be used to create something akin to China's "social credit" score. The social credit score is a fluctuating number being assigned to each Chinese citizen by the government based on political loyalty (protests result in lower scores), prompt payment of debts, and not spending too long playing computer

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[134] *Id*.
[135] IBA, *supra* note 3, at 50.
[136] *Id*. at 50-51.
[137] *Id*. at 51.
[138] *Id*. at 102; *Smile, you're on camera*, THE ECONOMIST (March 31, 2018), Special Report at 10 ("*Smile*").
[139] *See supra* note __ and accompanying text [word-search "GDPR"].
[140] *See supra* notes __-__ and accompanying text [first paragraph of this section].
[141] *See* IBA, *supra* note 3, at 103 (nothing that the answer to this question varies considerably around the world, making it difficult to companies operating internationally to create a uniform database); *Smile*, *supra* note 138, at 10 (noting the need for better legal protection, especially in the U.S.).

games.[142] The score can be used to restrict access to travel, schools, government jobs, and even dating apps.[143]

C. Monitoring in the Workplace

In the late 19th and early 20th century, Frederick Winslow Taylor devised a "scientific" method for organizing work.[144] Taylor believed skilled artisinal work was inefficient. He envisioned factories in which every detail of production was determined in advance by management. His prescription was to break jobs into simple movements, determine the exact time each movement should take, and require workers to follow this formula throughout their shifts. There was no room for worker imagination, creativity or spontaneity – these were controlled by management. Divest workers from their knowledge of production and their power would vanish. Workers would become, like the mass-produced products themselves, exact, predictable, interchangeable, and efficient.

Some degree of management monitoring of workers is both necessary and commonplace. Supervisors have always kept an eye on workers to discourage them from shirking. Employers in many industries record and monitor customer-service workers' phone calls both to ensure quality control and to ensure workers aren't talking to friends and family on company time. Employers monitor employees' computer use both to make sure they aren't spending the workday surfing the web and to screen for illegal or offensive pornography.

AI, however, permits employers to take workplace monitoring to a whole new level. Ultrasonic[145] wristbands issued by Amazon track workers' precise locations and hand movements, gauging workers' productivity and accuracy and vibrating to nudge workers into being more efficient.[146] The company Slack[147] uses AI to assess how quickly workers accomplish each task and to monitor workers who might be dozing or misbehaving.[148] The company Cogito[149] uses AI to listen to customer-service calls and grade workers on empathy and how quickly and effectively they solve complaints.[150] Microsoft's MyAnalytics[151] amalgamates data from a worker's emails, calendars, and phones to calculate how the worker spends her time,

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[142] Charles Rollet, *The odd reality of life under China's all-seeing credit score system*, WIRED (June 5, 2018), at https://www.wired.co.uk/article/china-social-credit.
[143] Jack Karsten & Darrell M. West, *China's social credit system spreads to more daily transactions*, BROOKINGS (June 18, 2018), at https://www.brookings.edu/blog/techtank/2018/06/18/chinas-social-credit-system-spreads-to-more-daily-transactions/.
[144] *See* Stone, *supra* note 4.
[145] Tyler Comrie, *Snooper Troopers: The Boss Sees You*, WIRED (Aug. 2018) at 20.
[146] *AI-Spy*, *supra* note 2, at 13; *Smile, you're on camera*, THE ECONOMIST (March 31, 2018), Special Report at 9.
[147] https://slack.com/.
[148] *AI-Spy*, *supra* note 2, at 13.
[149] http://www.cogitocorp.com/.
[150] *Id.*; *Here to help*, THE ECONOMIST (March 31, 2018), Special Report at 6-7.
[151] https://products.office.com/en-us/business/myanalytics-personal-analytics.

how often she is in touch with key contacts, and whether she multitasks too frequently.[152] The company Veriato[153] has produced software that registers everything that happens on a worker's keyboard; it can flag poor productivity, misconduct (such as stealing company records), and the worker's attitude.[154] The company KeenCorp[155] analyzes an employee's emails, focusing on word patterns and content, and then assigns it (in real time) a number measuring the employee's level of engagement (a high number indicates an employee feeling positive and engaged; a low number an employee feeling disengaged and expressing negative emotions).[156] The company Teramind sends workers pop-up warnings if it suspects they are slacking or about to share confidential documents.[157] The company Humanyze[158] requires to wear an ID badge containing a microphone that records conversations, Bluetooth and infrared sensor that monitors where they are (how long do they spend in the break room? Outside the building smoking?), and an accelerometer that notes when they move.[159] The company's software tracks data such as how much time each worker spends with people of the same sex, activity levels, and the proportion of time spent speaking versus listening.[160]

Some AI-enabled is no doubt benign. Computer vision enhanced with AI can ensure workers do not enter dangerous work areas without safety equipment like hard hats and gloves, and can monitor the factory floor for signs of danger.[161] However, many aspects of AI-enabled workplace monitoring look eerily similar to Taylorism.

