# The use of hybrid intelligence in recruiting: Opportunities, challenges, and experts' attitudes

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Abstract: The increasing significance of highly qualified and skilled personnel in organizations has elevated the importance of "human capital" (van Esch & Black, 2019, p. 731). Recruiting, once a straightforward task, is now considered strategically vital for a company's success. The emergence of new technologies, such as artificial intelligence (AI), presents opportunities to revolutionize the recruitment process, leading to numerous advantages, but also new challenges (cf. van Esch & Black, 2019, p. 731). This has created unprecedented issues for applicants, companies, and governments, as they navigate the implications of AI in the recruiting process, as well as a need for associated regulations.

Recognizing that the recruitment process is inherently reliant on human interaction, most experts agree that the integration of AI should support rather than replace the "human factor", thus advocating a hybrid approach (cf. Dellermann et al., 2019, p. 639). This paper, which is primarily based on two Bachelor's Theses by the second author, Mr. Justin Bullerjahn, which were supervised and assessed by the third author of this paper, Mr. Wolfgang Granigg, aims to explore the optimal utilization of AI in conjunction with human intelligence in recruitment, examine stakeholders' perspectives on using AI in the recruiting process, analyze the benefits offered by AI in this context, and address the ethical and legal considerations involved. In addition to providing an overview of AI and the recruiting landscape in general, the paper offers an insight into the attitudes and reservations that human resource experts from Austria and the United States of America share when discussing the use of artificial intelligence in recruiting. 

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#### I. HUMAN INTELLIGENCE VS. ARTIFICIAL INTELLIGENCE

Human intelligence encompasses cognitive abilities such as abstract thinking, problem-solving, adaptive behavior, and understanding complex ideas (cf. Franken, 2007, p. 26). It is characterized by qualities like empathy, flexibility, creativity, and intuition (cf. Dellermann et al., 2019, p. 640). On the other hand, artificial intelligence (AI) is a subfield of informatics (and mathematics) focused on developing "intelligent agents" (respectively "intelligent behavior") capable of independently solving diverse problems (cf. Buxmann & Schmidt, 2019, p. 6). AI offers advantages such as reduced error rates, quick and efficient data processing, and consistent performance. It can be categorized as weak AI (utilizing algorithms for specific problems) or strong AI (aiming to imitate intuition, consciousness, and empathy), though the implementation of a strong AI is currently nonexistent (cf. Buxmann &

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Schmidt, 2019, p. 6f.). Strong AI would also mean being able to independently apply certain problem-solving strategies to completely new problems - this is something AI is currently (fortunately?) not yet able to do.

Machine learning is a key aspect of AI, involving the programming of systems to "learn" through data input using statistical methods. This enables the system to make predictions and improve its performance over time. Machine learning can be 'supervised' or 'unsupervised', depending on the availability of labeled training data. Deep learning, a technique within machine learning, has demonstrated significant advancements in language and image recognition, enhancing the training capabilities of such systems through the use of neural networks. Besides supervised and unsupervised learning, reinforcement learning represents a third group of approaches. Compared to supervised and unsupervised learning, however, reinforcement learning is still in its infancy - especially as far as its concrete practical applicability is concerned.

Another subfield of AI, natural language processing (NLP), aims to enable computers to better understand human language and forms the basis for AI in recruiting in certain cases. Effective language comprehension is crucial for processing information accurately. In the recent past, NLP has become known to a broad public, especially through ChatGPT and other language-based AI tools.

Hybrid intelligence refers to the combination of human and artificial intelligence to achieve higher levels of intelligence than either alone. This synergy allows for the accomplishment of complex goals. Both humans and AI can benefit from this collaboration, as humans gain a deeper and more nuanced understanding of AI, while AI learns from human input.

A key question is how new technologies, such as AI, will be accepted in practice. One model which is often referred to in the context of business informatics is the Technology Acceptance Model (TAM). This model serves as a fundamental framework for evaluating the perception and acceptance of new technologies (cf. Davis & Venkatesh, 1996, p. 19). Widely utilized across various industries, TAM aids in understanding the factors influencing the acceptance of AI implementation. Key factors within the acceptance model include the perceived simplicity of use and the potential benefits offered by new technologies, such as reduced user effort, while maintaining ease of use. However, it is important to note that a standardized acceptance model specifically for AI has yet to be established.

