What if your boss was an algorithm?

Economic Incentives, Legal Challenges, and the Rise of Artificial Intelligence at Work

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Rapid advancements in automation will have a profound impact on labour markets. This paper focuses on a comparatively overlooked aspect of debates surrounding automation and the future of work: the rise of algorithmic management, enabled by hitherto infeasible forms of data collection and processing. As AI-driven decision-making is quickly becoming an important element of most employer functions, from hiring workers through to daily performance monitoring, received models of the legal regulation of employment relationships are faced with complex challenges – some of which, such as the rules of privacy and data protection, can be addressed through the careful adaptation and development of existing standards, whereas others, including notably management accountability for key workplace decision, may require a fundamental rethink of existing norms.

1. Introduction

The Future of Work is an age-old fascination: with every new wave of technological innovation comes a series of thorny questions about its impact on the labour market. Will jobs be replaced by the new technology? If not, how will they be reshaped? What are the broader implications, both for individual workers, and legal regulation more generally? Recent technological advances have brought many of these questions back to the fore, notably in the context of the gig economy, enabled by mobile phones equipped with powerful processors, fast internet connections, and highly accurate satellite navigation.[1] The labour market challenges inherent in a world of platform-based labour intermediation are considerable, from worker classification and collective rights protection through to health and safety, tax, and social security provisions. These issues have rightly been at the forefront of courts' and policy makers' attention, both domestically and at the international level.

At the same time, however, a detailed exploration of the gig economy soon encounters a fundamental *innovation paradox*. Whilst it is undoubtedly true that key (technological) elements behind the rise of the gig economy are completely new phenomena, their impact on work organisation can more accurately be characterised as the logic continuation and extrapolation of long-existing trends in non-standard work, as explored in a recent ILO report:

> 'over the past few decades, in both industrialized and developing countries, there has been a marked shift away from standard employment to non-standard employment … [including] temporary employment, part-time work, temporary agency work and other multi-party employment relationships, disguised employment relationships and dependent self-employment.'[2]

As De Stefano explains, on-demand work in the gig economy shares many dimensions with these forms of non-standard work: it is, in other words, a combination and rebranding of long-established

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[1] For a full overview, see the rich collection of articles in (2016) 37 Comparative Labor Law & Policy Journal.

[2] International Labour Office, *Non-Standard Employment Around the World: Understanding Challenges, Shaping Prospects* (ILO 2016) 2.

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models.[3] Technology plays a crucial role in enabling the gig economy's persistent growth – but despite the occasional call for a complete overhaul of applicable laws and regulations,[4] it is increasingly becoming clear that the primary policy solution lies in the consistent application and enforcement of existing regulatory models.[5]

Can the same conclusions hold true for the rise of artificial intelligence in general, and the deployment of increasingly sophisticated machine learning algorithms in particular? This article argues that they do not: at least some of the changes which this latest wave of automation will bring to the world of work require a fundamental rethink of key elements of the traditional apparatus of employment law and labour market regulation. This is not, however, due to the much-vaunted rapid displacement of employment and the consequent need to tackle mass technological employment. Instead of taking away workers' jobs, I suggest, advances in AI-driven decision-making will first and foremost change their managers' daily routines, augmenting and eventually replacing human day-to-day control over the workplace: we are witnessing the rise of the 'algorithmic boss'.

In order to substantiate this claim, discussion is structured as follows. Section two looks at common strands running through historical debates about technological unemployment, including an emphasis on substitution over complementarities and a tendency to ignore or underestimate the potential for creating novel jobs, in order to question the most recent wave of unemployment predictions. This is not to say that the advent of artificial intelligence will not have long-lasting and fundamental impacts on labour markets: drawing on the work of Abi Adams and other economists, section three sets out the key dimensions along which technological change will bring fundamental upheaval, from a dramatic increase in available information and the rapidly falling cost of processing power to new and evolving forms of exercising control. Taken together, these factors have already begun to enable the automation of decision making across the lifecycle of the

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[3] Valerio De Stefano, 'The Rise of the "Just-in-Time Workforce": On-Demand Work, Crowdwork, and Labor Protection in the "Gig Economy"' (2016) 37 Comparative Labor Law & Policy Journal 471.

[4] Seth Harris and Alan Krueger, *A Proposal for Modernizing Labor Laws for Twenty- First Century Work: The "Independent Worker"* (The Hamilton Project, Discussion Paper 2015-10)

[5] Cf, for example, the comments in *Pimlico Plumbers* [2018] UKSC 29 at para [27].

employment relationship. A number of case studies in section four including both start-ups and well-established operators demonstrate how AI has come to augment, or even replace, traditional management in the exercise of the full range of employer functions, from digital reputation screening and CV filtering to on-going job instructions, performance monitoring, and termination decisions. This is not merely a return to (digital) Taylorism: both the kinds of data considered and the probabilistic patterns relied upon in machine learning fundamentally differ from the traditional management structures around which employment law has been designed. The resulting regulatory challenges sit at the heart of section five: following the three-fold structure of the challenge, analysis will first explore the implications of new forms of data collection and organisation for privacy and data protection, before turning to the implications of AI processing and control, including *ex post facto* explicability and the cross-jurisdictional scaling of successful machine learning algorithms. It is here, as section six argues, that we encounter genuinely novel questions: the large body of scholarship exploring the ascription of employer responsibility has always proceeded on the basis that the issues at stake are legal ones – whether in sham contracting or (ab-)uses of corporate personality – and thus, at least in principle, amenable to legal solutions drawing on the same bodies of doctrine. The diffusion of responsibility inherent in AI decision making, on the other hand, is ultimately as much a technical challenge as it is a legal one. A brief conclusion highlights the importance of regulatory agency in shaping the development of algorithmic management.

2. Reshaping Labour Markets

Whilst Artificial Intelligence has been at the forefront of recent debates, the impact of technology on labour markets is not limited to this particular facet of automation. The notion of technological unemployment, *viz* the idea that rapid automation would leave large numbers of the population idle and without access to gainful employment, has a long pedigree, reaching back nearly a century. This section briefly looks at some of the leading proponents of technological unemployment, before turning to an exploration of the reasons why – at least to date – their predictions have not come true.

A. A brief History of the Future of Technological Unemployment

Amidst the economic depression of the 1930s, John Maynard Keynes wrote a note about the *Economic Possibilities for our Grandchildren*. Where others saw stagnation and decline, he predicted prosperity and development. Unprecedented technological improvements in manufacture and transport were key to this vision. In the long-term, the resulting productivity gains would bring manifold improvements in living standards for all. In the short term, however, 'the very rapidity of these changes is hurting us and bringing difficult problems to solve':

> We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come— namely, *technological unemployment*. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour.[6]

Similar fears have been voiced throughout the past century. President Kennedy, for example, regarded maintaining full employment 'as the major domestic challenge, really, of the '60s, ... when automation, of course, is replacing men.'[7]

In a 2013 paper looking at the US labour market, Carl Frey and Michael Osborne made a similarly startling prediction: as a result of advances in machine learning, just under half of total US employment was at a 'high risk' of being automated in the near future. Their model suggested that workers employed in management, business, and finance had little to worry about. Job losses would be concentrated at the bottom end of the labour market: 'computerisation will mainly substitute for low-skill and low-wage jobs ... most workers in transportation and logistics occupations, together

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[6] John Maynard Keynes, 'Economic Possibilities for Our Grandchildren', in *Essays in Persuasion* (Palgrave Macmillan, London 2010) 321, 325.

