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Algorithmic Management in the Work Environment: Responsible Interaction between the Employer, Technology Supplier, and Trade Union²

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Abstract

This study aimed to investigate the barriers to responsible interaction between the global employer, technology provider, and trade union to realize the postulate of ethical artificial intelligence in the algorithmic management process. To overcome the barriers, this study offers a pedagogical explanation based on a universal schema for shaping a machine-learning model.

Keywords: ethical AI, machine learning, algorithmic management, human resources analytics, HRA.

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Zarządzanie algorytmiczne w środowisku pracy – odpowiedzialna interakcja pomiędzy globalnym pracodawcą, dostawcą technologii oraz związkiem zawodowym³

Streszczenie

Celem niniejszego badania było prześledzenie przeszkód stojących na drodze odpowiedzialnej interakcji pomiędzy globalnym pracodawcą, dostawcą technologii oraz związkiem zawodowym, która służy realizacji postulatu etycznej sztucznej inteligencji w algorytmicznym procesie zarządzania. W celu pokonania tych przeszkód badanie wyjaśnia tę kwestię w sposób pedagogiczny, w oparciu o uniwersalny schemat kształtowania modelu uczenia maszynowego.

Słowa kluczowe: etyczna SI, uczenie maszynowe, zarządzanie algorytmiczne, analiza zasobów ludzkich, HRA.

³ Badania wykorzystane w artykule nie zostały sfinansowane przez żadną instytucję.

Introduction

Modern technology is critical in determining not only business success and competitive advantage but also the efficiency of the working environment. In the analysis of modern technology, Artificial Intelligence (AI) has been applied in the broadest sense to support human resource management processes or Human Resources Analytics (HRA), which is the focus of the current study. HRA is a process that relies on applying analytical methods to the overall work process, which, from a global employer's perspective, is designed to increase employee productivity, and thus, provide a better return on investment. Specifically, HRA is a set of tools that employ data mining to support or independently make accurate decisions in the employment sphere.⁴

A pertinent branch of AI technology relevant in the current area of investigation is machine learning, which, alongside deep learning, is one of the primary technologies driving AI today. Machine learning is a self-learning algorithm that uses past data and statistical models to perform a specific task automatically. Instead of being explicitly programmed, machine learning enables software applications to identify patterns in the data and learn to make accurate predictions. Within HRA, machine-learning technology enhances the efficiency of recruitment processes, performance management, building teams, selecting training, building incentive systems, administering employee benefits, shaping individual promotion paths, and recommending further employment.⁵

As a reference for the 'responsible interaction' between a global employer and a technology provider, this study mainly refers to the ethical AI principles defined by the Organisation for Economic Co-operation and Development (OECD). Adopted in May 2019, the OECD lists five value-based complementary principles for the responsible management of AI: inclusive growth, sustainable development, and

⁴ H.H.D.P.J. Opatha, *HR Analytics: A Literature Review and New Conceptual Model*, "International Journal of Scientific and Research Publications" 2020, 10(06), p. 131; A. Margherita, *Human Resources Analytics: A Systematization of Research Topics and Directions for Future Research*, "Human Resource Management Review" 2021, 32(2). <https://doi.org/10.1016/j.hrmr.2020.100795>.

⁵ M. Nocker, V. Sena, *Big Data and Human Resources Management: The Rise of Talent Analytics*, "Social Sciences" 2019. <https://doi.org/10.3390/socsci8100273>.

well-being, human-centred values and fairness, transparency and explainability, robustness, security, and safety, and accountability.⁶

The question then arises as to what kind of universally applicable structures or systems offer the chance to overcome these barriers while implementing machine learning systems. In other words, what are the ways to effectively address the widespread lack of knowledge and expertise in AI and related computer systems among employees and their representatives to meet the aforementioned ethical AI postulates?

The central research hypothesis of this study rests on the process of interaction between the global employer, not only with the technology provider but also with social partners, which requires the entire cycle of shaping the machine learning system to be examined. In this interface between the global employer and the technology provider, the process of social dialogue on the rules of algorithmic management in the working environment and the quest for its transparency are the primary areas that the current study focuses on.