## II. THE RECRUITING PROCESS

Before delving into how artificial intelligence tools can be using in recruiting, it is essential to gain an overview of different phases of the recruiting process in general. This process encompasses several key stages to identify and attract qualified individuals to meet their goals.

The first step involves determining the number of additional individuals and their qualifications required in each department to align with the company's objectives (cf. Troger, 2018, p. 135). Of course, budgetary boundary conditions must also be taken into account in this context. Once the vacancies are defined, the profile of the desired candidate is established, specifying the necessary qualifications, requirements, education, work experience, and other relevant factors.

During the 'outreach phase', job advertisements are published across various media platforms, such as the company's website, newspapers, and social media channels. These advertisements provide information about the company, the vacancy, and the required qualifications (cf. Panczuk, 2016, p. 26). Human resources (HR) personnel strategically formulate these advertisements to attract both active job seekers and passive candidates who may be enticed by an exceptional job opportunity.

Applicants then undergo a screening process based on specific criteria, aiming to streamline the selection process and save resources for subsequent interviews and assessments. This often involves the use of personality tests or other assessments to evaluate applicants' problem-solving abilities and logical thinking skills (cf. Panczuk, 2016, p. 39).

The final step in the recruitment process involves conducting job interviews to gain a deeper understanding of the applicants, including their character traits, soft skills, and overall fit for the role. In some cases, larger companies may have their own assessment centers, where promising applicants are given tasks to complete under professional supervision to further evaluate their skill sets (cf. Troger, 2018, p. 152f).

Once all the steps of the recruitment process are successfully completed, a job offer is extended to the chosen candidate(s). Subsequently, the onboarding process begins, ensuring a smooth transition for the new employees into their roles within the organization.

#### III. POSSIBLE USES OF AI TOOLS IN RECRUITING

AI tools have already been integrated into various stages of the recruiting process, including outreach, screening, and assessment. These tools offer several advantages and improvements to traditional methods (cf. Dudler, 2020, p. 102). Below, some examples for tools that are currently being used are listed.

In the outreach phase, AI-powered tools can assist in creating job advertisements by utilizing natural language processing. These tools suggest appropriate text formulations based on the target demographic, leading to better engagement and increased applicant numbers. They are also able to reduce gender bias in job ads, particularly prevalent in languages such as German, where generic masculine forms are commonly used. AI tools are employed in the analysis of social networks to identify the most suitable channels for job advertisements, optimizing the reach and effectiveness of advertising efforts. Additionally, chatbots can be employed as initial points of contact between companies and applicants, providing prompt responses to common inquiries about the company or the job. Some chatbots even enable applicants to apply for positions directly via an online application mask. This approach improves the candidate experience, as it offers direct feedback and constant availability while allowing HR personnel to focus on essential tasks (cf. Dudler, 2020, p. 102).

During the screening process, AI tools can facilitate preselection by automatically rejecting unsuitable applicants who do not meet minimum requirements in their CVs. Screening software evaluates the suitability of applicants by comparing data from their CVs and other documents using machine learning algorithms. The software provides scores based on historical data from the company. AI-driven screening analyzes information beyond the basic level, even understanding sentences to assess resilient applicants. Research suggests that AI screening is at least as reliable and valid as human screening, particularly in handling a large number of CVs, where human concentration may falter over time (cf. Lochner & Preuß, 2018, p. 198f).

AI screening is faster and more efficient, providing an advantage to companies that can swiftly identify and engage with desirable applicants, increasing their chances of hiring exceptional talent (cf. Lochner & Preuß, 2018, p. 198f). The time-to-hire (which refers to the duration of time between application and onboarding of an applicant) is a critical metric for companies, as those with shorter screening processes have a higher probability of securing outstanding candidates compared to their competitors. Background screening is another area where AI tools are employed. Systems search through various databases, including social media platforms, to assess potential risks associated with an applicant, such as hate speech, discriminatory posts, or previous legal issues. Additionally, these tools are used to verify the accuracy of application documents.