[7] President John F Kennedy, News Conference 24 (14 February 1962); available at https://www.jfklibrary.org/Research/Research-Aids/Ready-Reference/Press-Conferences/News-Conference-24.aspx archived at <https://perma.cc/LDS6-Y8X7>.

with the bulk of administrative and support workers, and labour in production occupations, are at risk.'[8]

In a closely related vein, Erik Brynjolfsson and Andrew McAfee of the Massachusetts Institute of Technology have argued that technological progress will have a starkly polarising impact on the labour market:

> There's never been a better time to be a worker with special skills or the right education, because these people can use technology to create and capture value. However, there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate.'[9]

The predictions, then, seem clear: given the exponential growth of machine learning and artificial intelligence, the gig economy is but a transitional phenomenon, with the majority of low-skill platform-based work soon to be handed over to algorithms and robots. With the advent of self-driving cars and laundry robots, emerging business models will leave large swathes of the workforce unemployed.

The consistent application of employment law standards might even create additional pressures to hasten this transition: the cost imposed on platforms will incentivise innovation—not least in the low-wage sector. As Professor Cindy Estlund puts it, 'Automation is an entirely lawful – indeed, almost unassailable – way to avoid the costs of employing people.' The cost of employment protection, she argues, will be felt particularly harshly by low-income workers: 'Especially at the bottom of the labor market, raising the floor on wages, benefits, and working conditions strengthens the business case for automation of technically automatable jobs'.[10]

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[8] Carl Frey and Michael Osborne, 'The Future of Employment: How Susceptible are Jobs to Computerisation' (Oxford Martin School 2013) 38, 42.

[9] Eric Brynjolfsson and Andrew McAfee, *The Second Machine Age: Progress and Prosperity in a Time of Brilliant Technologies* (W. W. Norton & Company Inc 2014) Chapter 1.

[10] Cynthia Estlund, "What Should We Do After Work? Automation and Employment Law" (2017) 578 New York University Public Law and Legal Theory Working Papers 21, 23. See now also (2018) 128 Yale Law Journal 254.

This is correct as a matter of labour economics—as long as jobs *are* automatable. The extent to which machine learning can grapple with long-established forms of work, however, is much more contested than might appear at first glance.

B. Challenging the Narratives

For the time being, the reality of work could not be further from Keynes' vision of 'three-hour shifts or a fifteen-hour week'. What happened? Why are we still at work? The economic literature points to a number of factors—income or capitalisation effects central amongst them. Technology makes us more productive, reducing prices and raising real income. As we become better off, our appetite for more products and services creates new job opportunities in emerging industries: think of the autoworker retrained as a computer engineer.

MIT economist David Autor is one of the leading sceptics when it comes to grand claims of automation and job destruction. With computers everywhere, he argues, it is tempting to assume that they can take over most jobs. 'But that leap of logic is unfounded.' Modern algorithms are vastly superior to workers when it comes to routine tasks which can be distilled into a clear set of instructions, such as crunching the numbers in a complex financial model—but many aspects of the modern labour market are much harder to automate than we assume, if they can be automated at all.

This is Polanyi's paradox, named after Michael Polanyi's observation that 'We know more than we can tell.' Human intuition, it turns out, is crucial across the labour market—including the bottom end. Autor argues that

> the tasks that have proved most vexing to automate are those demanding flexibility, judgment and common sense—skills that we understand only tacitly. At a practical level, Polanyi's paradox means that many familiar tasks, ranging from the quotidian to the sublime, cannot currently be computerized because we don't know "the rules."[11]

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[11] David Autor, 'Polyani's Paradox and the Shape of Employment Growth' (2014) NBER Working Paper No. 20485 129, 136.

McAfee and Brynjofsson disagree: as 'humanity has recently become much better at building machines that can figure things out on their own', they suggest, '"Polanyi's paradox" is not the barrier it once was; machines can learn even when humans can't teach them.'[12] It is true that engineers have been working hard to develop cleaning robots, self-driving cars, and image recognition software. Even after years of work and billions of investments, however, the algorithms continue to struggle: from a robotic cleaner getting tangled in its owner's hair until she could be freed by paramedics to self-driving cars confused by ice, snow, faded road markings and stray plastic bags.[13] There is, furthermore, an important distinction between jobs that could be automated and those which actually are.[14]

In the long run, no sector of the economy will remain beyond algorithms' reach. As long as the routine nature of the task is central to its automation, however, technology is likely to advance much more rapidly in other sectors of the economy,[15] including legal discovery and due diligence: once the preserve of well-paid junior lawyers, locked away for weeks on end to wade through crates of documents, it has quickly become dominated by language- and pattern-recognition software.[16]

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[12] Brynjofsson & McAfee, *The Second Machine Age.*

[13] Justin McCurry, 'South Korean woman's hair eaten by robot vacuum cleaner as she slept' *The Guardian* (London 9 February 2015) <https://www.theguardian.com/world/2015/feb/09/south-korean-womans-hair-eaten-by-robot-vacuum-cleaner-as-she-slept ; https://www.wired.com/story/self-driving-cars-perception-humans/> archived at <https://perma.cc/B8L9-7K32>; Marty Padget, 'Ready to pay billiosn for self driving car roads?' *Venture Beat* (17 May 2017) <https://venturebeat.com/2017/05/17/ready-to-pay-trillions-for-self-driving-car-roads/> archived at <https://perma.cc/ZJ9K-LSXF >.

[14] David Kucera, *New Automation Technologies and Job Creation and Destruction Dynamics* (International Labour Organisation 2016).

[15] Despite being 'routine' in the sense of regular, many tasks 'automated' through gig economy platforms, for example, are hardly routine in the sense of clear and predictable routines: whether it involves cleaning behind a corner with cables strewn in different directions, or and keeping parents and children happy, I struggle to see the immediate possibilities of automation.

[16] Jane Croft, 'Artificial Intelligence closes in on the work of junior lawyers', *Financial Times* (4 May 2017) <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16> archived at <https://perma.cc/MH5X-UBVU>.

3. Rewiring the Firm

This challenge to the unemployment narrative should not, however, be mistaken as an assertion that the rise of digitalisation in general, and AI in particular, will have no impact on existing employment models: from lowering transaction and monitoring cost and reshaping information asymmetries, to increasing job polarization, the impacts will be profound.