Collective Bargaining and Machine Learning

The doctrine of labour law attaches high importance to the balancing role of trade unions and collective bargaining in addressing the wide range of negative social impacts caused by labour automation and algorithmic management. Social dialogue and collective bargaining play essential roles in mitigating the impact of AI on the labour market and facilitating the introduction of new technologies.⁷

Social dialogue and collective bargaining play a fundamental role in the above areas. Evidence indicates that social dialogue and collective bargaining can help companies identify tailored and equitable solutions to organizational and technological change and highlights the flexibility of collective bargaining in the sectoral and company-specific applications of AI technologies, holding workers' and employers' interests accountable, and applying the general principles set out in legislation to specific contexts.⁸ In addition, social dialogue and collective bargaining can improve the quality of the working environment.⁹ In the same vein, a recent study found

⁶ OECD, *Recommendation of the Council on Artificial Intelligence 2019*, OECD/LEGAL/0449.

⁷ OECD, *Negotiating Our Way Up: Collective Bargaining in a Changing World of Work*, OECD Publishing, Paris, 2019. <https://doi.org/10.1787/1fd2da34-en>.

⁸ <https://www.etui.org/publications/algorithmic-management-and-collective-bargaining> (access: 15.03.2023); OECD, *Negotiating Our Way Up: Collective Bargaining in a Changing World of Work*, OECD Publishing, Paris 2019. <https://doi.org/10.1787/1fd2da34-en>.

⁹ OECD, *Negotiating Our Way Up...*

that worker representation leads to job designs that provide better working conditions and reduce workers' scepticism towards automation.¹⁰ Furthermore, social dialogue and collective bargaining are necessary to address excessive inequalities resulting from AI and ensure respect for basic labour and human rights as part of an international initiative towards human-centred governance. Hendrickx calls for the complete coordination of human rights instruments, such as the European Convention on Human Rights (ECHR), data protection instruments, such as the EU General Data Protection Regulation (GDPR), and labour regulation instruments, including collective bargaining, to ensure that the use of new technologies at work is compatible with human rights.¹¹ The UNI Global Union has developed principles on ethical AI and worker privacy and data protection to be implemented at different levels of global framework agreements.¹² Some trade unions have also called for new rights, such as the right to not be subjected to wholly automated decisions (without human intervention), and the right to clarify decisions made by algorithms or machine learning models, as automated choices can result in incorrect performance appraisals and biased assignment of tasks.¹³ The British Trades Union Congress (TUC) has produced an AI Manifesto proposing the introduction of new rights into legislation. These include the right to data reciprocity, giving workers the right to collect and combine data from the workplace, the right to human review of high-risk decisions, and the right to human contact when vital decisions involving people at work are made.¹⁴

The distinguishing attributes of AI technologies, such as their complexity and opacity, pose risks in creating and perpetuating social inequalities, unequal treatment of equals, and dehumanization of decision-making by making individuals the objects of mathematical calculations. It is worth noting that the risks can pose a threat to individual rights such as freedom of action, personal rights, and fairness, and group rights such as non-discrimination.

Ensuring transparency in the choice of concepts or criteria used and the identification of appropriate operationalizations can help mitigate the risks that AI technologies carry. A model's explanatory power and reliability can be understood, documented, and improved to a large extent by technical methods. The required

¹⁰ F. Belloc, G. Burdin, G. Burdin, F. Landini, *Robots, Digitalization, and Worker Voice*, 2022. <https://doi.org/10.2139/ssrn.4009136>.

¹¹ F. Hendrickx, *Protection of Workers' Personal Data: General Principles*, ILO Working Paper, 2022, 62 (Geneva, ILO), p. 16 ff.

¹² http://www.thefutureworldofwork.org/media/35420/uni_ethical_ai.pdf (access: 15.03.2023).

¹³ <https://www.etui.org/publications/algorithmic-management-and-collective-bargaining> (access: 15.03.2023); OECD, <https://www.tuc.org.uk/research-analysis/reports/dignity-work-and-ai-revolution> (access: 15.03.2023).