In the assessment phase, AI tools utilize gamified psychological measurements and machine learning algorithms to evaluate attributes, behaviors, and cognitive abilities of applicants (cf. Wilson et al., 2021, p. 668). This may include the usage of assessment centers and tests.

Personal interviews typically take place after the abovementioned steps, with a significant portion of applicants (50% to 80%) already eliminated by this stage. However, there is software available for conducting asynchronous interviews, where applicants answer pre-set questions in front of a video camera within a specific time frame. AI can analyze the answers, voice, microexpressions, body language, and more, providing potential insights into the applicant's job performance and attitudes at work. Asynchronous interviews can improve the candidate experience by allowing flexibility in scheduling, while also reducing the workload for HR personnel. However, the explainability and interpretability of AI systems for video recognition currently still remain limited, raising questions about the parameters and decision-making process. Ensuring transparency is essential, as the quality of

results depends on understanding how they were obtained. Legal frameworks can also have a sufficient explainability of the used AI methods as a basic requirement.

## IV. PERCEPTION OF AI IN RECRUITING

The perception of AI in recruiting is reflected by both the applicants' and companies' perspectives. From the applicants' point of view, there is a consensus that AI can assist humans in the recruitment process. However, the attitudes of individual applicants play a crucial role in determining their likelihood of applying to a company that utilizes AI in recruiting. Those who are skeptical of AI are less inclined to apply, while those with a positive perception are generally more open to the idea (cf. van Esch et al., 2019, p. 218). Many applicants express fear or concerns regarding AI, particularly in the context of video AI-assisted video interviews, which can be perceived as unattractive during the application process. A study revealed that screening tools were the most popular among applicants, while language analysis tools were the least popular, and chatbots fell in the middle (cf. Dahm & Dregger, 2019, p. 260). Applicants generally do not expect extensive interaction with HR during the screening stage but anticipate more engagement during the selection process and resulting interviews.

From the companies' perspective, the focus of integrating AI in recruiting is increased efficiency. HR personnel often perceive the use of AI in the outreach phase and screening as positive, as it saves time and resources (cf. Laurim et al., 2021, p. 5500). However, AI-powered video interviews are not well-received among HR employees, who express skepticism and fear of potentially losing talented candidates due to incorrect selection criteria (cf. Laurim et al., 2021, p. 5500). A study investigating recruiters' attitudes towards AI solutions in recruiting revealed that while AI is deemed useful for saving time, the final decision should ideally still be made by a human. It is also crucial for the AI system to be transparent in terms of its learning process and decision-making mechanisms (cf. Laurim et al., 2021, p. 5491).

#### V. THE HYBRID RECRUITING PROCESS

The goal of the hybrid recruiting process is to establish a symbiotic relationship between HR and AI, recognizing that AI alone cannot effectively replace human input. Recruitment is largely a decision-making process that benefits from both analytical and intuitive approaches. AI serves as the analytical component, providing data and insights, while HR professionals can use their experience and intuition to make informed decisions based on the AI's output. This approach allows the final decision to be driven by the qualified HR worker's holistic thinking, rather than relying solely on minor score differences. Consequently, AI-based recruiting without human intelligence is likely to be less effective, as the strategic, intuitive, and holistic thinking of the human mind cannot be replicated. The role of AI should be to support and enhance human intelligence, rather than replacing it (cf. Jarrahi, 2018, p. 584; cf. Dane et al., 2012, p. 187).

A conducted SWOT analysis of hybrid recruiting reveals several significant factors:

## A. Strengths of hybrid recruiting

Firstly, the strengths of this approach include a faster and more efficient recruitment process, resulting in better overall results compared to relying solely on either AI or human intelligence. It also enhances the candidate experience by maintaining the human component in the recruiting process. Often, a shorter time-to-hire is achieved through the elimination of manual work and the implementation of faster, automated processes. Additionally, recruiters are able to allocate their time towards important and more time-consuming tasks, avoiding extensive and monotonous screening procedures. Ideally, the use of AI helps reduce human bias in decision-making (cf. Laurim et al., 2021, p. 5500).