In a recent survey, Abi Adams explores the full range of these developments.[17] For present purposes, the most important change relates to 'technology and imperfect information'. Economists have long identified imperfect information (i.e., a scenario where actors have to make decisions without being able to know all relevant market features) as a key challenge in the operation of labour markets.[18] This is salient, first, when it comes to hiring workers: employers might not be able to reach all those looking for work in a particular locality, and those seeking work will not always be able to discover all the jobs currently available to them.[19]

Imperfect information also matters in what economists have come to call the 'lemons problem'. When hiring a worker, it will frequently be difficult for a prospective employer to know the quality of her skills and dedication, with negative consequences for both parties. Good workers will be underpaid, bad ones overpaid, with firms potentially unwilling to hire anyone.[20]

It is in addressing these challenges that 'technology can change both the search and hiring process and also facilitate new monitoring and performance management schemes once an employment relation is initiated.'[21] In terms of 'search frictions', first, technological innovation has drastically

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[17] A Adams, 'Technology and the Labour Market: the Assessment' (2018) 3 *Oxford Review of Economic Policy* 349. This article draws on a number of papers commissioned for a special edition of the *Oxford Review*, exploring the impact of technology on the labour market.

[18] See further Pelletier, A., and Thomas, C. (2018), 'Information in Online Labour Markets', Oxford Review of Economic Policy, 34(3), 376–92, on which Adams's discussion draws.

[19] For an overview, see Christopher Pissarides, 'Equilibrium in the labor market with search frictions' (2011) 101(4) American Economic Review 1092.

[20] G Akerlof, 'The Market for "Lemons": Qualitative Uncertainty and the Market Mechanism' (1970) 84 Quarterly Journal of Economics 488.

[21] Adams, 'Assessment' (n 17) 355.

reduced this friction: from location tracking and user ratings in the gig economy to sophisticated algorithms that match employers, consumers, and workers on job websites, whether purely online or in the real world.

Crucially, however, improved matching is not the only market friction caused by imperfect information which automation promises to remove. In an open-market transaction with an independent entrepreneur, employers would have to spend significant amounts of time and effort to find out information about the service provider's background and experience, control the quality of the work, and negotiate prices.[22] Even within the enterprise, there are concerns as to the cost of monitoring employees:[23] one of the key reasons behind the failure of Taylor's theories of 'scientific management'.[24]

What began with customer-driven rating mechanisms in the gig economy is quickly becoming a reality in workplaces across the socio-economic spectrum: 'both manual and non-manual jobs are affected.' As Adams explains, from a labour economics perspective, there are both upsides and downsides to this lowering of monitoring cost:

> The increased ease with which firms can monitor their employees should help to raise productivity by limiting moral hazard in the workplace. [Software provider] Evolv claims that its monitoring can help to improve productivity by at least 5 per cent in two-thirds of jobs, although this claim has not been independently verified. Insights from wearables can also allow firms to restructure jobs in a way that benefits its workers. Bank of America, for example, found that workers were more productive when they were allowed to take breaks together. Upon rolling out this policy universally, performance improved by 23 per cent and the 'amount of stress in workers' voices fell 19 per cent.'

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[22] According to Coase's theory of the firm, companies exist because the control exercised by an entrepreneur-coordinator over her workforce and other factors of production is much cheaper than the cost involved in going out to the market and haggling over each individual transaction: Ronald Coase, 'The nature of the firm' (1937) 4(16) Economica 386.

[23] P Davies, 'Efficiency Arguments for the Collective Representation of Workers: A Sketh' in A Bogg et al (eds), *The Autonomy of Labour Law* (Hart 2017) 367.

[24] F W Taylor, *The Principles of Scientific Management* (Harper & Brothers 1919).

However, there are reasons to be cautious about developments in this area. If not all aspects of a job can be monitored and performance managed to the same degree, employers will need to be careful not to distort their employees' efforts across tasks that are more or less captured by the technology. Further, some studies have found that wearables and monitoring increase workplace stress with potentially detrimental effects on productivity and retention.[25]

In a remarkably prescient note, David Autor in 2001 explored the consequences of 'wiring the labour market'.[26] Rather than bringing about mass unemployment, however, it appears that the immediate consequence of automation has been a '(re-)wiring of the firm': as the cost of data collection and processing continue to fall, employers are increasingly able to deploy technology to monitor – and control – the workplace to a hitherto unimaginable degree.

4. Automating Employer Decisions

What does this mean in practice? Ben Waber, CEO of one of the first start-ups active in the field, has written extensively about the rise of 'people analytics', *viz* 'how sensing technology and big data about organizations in general, can have massive effects on the way companies are organized. From changing the org chart to changing coffee areas, no aspect of organizations will be untouched by the widespread application of this data.'[27] The impact of data-driven Human Resource Management, he argues, will by no means be limited to large corporations:

> The people analytics system would essentially be 'management in a box' for small business … with only a few sensors and some basic programs, [they] could get automated help setting up their management structure and generating effective collaboration patterns. They could even receive feedback on their progress [… as well as] automated suggestions on org structure, compensation systems, and so on.[28]

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[25] Adams, 'Assessment' (n 17) 357 (citations omitted).

[26] Autor, D. H. (2001), 'Wiring the Labor Market', Journal of Economic Perspectives, 15(1), 25–40

[27] Ben Waber, *People Analytics* (FT Press, Pearson 2013) 178.

[28] Waber, *People Analytics* (n 27) 191.

Whilst Waber's vision of universal people analytics has not (yet) come to fruition, the underlying trends identified in his work are quickly becoming pervasive. As early as 2015, the Economist Intelligence Unit highlighted 'explosive big data IT growth' in HR, identifying 'major investments in IT capabilities to support workforce analytics/planning'.[29]

The first, and perhaps starkest, illustration of algorithmic management could be seen in the gig economy, with platforms relying on sophisticated rating mechanisms to manage their workforce. Designed, at first glance, to provide consumers and workers with accurate feedback about other platform providers, it quickly became apparent that ratings had little informational value, given their clustered distribution.[30] Instead, as Tom Slee has argued, reputation algorithms were designed to exercise control over platforms' workforces, operating as

> . . . a substitute for a company management structure, and a bad one at that. A reputation system is the boss from hell: an erratic, bad-tempered and unaccountable manager that may fire you at any time, on a whim, with no appeal.[31]

Rather than merely signalling quality, then, the real point of rating algorithms in the gig economy was to exercise employer control in myriad ways. Platform-based work thus served as an early laboratory for the development of algorithmic management tools. Today, on the other hand, it has spread across industries and workplaces. As opposed to the futuristic predictions explored in earlier sections, the advent of algorithmic management is not something we might speculate about: it is already taking place.

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[29] https://eiuperspectives.economist.com/strategy-leadership/future-business-human-resources/infographic/big-roles-big-data-hr

[30] Tom Slee, *What's Yours is Mine: Against the Sharing Economy* (O/R Books 2015).

[31] Ibid. This is confirmed by internal Uber documents, which suggest that, in 2014, fewer than 3 per cent of drivers were 'at risk of being deactivated' as a result of a rating below 4.6 stars (out of 5): James Cook, 'Uber's internal charts show how its driver-rating system actually works', *Business Insider UK* (11 February 2015), http://uk.businessinsider.com/leaked-charts-show-how-ubers-driver-rating-system-works-2015–2, archived at https://perma.cc/5UPM-SWFN. It might be argued that this is a result of the pressure of the rating system keeping the worker pool at a high standard, with lower performing bands excluded from the market. As Slee explains, however, this is not the case: 'J-curve rating distributions [where nearly all data points are at the high end of the scale], like those of the Sharing Economy reputation systems, show up whenever people rate each other' (Tom Slee, *What's Yours is Mine: Against the Sharing Economy* (O/R Books 2015), 101).