D. Monitoring Off-Work (and On-Line) Activity

As with monitoring on-duty conduct, AI will enable employers to take the monitoring of off-duty (particularly online) conduct to a new level. Today, employers typically review an applicant's publicly available social media accounts before a hiring decision is made[162] to determine whether the applicant's social media history should disqualify her from being

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[152] *Smile, you're on camera*, THE ECONOMIST (March 31, 2018), Special Report at 10.
[153] https://www.veriato.com/.
[154] *Id*. at 10.
[155] http://www.keencorp.com/.
[156] Frank Partnoy, *The Secrets in Your Inbox*, THE ATLANTIC (Sept. 2018) at 26. "Heat maps", created by aggregating employees' engagement numbers by department or division, can ostensibly be used to flag when something has suddenly gone wrong in that department or division, such as noncompliance with government rules or sexual harassment. *Id*. at 29.
[157] *Snooper Troopers*, *supra* note __.
[158] https://www.humanyze.com/.
[159] *Id*. at 9.
[160] *Id*.
[161] *Id*. at 10; *AI-Spy*, *supra* note 2, at 13.
[162] Kathleen McGarvey Hidy & Mary Sheila E. McDonald, *Risky Business: The Implications of Social Media's Increasing Role in Employment Decisions*, 18 J. LEGAL STUDIES IN BUS. 69 (2013).

hired.[163] Current employees often are fired for inappropriate social media posts or tweets.[164] Usually, such firings result not from an employer's pervasive monitoring of employees' social media accounts,[165] but instead from a "friend" or co-worker alerting management about the offensive posts or tweets of fellow employees.[166] Few employers have the time or inclination to pervasively monitor their employees' social media accounts.

AI, however, significantly changes the equation by making such monitoring much easier and cheaper. Companies now can use AI to comprehensively monitor an employee's on-duty work communications and off-duty social media communications. As described in a recent issue of The Economist, the company Slack is so-named because the word stands for "searchable log of all conversation and knowledge."[167]

Employers have some legitimate reasons to use AI this way. Racist or sexist posts may indicate a proclivity to racist or sexist conduct or harassment in the workplace. Aggressive posts may indicate a bullying personality. A post containing the company's name and words or phrases like "gun" or shoot" or "blow up" could be a red flag for impending workplace violence. Posts indicating illegal drug use or overconsumption of alcohol could raise workplace safety concerns. Posts disparaging the company or its products could harm the company's reputation. Indeed, the ease of conducting such monitoring using AI technology, coupled with the potential liability for wrongful hiring[168] or retention or failing to prevent harassment or violence, may begin to nudge more and more employers to comprehensively monitor their employees' social media accounts.[169]

A comprehensive social-media monitoring program raises two potential legal issues. The first is a possible violation of the Stored Communications At (SCA).[170] The SCA protects individuals' private communications content held in electronic storage by third parties.[171] Though the SCA does not explicitly mention social media accounts, such accounts fall within the

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[163] *See* Terry Morehead Dworkin, *Protecting Private Employees from Enhanced Monitoring: Legislative Approaches*, 28 AM. BUS. L.J. 59, 75 (1990); Don Mayer, *Workplace Privacy and the Fourth Amendment: An End to Reasonable Expectations?*, 29 AM. BUS. L.J. 625, 626 (1991).
[164] *Id*. at 71-73.
[165] A handful of employers have attempted to require applicants or employees to provide the employer with their social-media media passwords. *See* Jordan M. Blanke, *The Legislative Response to Employers' Requests for Password Disclosure*, 14 J. HIGH TECH. L. 42 (2014). However, this does not appear to be the norm.
[166] Ruth Mantell, Your Social-Media Posts Could Get You in Hot Water, MARKETWATCH (Jun. 6, 2012), http://articles.marketwatch.com/2012-06-04/finance/31951218_1_facebook-page-social-media-policiesworkers.
[167] *AI-Spy*, *supra* note 2.
[168] LEX K. LARSON, 1 EMPLOYMENT SCREENING § 10-2.3 (2006) (defining negligent hiring).
[169] Partnoy, *supra* note __, at 29 (arguing that the same types of potential liability may encourage employers to increase their use of text analytics to monitor employees' workplace emails).
[170] 18 U.S.C. § 2701(a).
[171] *Id*.