#### B. Weaknesses of hybrid recruiting

As any AI solution, hybrid recruiting is highly dependent on the quality and quantity of available data. Some AI tools currently lack a strong scientific foundation, making them susceptible to deceptive practices such as the strategic use of specific terms and keywords to trick natural language processing systems. Furthermore, for AI usage

to be effective, a sufficient number of applications must be available. Additionally, human bias may transfer into AI solutions depending on the data and learning processes involved (cf. Laurim et al., 2021, p. 5500).

#### C. Opportunitites and risks of hybrid recruiting

The opportunities for hybrid recruiting lie in its early stages of development, providing the potential for significant improvements in the recruiting process for both applicants and HR departments.

However, several risks must be acknowledged. Legal and ethical concerns are prominent, and there is also a fear of job loss due to automation. Nonetheless, hybrid recruiting mitigates this risk to some extent as the human component remains essential. Additionally, limited research has been conducted on applicants' perception of AI in recruiting, leading to skepticism and fear surrounding AI-based solutions (cf. van Esch et al., 2019, p. 218).

In summary, the strengths of hybrid recruiting include a faster and more efficient process, improved candidate experience, and the reduction of human bias. However, weaknesses are present, such as the dependence on data quality and the potential for human bias transfer. Opportunities lie in the developmental stage of hybrid recruiting, offering the potential for significant process improvements. However, risks related to legal and ethical concerns and job loss due to automation should be considered. Limited research on applicants' perception of AI in recruiting contributes to skepticism and fear regarding AI-based solutions.

#### VI. ETHICAL AND LEGAL FRAMEWORK

The legal and ethical considerations surrounding AI in recruiting present important aspects to examine. For example, the European Union has established specific regulations like the General Data Protection Regulation (GDPR), setting rules for data protection and privacy. For instance, Article 22 (1) of the GDPR grants applicants the right to not be solely assessed by a fully automated process, emphasizing the need for a qualified decision maker in the final step of the process (cf. Kunkel & Schoewe, 2021, p. 12). Additionally, personal data can be used during this process (cf. Blum & Kainer, 2019, p. 24). However, the legal text does not directly address the advantages of AI utilization. The restrictions on fully AI-based recruiting reflect a degree of skepticism on the part of the government. The question arises whether these norms are applicable in practical use and if they will withstand the ongoing AI revolution (cf. Kunkel & Schoewe, 2021, p. 15). It is very likely that in the future, an essential question in this context will be how explainable and comprehensible the respective AI method will be.

An ethical concern arises regarding the question whether AI can reduce human bias or whether it merely introduces new biases. While AI solutions may appear impartial by disregarding factors like ethnicity or appearance, the extent of bias depends on the data used to train the AI system. If the training data itself is biased, the AI system will reflect the same biases. For example, if the AI predominantly learns from a specific ethnicity, it may not make unbiased decisions when faced with a different ethnicity. Furthermore, existing human biases can be transferred to AI systems based on the input data (cf. Mujtaba & Mahapatra, 2019, p. 2).

To address these concerns, the implementation of ethical AI is crucial to prevent scandals and minimize bias in algorithms. Thorough assessment and adaptation of datasets during AI training are necessary to ensure fairness, which should be a foundational principle in all AI solutions for recruiting. Additionally, AI systems should be transparent and explainable to understand how results are obtained – as already mentioned above. Privacy concerns related to the handling of applicants' personal data are also of utmost importance (cf. Mujtaba & Mahapatra, 2019, p. 4).

In summary, the legal framework, ethical implications, and privacy concerns play significant roles in the use of AI in recruiting. Compliance with regulations, thorough dataset checks, and transparency are vital to ensure fairness, minimize bias, and protect applicants' personal data.