Start-ups and established software providers compete in offering software that promises to support, and potentially automate management decision-making across all dimensions of work, including the full socio-economic spectrum of work places, as well as the entire life cycle of the employment relationship: whether it is in factories or offices, universities or professional services firms, the exercise of employer functions from hiring and managing workers through to the termination of the employment relationship can already be automated.[32]

When it comes to the *inception of the employment relationship*, for example, AI-driven software now allows prospective employers to conduct extensive screening of applicant's online presence, Software provider *FAMA* promise to screen workers' online presence in unprecedent breadth and depth:

> Standard background checks don't catch everything they should. While traditional checks help verify important information, few screening methods can ensure that current and future employees are aligned with your mission and values. Even fewer can predict whether they'll exhibit toxic behavior. As sexual harassment, bigotry, and other workplace issues move to the forefront of our society, companies that rely on standard background checks risk brand damage and lost authenticity. Fama brings compliant, AI-based employment screening to help you create a productive, welcoming workplace and get you the information you need.[33]

The deployment of recruitment algorithms is not limited to background screening: the entire process, from analysing CVs through to ranking candidates, making offers, and determining salary

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[32] In previous work, I have defined a 'function' of being an employer as one of the various actions employers are entitled or obliged to take as part of the bundle of rights and duties falling within the scope of the open-ended contract of service: J Prassl, *The Concept of the Employer* (OUP 2015) 24–25. In trawling the established tests of employment status such as control, economic dependence, or mutuality of obligation for these employer functions, there are endless possible mutations of different fact scenarios, rendering categorisation purely on the basis of past decisions of limited assistance. The result of this analysis of concepts underlying different fact patterns, rather than the actual results on a case-by-case basis, is the following set of functions, with the presence or absence of individual factors becoming less relevant than the specific role they play in any given context - the 'equipollency principle' (*Äquivalenzprinzip*): L Nogler, 'Die Typologisch-Funktionale Methode am Beispiel des Arbeitnehmerbegriffs' (2009) 10 ZESAR 459, 463. Whilst this analysis was developed primarily on the basis of Common Law jurisdictions, subsequent work suggests that the approach is capable of being similarly developed in Civilian jurisdictions: see e.g. J Prassl and M Risak, 'Uber, TaskRabbit, and Co.: Platforms as Employers? Rethinking the Legal Analysis of Crowdwork' (2016) 37 *Comparative Labor Law and Policy Journal* 619-651.

[33] https://www.fama.io/about

levels can be automated – and increasingly is, with sometimes deeply problematic consequences: in early 2019, media reports suggested that Amazon had been forced to abandon its automated recruitment tool after the machine learning algorithm had begun systematically to reject female applicants for engineering roles within the firm.[34]

Once employees are hired, they might find themselves under the watchful eye of the algorithmic boss: the day-to-day *management of the enterprise-internal market* (another core employer function) can similarly be automated to a surprising degree. One of the most-discussed providers in this context are *Humanyze*, a company coming out of Ben Waber's and colleagues' work at MIT. In order to facilitate information-gathering in the workplace the company has developed a badge to be worn by participating employees during their working days. Whilst the 'Humanyze badge does not measure or record content, web activity, or personal activities outside the office', it does offer 'sensors to measure whether the participant is in motion or still, their proximity to other badged users and beacons, whether the participant is talking or not talking, and the frequency and duration of in-person interactions.' (Though, employees are assured, 'No, the Humanyze Badge does not track [you] in the bathroom'.[35])

The information thus gathered is then analysed 'to uncover informal communication networks. These communication networks are fundamental to understanding how work gets done on your team and within your organization.' Management 'no longer have to rely on surveys or observations to understand what's working (and what's not). [Humanyze] metrics quantify the previously un-measurable factors for team success, like collaboration and communication, that are essential for productivity and performance.'[36]

Workforce analytics software, finally, can even be relied upon in exercising the employer's power of *terminating the employment relationship*. When faced with allegations of retaliatory dismissals in response to concerted trade union activity in one of its warehouses, Amazon revealed the

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[34] https://www.independent.co.uk/life-style/gadgets-and-tech/amazon-ai-sexist-recruitment-tool-algorithm-a8579161.html

[35] https://www.humanyze.com/resources/data-privacy/

[36] https://www.humanyze.com/solutions#process

extensive use of algorithmic management: the claimant's employment had been terminated for a lack of productivity, as determined by a neutral algorithm. Local warehouse management, the company's defence asserted, had had no input, control, or understanding of the details of the system deployed.[37]

5. Concentrating Control

Present space limitations prohibit a further exploration of how the exercise of the full range of employer functions can – and has – become automated through the advent of people analytics. The picture emerging from the rich literature on point is clear:[38] management automation enables the exercise of hitherto impossibly granular control over every aspect of the working day. This, however, is not merely a return to (digital) Taylorism: the kinds of data considered, the probabilistic patterns relied upon in machine learning, and new forms of exercising control all differ fundamentally from the traditional management structures around which employment law has been designed.

A combination of real-time data collection and machine-learning analysis allows employers to monitor and direct their workforce on a continuous basis – whilst dispersing responsibility to algorithms. Driven by unpredictable and fast-evolving parameters, management decisions become difficult to record, or even explain. The remaining sections of this article explore the ensuing *control/accountability paradox*, looking first at the concentration of control, before turning to the diffusion of responsibility.

A. Data

The first element in the rise of people analytics is the gathering of hitherto unimaginable quantities of *Data*: fine-grained information about individual employees. There are three broad sources of

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[37] https://www.theverge.com/2019/4/25/18516004/amazon-warehouse-fulfillment-centers-productivity-firing-terminations

[38] See e.g. E Ales, Y Curzi, T Fabbri, O Rymkevich, I Senatori and G Solinas (eds), *Working in Digital and Smart Organizations: Legal, Economic and Organizational Perspectives on the Digitalization of Labour Relations* (Palgrave McMillan, 2018).

data in the modern workplace: digital information, sensors, and a growing trend of employee self-tracking. As regards digital information, first, a large number of providers offer software solutions that allow employers to capture employees' digital activities, from key stroke logs through to screenshots taken at regular (yet random) intervals.[39] Information about phone calls, emails, and other communication channels can similarly be recorded. Even where the actual substance of such communications is not disclosed or analysed, so-called 'metadata' (for example, the duration and frequency of calls between specific individuals, or the size and timing of email attachments sent to external recipients) can easily be captured.