statute's definition of electronic storage.[172] Social media content that is publicly available probably would not be protected by the SCA, because such content is not "private".[173] However, content shared privately – i.e., sent directly to only a select group of people, or using privacy settings that restrict public access – probably is protected, such that an employer's monitoring it would violate the statute.[174]

The second issue concerns the National Labor Relations Act's[175] protection of "protected, concerted activity" engaged in for "mutual aid or protection".[176] This Section 7 protection exists to ensure employees are able to discuss their working conditions and whether they wish to engage in collective bargaining. Working conditions can include wages, hours, workplace conditions (including co-workers and supervisors), employment policies and practices, and in some cases, customers or clients.[177] An employer that restricts or "chills" these discussions commits an unfair labor practice. So, for example, an employer monitoring policy that tends to discourage employees from using Facebook to complain among themselves about a supervisor probably would violate Section 7,[178] as would any search that reveals to the employer that one or more employees is engaged in union activity.

E. Job Redesign

One report estimates nearly half of U.S. jobs are at risk from AI;[179] a survey indicates 65% of Americans believe that within 50 years a robot or intelligent algorithm will be doing their work.[180] Reality probably is less dire than these headline-grabbing predictions suggest. Some jobs will be lost, but others will be gained. There is a vigorous debate in the economics literature over whether AI (as with increased trade) will create a net gain or loss in jobs.[181] That

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[172] *See* Crispin v. Christian Audigier, Inc., 717 F. Supp. 2d 965, 991 (C.D. Cal. 2010).
[173] European law may provide workers with more protection than American law. *See* IBA, *supra* note 3, at 110-13.
[174] *Crispin*, 717 F.Supp.2d at 991; Pietrylo v. Hillstone Restaurant Group, No. 06-5754-FSH, 2008 WL 6085437, at *1-2 (D.N.J. July 25, 2008); *see also* Christopher J. Borchert, Fernando M. Pinguelo, & David Thaw, *Reasonable Expectations of Privacy Settings: Social Media and the Stored Communications Act*, 13 DUKE LAW & TECH. REV. 36 (201_); Patricia Sánchez Abril, Avner Levin, & Alissa Del Riego, *Blurred Boundaries: Social Media Privacy and the Twenty-First-Century Employee*, 49 AM. BUS. L.J. 63, 83, 87 (2012).
[175] 29 U.S.C. §§ 151-169.
[176] 29 U.S.C. § 157.
[177] *See* George H. Pike, *Social Media and the Workplace*, 31 #9 INFORMATION TODAY, at 1 (Nov. 2014).
[178] *See* Settlement Agreement, In re Am. Med. Response of Conn., Inc., No. 34-CA-12576 (N.L.R.B. Feb. 7, 2011), available at www.minnesotaemploymentlawreport.com/NLRB%20 Facebook%20Settlement.pdf (settlement of case involving employee who had posted remarks on Facebook angrily implying that her supervisor was mentally ill and disparaging him with expletives).
[179] Carl Benedikt Frey & Michael A. Osborne, *The Future of Employment: How Susceptible Are Jobs to Computerization?* (2013) 1, pdf available at https://www.oxfordmartin.ox.ac.uk/publications/view/1314.
[180] Aaron Smith, *Public Predictions for the Future of Workforce Automation*, Pew Research Center (March 10, 2016) at http://www.pewinternet.org/2016/03/10/public-predictions-for-the-future-of-workforce-automation/.
[181] For sources discussing job gains and losses from AI, see Nir Jaimovich & Henry E. Siu, *The Trend is the Cycle: Job Polarization and Jobless Recoveries*, NBER Working Paper No. 18334 (Aug. 2012, revised March 2014),

issue is beyond the scope of this article; this section will focus instead on how AI will change many jobs – some for better and some for worse.