¹⁴ <https://www.tuc.org.uk/research-analysis/reports/dignity-work-and-ai-revolution> (access: 15.03.2023).

technical knowledge should be complemented by less formalized knowledge, e.g. what is morally appropriate in a given context. Such knowledge needs to be developed in collaboration with various stakeholders, who may need to be engaged specifically for this purpose. According to Michele Loi, an expert on the ethical aspects of AI at the University of Zurich, employees have a right to understand the logic behind such systems.¹⁵ This is a necessary, though not sufficient, condition for the autonomy of employees who must not become passive objects of algorithmic management. Instead, they must be able to actively contribute to improving organisational performance using the insights generated by applying these algorithmic systems. Ultimately, the systems must be designed and implemented to benefit the employees, not just the employer, permanently.

All the actors involved – the providers of the algorithmic systems, the companies that use them, and the employees affected – must be willing to work together to develop AI-related solutions that consider varied interests. To this end, providers must make information available that allows employers and employees to understand how the AI systems work. At the same time, in many cases, it may be reasonable for companies to protect their investments, including the use of trade secrets. In order to develop appropriate models for ‘self-learning’ systems in an ethically acceptable way, the explainability and fairness of algorithmic systems must be addressed first.

Trade unions have an essential role to play in this regard. Social dialogue needs to be developed following a universal series of steps, also referred to in existing literature as ‘machine learning pipelines’, which are adopted to develop, implement, and monitor a machine learning model. Based on the use cases of the machine learning model and the organization’s requirements, each machine learning pipeline can be different to some extent. However, all stages follow the general machine learning workflow with some standard stages that every pipeline contains. Each pipeline stage takes the output from the previous step, which serves as the input for that stage.

One initial step in building a machine learning model is understanding its need in the organization. Developing machine learning can be resource-intensive, and therefore, clear objectives need to be agreed upon and set at the outset. The implemented model will deliver much more value if aligned with the organization’s goals. The next stage is to determine the type of model required. This requirement varies depending on the type of task the model needs to perform and the characteristics of the dataset at hand. The analyst should initially explore the data

¹⁵ M. Loi, *People Analytics muss den Menschen zugutekommen*, „Study der Hans-Böckler-Stiftung“ 2021, 450, p. 17 ff.

through an exploratory data analysis process, which provides an initial understanding of the dataset, including its features and components, and the ability to do some primary clustering. Machine learning models typically need large arrays of high-quality training data to provide an accurate model. The model will generally learn the relationship between input and output from this training dataset. Depending on the type of machine learning training being performed, the composition of these datasets varies. Supervised machine learning models are trained on labelled datasets that contain both input variables and labelled output variables.

The effectiveness of a machine learning model in the real world depends on its ability to generalise, i.e. apply the logic learned from the training data to new, unseen data. Models are often at risk of overfitting the training data, meaning that the algorithm may be too closely aligned with the original training data. This will result in a decrease in accuracy or even loss of function when encountering new data in the real-world environment. Model optimization is integral to building accuracy and performance in a machine-learning model by adjusting the model configuration. Models can also be optimised to fit specific goals, tasks, or use cases. Machine-learning models will have a certain degree of error, which is aimed to be reduced through optimisation. The final step in building a machine learning model is to implement it. Machine-learning models are typically developed and tested locally or offline using training and test datasets.

The participation of social partners in the building of the machine-learning model is possible from the programming side. This participation is essential, since the impact of digitalization and automation technologies depends mainly on designing and implementing these technologies in the workplace. Business case studies have indicated that amplifying employee voice is beneficial in shaping workplace digital transformation. Employee engagement through formal employee representation bodies and direct participation results in greater acceptance of technological change, ultimately leading to a more practical approach to digitalization.¹⁶ However, many employees do not know what data their employers are collecting about them and what algorithmic management systems are being used. Researchers highlight the importance of employees being able to 'negotiate the algorithm' when AI is used in performance management systems. This task is more difficult when transparency is low.¹⁷ Beyond data protection and privacy rights, a more far-reaching ethical approach addresses fundamental human rights, i.e. the right to non-discrimination, human dignity and integrity, freedom of association,

¹⁶ <https://op.europa.eu/en/publication-detail/-/publication/5d7feb38-45c9-11ec-89db-01aa75ed71a1> (access: 15.03.2023).