In addition to these digital crumbs, increasingly sophisticated sensors (such as Humanyze's badge, as discussed in the preceding section) allow the capture of physical information: Uber famously pioneered the use of its drivers' iPhones to measure how quickly individuals accelerate and/or break, thus capturing smooth and abrupt driving patterns.[40] Surveillance, crucially, is not limited to employer-imposed monitoring: whether through the use of fitness trackers or health-apps on our telephones, there is an increasing trend of self-monitoring or self-tracking, the results of which can easily be combined with data gathered in the workplace.[41]

In addition to the sheer quantity of information that can be captured, the reliance on these sources raises two further concerns: first, that the traditional boundary between the workplace and individuals' private lives is rapidly breaking down. Information about an individuals' weekend activities can easily be combined with measures of Monday morning productivity, revealing patterns far beyond traditional employer concerns. Second, even where information is collected and stored in anonymised form, as information is increasingly organised in machine-readable formats, data sets from different sources can – at least in principle and subject to data processing consent and privacy laws in jurisdictions such as the European Union – easily be combined to build large employee databases, and – again, at least in principle – quickly identify individuals within a firm.

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[39] https://support.upwork.com/hc/en-us/articles/211068518-Use-Your-Work-Diary

[40] https://eng.uber.com/telematics/

[41] G Neff and D Nafus, *Self-Tracking* (MIT Press Essential Knowledge series, 2016).

B. Processing

Recording and organising large amounts of data in and of itself is not enough, however: key to the rise of People Analytics is the availability of increasingly powerful tools to process and analyse what has been captured. The rise of Artificial Intelligence in general, and Machine Learning in particular, has become the object of intense discussion in legal and policy debates beyond the scope of the present enquiry. It is important to note that (domain-specific) Artificial Intelligence is not a novel concept, or even new term.[42] Historically, however, the technology was mostly restricted to so-called 'expert systems', where a series of decisions were coded into a complex decision-tree.[43]

More recently, the advent of large data sets and precipitous drops in the cost of processing power have fuelled the rise of machine learning – probabilistic analyses of large datasets, relying on sophisticated statistical modelling to spot patterns or correlations in the data.[44] This is a crucial step away from our traditional understanding of algorithms: Machine learning is designed to rely on a constant evolution and redefinition of parameters – algorithmic control is no longer just confined to experiences taught through training data sets and pre-programmed analytical routines.[45] The results are ever-changing decision structures: as increasing amounts of data are collected about individual employees and every aspect of their working lives scrutinised on an on-going basis, the factors considered relevant for key metrics such as productivity or innovation will continue to change.[46]

C. Control

In a first wave of People Analytics, the emphasis was on augmenting managerial decision-making power: machine learning algorithms would scour big data sets for important insights into the

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[42] Some of the classic early citations include J McCarthy, M Minsky, N Rochester and C Shannon, *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence* (1955); and A Turing, 'Computing Machinery and Intelligence' (1950) 49 *Mind* 433.

[43] For an illustration in the employment context, see e.g. the UK Government's employment status tool, https://www.gov.uk/guidance/check-employment-status-for-tax

[44] N Polson and J Scott, *AIQ: How Artificial Intelligence Works and How We Can Harness its Power for a Better World* (Bantam Press, 2018).

[45] D Heaven (ed), *Machines That Think* (New Scientist, 2017).

[46] I Goodfellow, Y Bengio, A Courville, *Deep Learning* (The MIT Press, 2016).

Electronic copy available at: https://ssrn.com/abstract=3661151

workplace, from the arrangement of physical spaces to productive and unproductive team behaviours, and then provide the automation to management in order to inform their choices.

At least from a technical perspective, however, there is nothing inherent in the capabilities of such software to limit itself to informing traditional managers: in principle, at least, their actual decisions can be fully automated.[47] Amazon's Baltimore warehouse, discussed above, is a case study in point:

> Amazon's system tracks the rates of each individual associate's productivity and automatically generates any warnings or terminations regarding quality or productivity without input from supervisors [...] If an associate receives two final written warnings or a total of six written warnings within a rolling 12-month period, the system automatically generates a termination notice.[48]

The use of algorithmic management to sanction workers was pioneered in the gig economy, with platforms' keen to detect and prevent any 'gaming' of their systems by individuals: [D]rivers are penalized for rejecting lower paid work in favo[u]r of higher paid work, which is illustrative of another constraint on their "freedom" as independent entrepreneurs.'[49] For some time, Uber also instigated brief deactivation periods of up to 10 minutes as an immediate sanction for a driver's repeated refusal to accept unprofitable rides.[50]

<div align="center">* * *</div>

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[47] In jurisdictions covered by the European Unions' General Data Protection Regulation, such an approach would not be legal, given a right to have a 'human in the loop', i.e. not to be subject to fully automated decisions: see GDPR, Art 22.

[48] The Verge (legal documents as linked in article), (n).

[49] Alex Rosenblat and Luke Stark, 'Algorithmic labor and information asymmetries: a case study of Uber's drivers' (2016) 10 International Journal of Communication 3758, 3761, 3762, 3766.

[50] Doug H, 'Fired from Uber: why drivers get deactivated, and how to get reactivated', *Ride Sharing Driver* (21 April 2016), http://www.ridesharingdriver.com/fired-uber-drivers-get-deactivated-and-reactivated/, archived at https://perma.cc/3MQL-4TWD; Kari Paul, 'The new system Uber is implementing at airports has some drivers worried', *Motherboard* (13 April 2015), http://motherboard.vice.com/read/the-new-system-uber-is-implementing-at-airports-has-some-drivers-worried, archived at https://perma.cc/CV8P-EM7U; '10 minute timeout', *Uber People* (1 March 2016), http://uberpeople.net/threads/10-minute-timeout.64032/, archived at https://perma.cc/AS3C-94EP. As part of a recent settlement in the United States, drivers there now enjoy marginally more clarity, even though temporary deactivation for low acceptance rates is still explicitly mentioned: Uber, 'Uber community guidelines', http://www.uber.com/legal/deactivation-policy/us/, archived at https://perma.cc/8MR4-GFDL. In other cities, temporary deactivation has been replaced by a simple logout.

Taken together, the increasing availability of data, sophisticated machine learning processing, and algorithmic control, are key ingredients in a fundamental change which is not merely on the horizon as a distant future vision, but already becoming reality in workplaces across the socio-economic spectrum, as the warehouse example, above, demonstrates. The algorithmic boss can hover over each worker like a modern-day Panoptes, the all-seeing watchman of Greek mythology: from vetting potential entrants and assigning tasks, to controlling how work is done and remunerated, and sanctioning unsatisfactory performance—often without any transparency or accountability. As US District Judge Chen put it, citing Michel Foucault, 'a state of conscious and permanent visibility . . . assures the automatic functioning of power'.[51]

6. Diffusing Responsibility

From a legal perspective, this dramatic increase in control might at first be thought to be welcome: most employment law systems place significant emphasis on control and/or subordination as a key factor in determining when a relationship should come within the scope of protective norms. At the same time as dramatically concentrating employer control, however, key elements of algorithmic management can also be relied upon to diffuse responsibility: questions as to who should be liable – the employing enterprise? The designers of the software? The providers of contaminated training data? – can no longer necessarily be tackled with the traditional tools of employment law. This is the fundamental technical challenge in the rise of people analytics.