Two books published in 2018 – Ajay Agrawal, Joshua Gans, and Avi Goldfarb's PREDICTION MACHINES[182] and Paul Daugherty & James Wilson's HUMAN+MACHINE[183] – each argue that many job changes caused by AI will be for the better, as computers and machines take over the most mundane and repetitive aspects of work and leave humans to do more creative, interesting work requiring independent judgment and empathy.[184] Several key themes underlie their prediction. First, even with ever-more-powerful AI, humans still are and will be for the foreseeable future better at some tasks than computers or robots. These include the characteristics described in the paragraph above, and also – for now, at least – jobs requiring manual dexterity.[185]

Second, humans and AI working together often produce better results than either working independently. An example is the job of a pathologist trying to detect metastatic breast cancer from biopsy slides.[186] Machine-learning techniques have become so proficient at pattern recognition that the ability of computers to make correct diagnoses often approaches or even exceeds that of humans. The 2016 winner of contest to predict metastatic breast cancer resulted in a deep-learning algorithm making the correct prediction 92.5% of the time, compared with a human success rate of 96.6%.[187] When paired together, however, the accuracy was 99.5%. Similarly, smart cobots on an automobile assembly line can do heavy lifting, repetitive tasks, and tasks requiring certain types of precision, leaving the human to direct the cobot and perform tasks that require manual dexterity and improvisation.[188] The autoworker becomes more like a pilot and less like a laborer.[189] Just as spreadsheets, far from putting bookkeepers out of work, elevated their job to that of analyst by making calculations (and therefore predictions) infinitely faster and easier,[190] AI often can give many workers "superpowers" that augment the workers' physical and cognitive abilities.[191]

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http://www.nber.org/papers/w18334 (arguing that routinized jobs are most susceptible to job loss); IBA, *supra* note 3, at 31-32 (arguing that repetitive jobs in manufacturing, jobs in which the employee processes data, and jobs that require primarily physical strength, are most at risk); AGRAWAL ET AL., *supra* note 1, at 173-74 (arguing that AI will create jobs requiring independent judgment, relational work, or technical knowledge or skills – the types of non-routinized work that computers and robots are least capable of performing); DAUGHERTY & WILSON, *supra* note 1, at 121 (describing the new occupation of "data hygienist" as one that will ensure the integrity of data use to train algorithms).

[182] AGRAWAL ET AL., *supra* note 1.

[183] DAUGHERTY & WILSON, *supra* note 1.

[184] AGRAWAL ET AL., *supra* note 1, at 141-51; DAUGHERTY & WILSON, *supra* note 1, at 135-52.

[185] AGRAWAL ET AL., supra note 1, at 143-45.

[186] AGRAWAL ET AL., supra note 1, at 65.

[187] *Id*.

[188] DAUGHERTY & WILSON, *supra* note 1, at 148.

[189] *Id*. at 149.

[190] AGRAWAL ET AL., supra note 1, at 141-42.

[191] DAUGHERTY & WILSON, *supra* note 1, at 138-39.

Even in jobs where AI can outperform humans, that doesn't necessarily mean humans are out of a job. Consider, for example, the job of radiologist, which in recent years has often been held out as one of the first jobs to be replaced entirely by AI.[192] Even if algorithms become better than humans at spotting abnormalities in medical images, radiologists still will be needed to determine the images needed for a particular patient, translate results to primary care doctors, and make judgments on the type of care to pursue once an abnormality is identified, among other things.[193] A radiologist thus might spend less time reviewing images and more time doing other things for which a human adds unique value.

This represents a third theme of job-change: an old job exchanging one set of responsibilities for a different set. Even after self-driving cars make the job of driving a school bus obsolete, an adult will still need to be on the bus to supervise the children – and she can do a far better job of it if she is not simultaneously tasked with driving the bus.[194]

IV. A Role for Unions?

all this workplace change and disruption creates a unique opportunity for unions to become relevant again.

A. Bargaining Law
   1. Unilateral change doctrine. Rosenfeld article at 20-21.
   2. Bargaining over tech. R 21-
   3. Preserving the right to bargain; avoiding broad management-rights clauses. R 33-35.

B. Bargain for:
   - Mitigating pain. Int'l Bar Ass'n article at 41.
   - Oppose Taylorization.
   - Lifetime jobs for existing members, in return for not opposing phase-out of obsolete jobs. R at 16.
   - educational leave. G at 43. Training for the Future. G at 19-21, 43-44.
   - Monitoring, such as email searches. R at 55-57, 61.

C. Unions will have to organize beyond mfg. IBA at 41. Distance-work will make organizing more difficult. IBA at 44.

- Bargain for:
  - Mitigate pain of job losses/restructuring.
  - Only reasonable, non-individualized monitoring.

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[192] *See*, e.g., *Scanning The Future, Radiologists See Their Jobs At Risk*, All Tech Considered (Sept. 4, 2017, 4:50 PM ET), at https://www.npr.org/sections/alltechconsidered/2017/09/04/547882005/scanning-the-future-radiologists-see-their-jobs-at-risk.

[193] AGRAWAL ET AL., supra note 1, at 145-48.

[194] *Id*. at 149.

- Regular educational leave.
- Up- rather than down-skilling of jobs.