¹⁷ A. Antonio, V. De Stefano, *Your Boss Is an Algorithm: Artificial Intelligence, Platform Work and Labour*, Hart Publishing, 2022, p. 11 ff.

and collective bargaining. To ensure that an ethical approach to the digitalisation of work is adequately developed, the involvement of social partners is crucial to protect the interests of all stakeholders at all levels, from the design and implementation of national strategies to the introduction and use of technology into the workplace. This is in line with claims by academics that better worker representation is needed to protect workers' data rights.¹⁸

Stages of Machine Learning Development

Conceptualizing Machine Learning in the Organization

This initial stage of conceptualizing machine learning in the organization is related to understanding the need to apply the technology in the organization. In other words, it is an attempt to define the main business problem the company wants to address by using HRA. The model implemented is likely to function better if it is the subject of dialogue with the employee side. This stage is, therefore, one of the most sensitive steps of the machine-learning pipeline. At the design stage, there is a risk of choosing the wrong analytical concept or mathematical model or (pre) selecting irrelevant data for the task at hand. Errors in operationalising social phenomena and ideas or in applying aspects irrelevant to solving the target problem can further generate risks. Ensuring transparency and optimal operationalization can help to address these problems.

In addition, there is a potential for ex-ante assessments of the social impact of machine-learning systems to be based on incorrect predictions. Subsequent evaluations based on audit content may result in wrong estimates. Programming not considering potential use in other operational areas relevant to fundamental rights may render ex-ante assessments outdated. Impact assessments should, therefore, be conducted each time an algorithm is used in a different place of application. The risk that project logic prioritises short-term economic efficiency gains over social utility can be reduced if the common good is considered in development processes (e.g. identifying an appropriate logic model).

Questions that may arise on the employee side are, for instance, related to the scale of work automation, the problem of concentration of power and knowledge in the algorithmic management process, the right to information regarding the interaction and decision-making rules of AI systems, shaping the pattern of the

¹⁸ P.V. Moore, *Data Subjects, Digital Surveillance, AI and the Future of Work*, European Parliamentary Research Service, 2020, p. 15 ff.

ideal employee in an organisation, and counteracting discriminatory practices as a result of the system perpetuating inappropriate patterns, among others.

Data Mining

The second stage concerns the realm of data collection and processing. This stage involves determining the type of machine-learning model required. Again, the differences in requirement depend on the task the model should perform and the characteristics of the available dataset. In general, we can distinguish between three machine-learning models or types of machine-learning algorithms: learning with reinforcement, unsupervised learning, and supervised learning. In terms of workforce issues, supervised learning is the most common form of machine-learning model. This machine-learning model learns from a dataset and is used to identify trends and groups to categorise data and detect rules governing the dataset.

The role of the employee side is also indispensable in the second stage. It is important to bear in mind that all the objectives of the global employer are mainly focused on business strategies. The risks related to employee interests are, for instance, excessive focus on the efficiency effect in the final form of algorithmic management and the exclusion of interpersonal issues. Undoubtedly, it is challenging to create a fair and transparent HRA system. Nevertheless, the trade union side can participate, including at this stage, through dedicated software to support the machine-learning modelling process. On the technical side, employees and trade unions should be provided tools that allow other stakeholders to understand why a machine-learning model works in a certain way. With the appropriate software, it is technically possible for the union side to understand the model's behaviour and attempt to influence its final shape. This is served, for instance, by specific dashboards and metrics such as ATP files and integrated functionalities that help keep machine-learning models within the requirements of a specific risk.

Training the Model

In the third stage, the global employer and the technology provider test the machine-learning system under development in a local or offline environment, using training and test datasets. The subsequent stages of technology implementation raise important ethical questions regarding whether there is sufficient cognitive knowledge, also in ethical terms, of the user-managers of the system at this stage about the system, its limitations, and the relevant application domain. In addition, whether the system provides a possibility to audit the system, to correct decisions made algorithmically, especially if something goes wrong. What kind of feedback

mechanism does the system follow? This third stage of system development should, through system testing, answer the above questions.

Implementation and Evaluation

The final step of shaping a machine-learning model is to implement the model. Implementation is when the model moves into the actual environment in which it operates and begins to perform the tasks for which it has been trained. The model is subject to continuous management to ensure that it is working not only effectively and efficiently but also transparently according to employees and their representatives. Alongside the development of the machine-learning model, an additional challenge is the establishment of monitoring processes.