The scope of employment law has been a vexed question for decades: in most legal systems, control and subordination are central criteria in the definition of the employee (who enjoys legal rights and protection), her employer (who is subject to the corresponding duties), and the contract of employment between them.[52] Drawing on Coase's Theory of the Firm, Deakin and Wilkinson have demonstrated how this legal model plays a similarly crucial role in the economics of labour market

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[51] Citing Michel Foucault, *Discipline and Punish: The Birth of the Prison* (ed. Alan Sheridan, Vintage Books 1979), 201.

[52] B Waas and G Heerma van Vosss (eds), *Restatement of Labour Law in Europe: Volume I* (Hart 2017).

regulation:[53] employment law is the trade-off site between the benefits of control imposed on employees, and the cost of protective obligations imposed on employers in return. Individual instances of managerial control are attributed to the employer's (legal) personality in order to ensure accountability and facilitate enforcement.[54]

A vast literature on 'atypical work' has explored the problematic implications of this approach in work arrangements which deviate from the received paradigm of stable, open-ended employment for a single employer.[55] Examples include the 'fissuring workplace',[56] where employer control is exercised by multiple parties through outsourcing agreements, the use of temporary agency work, or complex corporate groups; and false self-employment, where employer control is contractually denied through the fiction of independent contractor status.[57] Once the reality of control is thus camouflaged, so-called 'atypical' or 'non-standard' workers may no longer enjoy access even to basic protective norms such as minimum wages or discrimination law.[58]

Crucially, however, the mechanisms which hide the reality of employer control in 'non-standard work' are fundamentally legal ones: from the use of corporate personality (e.g. in the incorporation of subsidiary agency companies)[59] to contract law (e.g. in inserting independent contractor or self-employment clauses in traditional employment contracts),[60] the problem is one of '"armies of

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[53] S Deakin and F Wilkinson, *The Law of the Labour Market: Industrialization, Employment, and Legal Evolution* (OUP 2005) 15, 86-7.

[54] P Davies and M Freedland, 'The Complexities of the Employing Enterprise' in G Davidov and B Langile (eds), *Boundaries and Frontiers of Labour Law* (Hart 2006).

[55] For an overview, see eg E Albin and J Prassl, 'Fragmenting Work, Fragmented Regulation: The Contract of Employment as a Driver of Social Exclusion' in M Freedland et al (eds), *The Contract of Employment* (OUP 2016) 209.

[56] D Weil, *The Fissured Workplace: Why Work Became so Bad for so Many and What Can Be Done to Improve it* (Harvard University Press 2014).

[57] See e.g. *Autoclenz Limited v Belcher and ors* [2011] UKSC 41; A Bogg, 'Sham self-employment in the Supreme Court' (2012) 41 *Industrial Law Journal* 328.

[58] International Labour Organisation (ILO), *Non-Standard Employment around the World: Understanding Challenges, Shaping Prospect* (Geneva 2016).

[59] H Collins, 'Independent Contractors and the Challenge of Vertical Disintegration to Employment Protection Laws' (1990) 10 *Oxford Journal of Legal Studies* 353.

[60] ILO, *Regulating the Employment Relationship in Europe: A Guide to Recommendation No 198* (Geneva 2013) 33.

lawyers" contriving documents … which simply misrepresent the true rights and obligations on both sides', as Employment Tribunals have repeatedly highlighted.[61]

In principle, at least, this makes it relatively straightforward to respond to evasion: existing legal mechanisms create the difficulty in ascribing responsibility to the controlling employer, and existing legal mechanisms can be relied on to restore it. Doctrines such as sham contracting or the primacy of facts allow courts to look through self-employment clauses and focus on the reality of employer control; and the corporate veil may be pierced to combat fraudulent abuse by controlling parent entities. [62]

The challenge arising from the advent of people analytics, on the other hand, is radically different: algorithmic management does not rely on legal mechanisms to obfuscate control in order to evade responsibility – rather, diffuse and potentially inexplicable control mechanisms are inherent in the use of increasingly sophisticated rating systems and algorithms.

* * *

How can employment law grapple with the challenges identified? There is a clear need for legal regulation to ensure that emerging technologies are deployed within proper boundaries. Over the past few years, the legal challenges arising from 'big data' and machine learning have increasingly become the focus of extensive academic discussion, both in computer science and more traditional legal debates. At the same time, however, it is not always clear whether the ideas proposed could work in the very specific regulatory context of employment law. Given the specificities of the personal employment relationship, solutions proposed in general contexts, or even other areas such as consumer protection, cannot necessarily be translated across. This point can be illustrated briefly by reference to the three areas explored in the preceding section.

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[61] *Aslam and Farrar v Uber*, Case No. ET/2202550/2015, at para [73] (London Employment Tribunal, Judge Snelson).

[62] The reality of litigation and enforcement will of course be significantly more complex: J Prassl, *The Concept of the Employer* (OUP 2015) ch 5, ch 6.

Data

When it comes to *Data*, first, the key question regarding the responsible use of AI relates to privacy and data protection, and more recently, the real dangers of algorithmic discrimination inherent in the use of automated decision making. Early empirical work has clearly demonstrated that automated decision making can replicate – or even bolster – patterns of discriminations prevalent in the labour market. At the same time, however existing legal categories, including notably indirect discrimination / disparate impact, may well be insufficient to hold employers accountable for algorithmic control resulting in such discriminatory outcomes.

It is important to acknowledge these shortcomings in existing regulatory structures. However, in in order to come up with credible solutions, we first need to understand the fundamentally different control and decision structures behind algorithmic decision making, and model legal responses accordingly – up to and including a complete rethink of the legal techniques required to counter discrimination at work. It is unclear, for example, whether discrimination law's long-standing emphasis on causation can be reconciled with machine learning's reliance on correlation?[63] As predictive algorithms improve their accuracy with ever-larger datasets, what sanctions should be in place for a pre-emptive dismissal on grounds of an unprotected characteristic (such as a preference for sugary drinks) which is highly correlated with a protected ground (e.g. developing a disability in old age)?[64]

In terms of data protection more specifically, the European Union's General Data Protection Regulation ('GDPR') may provide some level of protection for employees across the Union's member states,[65] as explored in the Article 29 Data Protection Working Party's extensive documentation, including in particular *Opinion 2/2017 on data processing at work* ('Opinion').[66]

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[63] Allan G. King & Marko Mrkonich, "Big Data" and the Risk of Employment Discrimination, 68 Okla. L. Rev. 555 (2016).

[64] Sharona Hoffman, 'Big data and the Americans with Disabilities Act' 68 Hastings Law Journal 777 (2017).

[65] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation), OJ L 119, 4.5.2016, p. 1-88.

[66] https://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=610169 . Today, the Article 29 Working Party ('WP29') has been replaced by the European Data Protection Board, an independent body responsible for

The 'collection, recording, organisation, structuring, [and] storage' of Data (perhaps somewhat confusingly included in the broader definition of 'processing'[67] will only be lawful, for example, where the employer can show a legal ground for doing so.[68] As the recitals make clear, however, consent, the primary lawful reason in many areas, 'should not provide a valid legal ground for the processing of personal data in a specific case where there is a clear imbalance between the data subject and the controller'.[69] Recognising the specific features of the employment relationship, the Opinion therefore concludes that '[u]nless in exceptional situations, employers will have to rely on another legal ground than consent—such as the necessity to process the data for their legitimate interest. However, a legitimate interest in itself is not sufficient to override the rights and freedoms of employees.'[70]

The deployment of people analytics software may, in principle, constitute an employer's legitimate interests.[71] In order to collect the data required for the software to work, however, employers must first engage in a detailed proportionality assessment, considering whether:

- the processing activity is necessary, and if so, the legal grounds that apply;

- the proposed processing of personal data is fair to the employees;

- the processing activity is proportionate to the concerns raised; and

- the processing activity is transparent.[72]

The WP29's Opinion explores a number of relevant scenarios in detail. In screening candidates' social media profiles during recruitment process, the collection of data must only take place to the extent to which it is 'necessary and relevant to the performance of the job'. The data subject must be 'correctly informed' of the employer's steps, and all data collected should be 'deleted as

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the consistent implementation of the GDPR. The Board has endorsed the Opinions and Guidelines of WP29 (Endorsement 1/2018): see https://edpb.europa.eu/news/news/2018/endorsement-gdpr-wp29-guidelines-edpb_en

[67] GDPR, Art 4(2).

[68] GDPR, Art 6(1).

[69] GDPR, Recital 43

[70] WP29 Opinion, 4.

[71] GDPR, Art 6(1)(f)

[72] WP29 Opinion, 10-11.

soon as it becomes clear that an offer of employment will not be made or is not accepted by the individual concerned.[73] Keystroke logging and screen capture technology, particularly when deployed in order to monitor home or remote working, on the other hand, is unlikely to be permissible under the GDPR. As the Working Party concludes, 'the processing involved in such technologies are disproportionate and the employer is very unlikely to have a legal ground under legitimate interest, e.g. for recording an employee's keystrokes and mouse movements.'[74]

Insofar as employee data are concerned, it thus appears that the provisions of the GDPR provide a number of mechanisms which might be able to counterbalance some of the concerns raised in connection with the increasing spread of algorithmic management. This is not to say that it can solve all the inherent contradictions. The Working Party's recommendations on the monitoring of employees' personal devices exhorts employers to ensure that '[i]n order to prevent monitoring of private information appropriate measures must be in place to distinguish between private and business use of the device.'[75] Given the increasingly fluid boundaries between these contexts, however, it is not immediately clear how such lines might be drawn.

Processing

A second set of challenges relates to explaining and understanding the operation and results of machine learning for purposes of legal responsibility. As we have seen, the iterative approach inherent in modern machine learning techniques can make the algorithmic boss highly unpredictable – and inexplicable, as evolving decision parameters can be near-impossible to reconstruct, or document exhaustively.[76] In concrete terms, this means that the reason why a worker was fired by her algorithmic boss may no longer be relevant – or even discernible – a few days after the event.

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[73] WP29 Opinion, 11.

[74] WP29 Opinion, 16.

[75] WP29 Opinion, 17.

[76] M Temme, 'Algorithms and Transparency in View of the New General Data Protection Regulation' (2017) 3 *European Data Protection Law Review* 473.

How, then, can algorithmic management be held accountable? In beginning to explore these questions, important inspiration can be found in the emerging literature on data protection, explicability and algorithmic design at the intersection of data science and the law, including notably Frank Pasquale's work on the 'black box society', [77] and most recently, the European Union's General Data Protection Regulation.[78] Once more, however, the majority of existing work in this field, with the notable exception of Opinion 2/2017, has relatively rarely strayed into the specific context of employment. This is not necessarily surprising, given the number of specific features which heighten many of the underlying tensions, including most importantly the fundamental inequality of bargaining power between an employer and her employees,[79] as well as vast differences in industrial relations structures and labour market organisation in different jurisdictions.[80]

As a result, even the most promising regulatory strategies developed in contexts such as financial regulation or data protection will rarely fit the workplace: whereas increased transparency can be a powerful tool in scrutinising financial market,[81] imposing similar obligations on employers might quickly run up against employees' privacy expectations.[82] Advocates of unconditional counterfactual explanations as a promising strategy to explain algorithmic decision making whilst avoiding complex technical arguments, have similarly explicitly highlighted that 'counterfactuals do not provide the statistical evidence needed to assess algorithms for fairness or racial bias'.[83]

As opposed to its potential in the context of data collection, even the GDPR is unlikely in the short term successfully to tackle these challenges. There are a number of substantive and procedural requirements which might impact on the deployment of algorithmic management – including the

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[77] F Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (HUP 2015).

[78] L Feiler, N Forgó, and M Weigl, *The EU General Data Protection Regulation (GDPR): A commentary* (Globe Law and Business, 2018).

[79] K Wedderburn, *The Worker and the Law* (3rd edn, Penguin 1986).

[80] O Kahn-Freund, 'On Uses and Misuses of Comparative Law' (1974) 37 *Modern Law Review* 120.

[81] F Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (HUP 2015).

[82] J Atkinson, 'Workplace Monitoring and the Right to Private Life at Work' (2018) 81(4) *Modern Law Review* 688.

[83] S Wachter et al, Counterfactual explanations without opening the black box: automated decisions and the GDPR' (2018) 31 *Harvard Journal of Law & Technology* 842, 883.

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limitation that data must be 'collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes';[84] the need to conduction a Data Protection Impact Assessment ('DPIA') '[w]here a type of processing in particular using new technologies, and taking into account the nature, scope, context and purposes of the processing, is likely to result in a high risk to the rights and freedoms of natural persons';[85] and particular safeguards surrounding sensitive personal data, including 'racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership.'[86]

These obligations, however, are primarily procedural. It is less clear whether the GDPR – despite provisions on processing transparency and information provision for data subjects[87] - is equipped to provide rights in this context. The literature is divided, in particular, as to whether the GDPR gives data subjects a 'right to explanation' as to how a particular set of algorithms has arrived at a decision – and which would therefore quite dramatically reduce the range of solutions available. Malgieri and Commandé, for example, argue for a broad reading of the GDPR which would mandate a 'legibility test that data controllers should perform in order to comply with the duty to provide meaningful information about the logic involved in an automated decision-making;'[88] whereas Wachter, Mittelstadt, and Floridi restrict their reading to a narrow 'right to be informed', which demonstrates a lack of 'explicit and well-defined rights and safeguards against automated decision-making, and therefore runs the risk of being toothless.'[89]

In assessing the GDPR's potential, finally, it is also important to watch out for specific carve-outs and domestic implementation. The potentially powerful limitation on subjecting individuals to decisions based solely on automated processing in Article 22, for example, is subject to an explicit

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[84] GDPR Art 5(1)(b).

[85] GDPR Art 35(1).

[86] GDPR Art 9(1).

[87] GDPR Art 13, 15.

[88] G Malgieri and G Comandé, 'Why a Right to Legibility of Automated Decision-Making Exists in the General Data Protection Regulation' (2017) 7 International Data Privacy Law 243, 243.