The data on which the model works changes over time. Viewed from this perspective, a trained model is a kind of 'snapshot' of historical data, which suggests that the input data will be different from that on which the model was trained, and consequently, the performance of such a model may degrade over time. Obviously, this depends on the context, the use case, and how quickly things change in an organization. The solution is to retrain the model based on social dialogue between the global employer and the employee side.

The Legal Environment

In order to better understand the applications of AI, in particular the surveillance of data and algorithms that exist in various workplaces and how trade unions and workers' councils can protect workers in these sectors, trade unions are increasingly offering training for workers and workers' representatives.¹⁹

Based on the pedagogical model of algorithmic transparency, it is worth analysing the legal environment in which it operates. In this respect, the EU perspective and regulations in the United States are of particular importance. In each of these jurisdictions, the essential core of AI provisions focuses on four areas of law: data protection law, antidiscrimination law, consumer protection law, and procedural law provisions, particularly concerning the right to a fair trial.

Regarding data protection, the European order mainly comprises the provisions of the EU GDPR, the related judicial case law, and the operations of the European data protection authorities. The provisions of the GDPR address the various phases

¹⁹ <https://www.etui.org/publications/algorithmic-management-and-collective-bargaining> (access: 15.03.2023).

of machine learning design to a limited extent. In this respect, Article 22 of the GDPR addresses the prohibition of automated decision-making, but only under certain conditions. Article 22 does not prohibit automated decision-making when the data on which the decision is based was processed lawfully on the basis that it was necessary for the conclusion of a contract, permitted by law, or, most importantly, based on explicit consent (Article 22(1)).

In addition, the right to explanation is not included in Article 22. Only the recital mentions it, which leads to the broad issue of the interpretation of the GDPR in European legislation concerning the legal status of recitals. In the context of the right to explanation, the wording in the recital 'should' further weakens the institution. Article 22 also provides the right not to be subject to a decision based solely on 'automated processing, including profiling, which produces legal effects against it [...]'. This important threshold practically excludes algorithmic management, which entails full automation of decisions in EU countries and which has no significant human input in such decisions. Furthermore, GDPR rights apply to general data collection and processing technologies. These include, in particular, the right to transparent information and communication and the right to access (Articles 12, 13, and 15), rectification, erasure, and restriction of processing (Articles 16 and 17). Article 22 is, therefore, a relatively unstable legal basis for building a harmonized, general EU right to algorithmic clarification. Moreover, Article 22 contains an additional ambiguity – to operationalize the right to explanation, it is necessary to know what the relevant input variables of the data were (see steps one to four), which in itself requires access to part of what resembles an algorithmic explanation.

Several additional EU proposals could affect the use of AI systems in the workplace. For instance, the proposed Directive to Improve the Working Platform would require digital work platforms to inform workers about the use and critical features of automated monitoring and decision-making systems while limiting the types of data that could be processed. This would also require human monitoring of automated systems and a review of the key decisions made by such systems (European Commission, 2021). In many ways, this proposal clarifies the regulation of algorithms relevant to platform workers, which has been uncertain concerning the Digital Services Act and Digital Markets Act proposals discussed by the European Parliament.²⁰ The proposals would have established general principles applicable to all data access and processing platforms and specific obligations that would apply to 'core platform services' or 'gatekeepers'. In particular, recommendation

²⁰ A. Ponce Del Castillo, *The Digital Services Act Package: Reflections on the EU Commission's Policy Options*, *ETUI Policy Brief*, 2020, 12, p. 2 ff.

algorithms would be required to be secure and transparent while promoting fair competition and fostering innovation.²¹

The EU AI Act is an ambitious contribution to the AI policy conversation, with concrete implications for AI use in the workplace. In April 2021, the European Commission (EC) released an AI package containing the EC's review of the Coordinated Plan and a proposal for an AI law to enable an AI 'ecosystem of trust' in Europe.²² The proposal may encounter significant changes as it undergoes negotiations with the EU Parliament and Council. Starting from the end of 2021, the proposed AI regulation would regulate the 'development, marketing, and use of AI systems' in the EU according to a horizontal and risk-based regulatory approach that distinguishes between AI applications based on minimal risk, low risk, and high risk, while subject to specific safeguards, and unacceptable risk, proposing a strict prohibition of the same. This approach would affect the entire lifecycle of AI systems from development to deployment and use and would apply to both the public and private sectors.