[89] S Wachter, B Mittelstadt, L Floridi, 'Why a Right to Legibility of Automated Decision-Making Does Not Exist in the General Data Protection Regulation' (2017) 7 International Data Privacy Law 1, 1.

consent exception.[90] Article 88, finally, provides significant implementation flexibility in the employment context:

> Member States may, by law or by collective agreements, provide for more specific rules to ensure the protection of the rights and freedoms in respect of the processing of employees' personal data in the employment context, in particular for the purposes of the recruitment, the performance of the contract of employment, including discharge of obligations laid down by law or by collective agreements, management, planning and organisation of work, equality and diversity in the workplace, health and safety at work, protection of employer's or customer's property and for the purposes of the exercise and enjoyment, on an individual or collective basis, of rights and benefits related to employment, and for the purpose of the termination of the employment relationship.

Whilst such flexibility, in particular through the involvement of the social partners, is to be welcomed in principle, it is interesting to note that deviation from the GDPR's standards is possible as long as rules are 'more specific' – a curious divergence from the more traditional wording in the context of employment directives, which have tended to provide for derogation only in order to 'introduce laws, regulations or administrative provisions which are *more favourable* to employees'.[91]

Control

A final challenge is linked to the wide range of control mechanisms which algorithmic management enables. In the previous section, we saw how the use of algorithmic management software can quickly go far beyond mere monitoring, up to and including automated terminations. Crucially, however, employer orders need no longer be explicitly framed as directives aimed at the workforce: Algorithmic control is exercised in myriad ways, often eschewing direct orders or explicit

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[90] GDPR Art 22(2)(c). Though cf the Working Party's concerns regarding consent in the employment relationship, as discussed in the text surrounding note 70, above.

[91] See e.g. Council Directive 2001/23/EC of 12 March 2001 on the approximation of the laws of the Member States relating to the safeguarding of employees' rights in the event of transfers of undertakings, businesses or parts of undertakings or businesses OJ L 82, 22.3.2001, p. 16–20, Art 8 (emphasis supplied).

instructions.[92] As a result of the advent of the algorithmic boss, the use of automated rating mechanisms,[93] gamification,[94] and incentive-based 'nudge' mechanisms,[95] become increasingly effective in controlling large, heterogeneous workforces whilst scrupulously avoiding the appearance of traditional employer control.[96]

Alex Rosenblat and Luke Stark were amongst the first to conduct an extensive study of such control mechanisms. They demonstrates how working conditions can easily be 'shaped by the company's deployment of a variety of design decisions and information asymmetries via the application to effect a "soft control" over workers' routines'.[97] Even though instructions are 'carefully designed to be indirect, presumably to avoid the appearance of a company policy',[98] they can achieve essentially the same outcome as direct orders:

> Individualized metrics . . . foster a 'highly individualized sense of responsibility
> for one's own job stability', even though [workers] have limited control over how
> passengers interact with the rating system or how [the company] assesses it. By
> design, systematic accountability for the whole interactive process is downloaded
> onto individual [workers].'[99]

When an Uber driver is ready to quit at the end of her shift, for example, algorithmic control can be quick to step in. Rosenblat and Stark demonstrate how the app prompts drivers with an enticing

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[92] The operation of algorithmic control mechanisms tallies closely with 'the most effective and insidious use of power' identified by Steven Lukes. He argues that control over a situation can be exercised in myriad ways, 'whether through the operation of social forces and institutional practices or through individuals' decisions':
To put the matter sharply, A may exercise power over B by getting him to do what he does not want to do, but he also exercises power over him by influencing, shaping or determining his very wants. Indeed, is it not the supreme exercise of power to get . . . others to have the desires you want them to have—that is, to secure their compliance by controlling their thoughts and desires?' (Steven Lukes, *Power: A Radical View* (Palgrave 2005), 27)

[93] T Slee, *What's Yours Is Mine* (O/R Books 2015), 101.

[94] M Bodie, M Cherry et al, 'The law and policy of people analytics' (2016) *University of Colorado Law Review* 962.

[95] A Rosenblat and L Stark, 'Algorithmic labor and information asymmetries: a case study of Uber's drivers' (2016) 10 *International Journal of Communication* 3758

[96] P Moore, M Upchurch, and X Whittaker (eds), *Humans and machines at work: monitoring, surveillance and automation in contemporary capitalism* (Palgrave 2017).

[97] Alex Rosenblat and Luke Stark, 'Algorithmic labor and information asymmetries: a case study of Uber's drivers' (2016) 10 International Journal of Communication 3758, 3775.

[98] Ibid.

[99] Ibid., 3772 (citations omitted).

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pop-up message accompanied by the surge-price icon: 'Are you sure you want to go offline? Demand is very high in your area. Make more money, don't stop now!'[100]

In order to capture the full range of algorithmic management, it will be crucial to adapt and develop our received legal notions of control to include a much broader range of instructions and control. In a 2015 decision which was part of on-going litigation about Uber's employee classification, US District Judge Edward M. Chen recognised this very point, in finding that:

> Uber's application data can . . . be used to constantly monitor certain aspects of a driver's behavior. This level of monitoring, where drivers are potentially observable at all times, arguably gives Uber a tremendous amount of control over the 'manner and means' of its drivers' performance.[101]

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The challenges arising from algorithmic management are not limited to the examples presented: another major set of issues arise from the scalability of the technology. One of the reasons why Taylorism failed were the high transaction cost involved in monitoring and measuring each individual worker's performance. With algorithmic management, the marginal monitoring cost for additional employees are minimal. As a result, software written in California and run on cloud servers in multiple locations is able to monitor and sanction worker behaviour across the world in real time. The resulting jurisdictional issues alone will require intensive study and debate.

7. Conclusion

The rise of algorithmic management is slowly but definitely becoming a focal point of academic analysis and broader policy debates surrounding the future of work. The patterns of discourse are reminiscent of those surrounding the early days of what was then frequently referred to as the

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[100] Alex Rosenblat and Luke Stark, 'Algorithmic labor and information asymmetries: a case study of Uber's drivers' (2016) 10 International Journal of Communication 3758, 3768.

[101] *Douglas O'Connor v Uber Technologies Inc.*, 82 F.Supp.3d 1133, 1151–2 (ND Cal. 2015).

'sharing economy'. Once more, we are faced with starkly conflicting messages, juxtaposing the promise of the future of work with dire predictions of (algorithmically perfected) exploitation. In reality, of course, there are elements of truth in both accounts: we should be very weary of easy regulatory solutions proposed by proponents on either side, whether it's complete deregulation on the one side, or a luddite phantasy of smashing technology on the other.

The real challenge lies in harnessing the unequivocal potential in the trends which will shape tomorrow's work, whilst ensuring that no one is left behind in enjoying decent and sustainable working conditions. More fundamentally, this requires that we avoid falling into the trap of (technological) determinism: none of the trends identified in this paper come as the result of some inexorable logic. Historical evidence strongly suggests that technological progress makes work easier, safer, and more productive. At the same time, however, it opens up the possibilities of abuse, from privacy-invading surveillance to precarious, highly pressured work.

What is essential, then, is a real sense of agency, of the power and the path-dependence of regulatory choices. Where our efforts are focused depends on legal and economic incentives, which ultimately determine whether technology is deployed in support of decent work – or whether it presents a real threat to it. It is hoped that the challenges highlighted in this article will contribute a few first steps towards that task.