The draft AI Act regulation lists two main categories of stakeholders: the supplier and the user. The supplier is the legal entity that places an AI system on the market or puts it into use (Article 3(2)). The user uses the AI system under his or her control, except when the AI system is used in the course of personal, non-professional activities (Article 3(4)).

Concerning the working environment, a separate category of stakeholders, currently not explicitly mentioned in the draft regulation, are employees and representatives of their collective rights and interests. The legal environment in which an AI system operates is so diverse that the EU legislator did not choose to additionally regulate these groups. Therefore, the labour and trade union sides appear in the EU regulation indirectly. This is evident, if only, from the fundamental objective of the draft regulation, which is to develop and ensure safe, reliable, and ethical AI. The regulation is intended to serve a protective function aimed at counteracting certain harmful practices related to using AI. Such systems will have to meet several horizontal, mandatory requirements for trustworthy AI and be subject to a conformity assessment procedure. Indirect stakeholders, including the broader workforce and their representatives (most often trade unions), are a protected group because AI systems related to the employment sphere have been classified as 'high risk'. This implies, among other things, introducing robust pro-

²¹ European Commission, *Europe Fit for the Digital Age: Commission Proposes New Rules for Digital Platforms*, 15 December 2020, press release, https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2347 (access: 15.03.2023).

²² <https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence> (access: 15.03.2023).

cedural solutions aimed at the security of employees. Chapter II sets out an extensive list of requirements for high-risk AI systems, ranging from the need to establish risk management and data management systems, rules for technical documentation, recording of events, transparency in the provision of information to users, to the introduction of the principle of human oversight. Moreover, high-risk AI systems should be registered in a public database (EU database for stand-alone high-risk AI systems – Article 60), supervised by national supervisory authorities and coordinated by the European AI Council (Article 56).

Trade unions have prepared guidelines, ethical principles, reports, and policy briefs to highlight workers' concerns and potential policy solutions. Trade unions can serve as a medium for public participation in AI regulation without broader government policy debate or action. For instance, in its 2021 report, the UK Trades Union Congress highlighted several ethical challenges, noted the value of targeting high-risk systems, and made legislative recommendations to avoid AI-based discrimination, protect privacy, and establish a set of rights for workers.²³ Trade unions have also called for greater participation of workers and their representatives in managing AI in the workplace. Trade unions representing AI developers have emphasised a more trustworthy use of AI, noting the need to strengthen transparency (including open audit trails and real-time surveillance), develop technical standards and certification to increase accountability, and involve workers in decisions regarding the adoption of AI in the workplace. They also made pertinent policy recommendations, including the need for defining accountability (mainly outside the engineering profession) and a framework for explainability (Association of Nordic Engineers, n.d.).

Conclusions

Responsible collaboration between a global employer and a technology provider involves the demand for ethical AI. In the case of AI technologies applying machine learning, a barrier to genuine social dialogue is the difficulty associated with the complexity of AI systems and the concomitant lack of sufficient, specialized knowledge on the part of the trade union or employee representation. For the most part, such barriers can be overcome. One such avenue is a method of pedagogical explanation based on a universal schema for shaping a machine-learning model.

²³ R. Allen QC, D. Masters, *An Italian Lesson for Deliveroo: Computer Programmes Do Not Always Think of Everything!* 2021, ai-lawhub.com, <https://ai-lawhub.com/2021/01/18/an-italian-lesson-for-deliveroo-computer-programmes-do-not-always-think-of-everything/> (access:15.03.2023).

This is a model, or in other words, a roadmap for the collaboration between a business organisation and a technology provider, which should also be followed by employee representatives. The legal environment in the European Union, and especially the European Commission, has made many regulatory efforts to administer this sphere of social life while moving towards the fundamental goal of ethical AI. However, the proposed solutions seem to underestimate the balancing role of employee representation, especially trade union representation. Indeed, the primary weight of the regulation focuses on shaping the user-technology provider relationship with a prominent role of the latter. Accordingly, the provisions of the GDPR, similar to many labour law institutions, need to be reassessed. In addition, a unique research challenge opens up for employment law in examining the dynamic development of high-risk AI technologies in the work environment.

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