#### VII. EXPERT INTERVIEWS

In one of the two initially mentioned Bachelor Thesis of the second author (whereat both of them have been assessed with the highest grade possible), qualitative expert interviews were conducted in order to gather specific knowledge and provide new insights into the research area of hybrid recruiting. A total of eight experts were interviewed, four from Austria and four from the USA. These experts were selected based on their roles as key employees in the HR departments of their respective companies, possessing valuable experience and well-founded knowledge in the field. While being advantageous for the study, practical experience with AI in recruiting was not a mandatory criterion for the selection as an expert. All interviews were conducted in compliance with relevant data protection laws and regulations, with interview guidelines to ensure consistency across all eight interviews. Open-ended questions were used to allow experts maximum freedom in sharing their insights without steering the conversation into a specific direction. The results of the interviews were anonymized, transcribed, and translated, then sent to the respective experts for confirmation.

The qualitative content analysis of the interview results followed a structured approach based on Mayring's (2019, p. 637) methodology. The source material was systematically aggregated and reduced until only the most relevant content remained. Through the process of abstraction, concise statements were derived that still reflected the essence of the source material (cf. Mayring, 1994, p. 164). The following eleven categories were selected for the analysis:

- Chances and positive aspects of AI in recruiting
- Threats and negative aspects of AI in recruiting
- Assessment of AI tools with regards to job postings and advertisements
- Assessment of AI tools with regards to CV screening
- Assessment of AI tools with regards to video interviews
- · Selection of criteria and understandable explanations of AI in recruiting
- Legal assessment of AI in recruiting
- · Fairness and bias when using AI in recruiting
- The future of recruiting
- Main factors for acceptance of AI in recruiting
- Cooperation human and artificial intelligence in recruiting

Based on the conducted qualitative interviews and the application of Mayring's methodology along these categories, the following key statements can be deduced:

## A. Strengths and weaknesses of hybrid recruiting

Overall, the perceptions of HR experts towards the strengths and weaknesses of AI tools in recruiting showed little difference between experts from Austria and the USA. This suggests that there is a general similarity in attitudes towards AI tools in recruiting across these countries.

The primary focus of companies when using AI tools in recruiting is to increase efficiency – a sentiment that all experts agreed upon. AI is viewed as a tool for improving efficiency due to its cost-effectiveness and the reduction of manual tasks for recruiters, such as CV analysis and evaluation. The time saved by recruiters can then be allocated to more demanding tasks, such as preparing for interviews with promising candidates. The main advantage of using AI tools is the ability to handle a larger volume of applications compared to manual screening. Additionally, AI tools offer advantages in terms of accessing a global pool of applicants and the ability to filter out 'no-go-criteria' during the initial screening process, such as racist behavior.

However, it is crucial for companies to ensure that the use of AI tools complies with relevant regulations and legal frameworks, including data protection laws. Experts stated that companies must be transparent about the requirements for candidates and the development of AI tools. Incorrect setup or use of AI tools can have significant implications for the entire recruiting process, potentially excluding suitable applicants. Therefore, the establishment of high-quality learning algorithms that feed accurate data to AI systems is crucial in the opinion of the experts that were interviewed. Furthermore, data protection laws in Europe may pose challenges for machine learning compared to the USA, as certain data may not be allowed within AI solutions or systems.

Experts also expressed concerns about the boundaries between private and corporate life. The potential relevance of an applicant's personal social media page in the screening process was questioned. Additionally, the possible loss of HR jobs due to the increased efficiency of screening processes through AI was mentioned as a concern. The human contact between HR and applicants could also be lost, which was a concern for experts, as applicants may value the presence of HR employees and human interactions during the application process.

#### B. Comparison of different tools and experts' attitudes towards them

Similarly to the previous section, there were little to no differences in the attitudes of Austrian and American experts towards AI tools in recruiting. Experts were asked about their opinions on different use cases of AI in recruiting, specifically AI assisted optimization of job advertisements, screening software and AI based video interviews.

The AI assisted optimization of job postings received positive feedback from experts. The ability to create the 'perfect' job ad and formulate it using AI-generated keywords was of great interest to experts, some pointing out the additional positive influence on search engine optimization. Companies can save time and resources compared to manually creating job ads, as the task of creating optimized job postings is often time-consuming. Therefore, any reduction in manual effort is seen as a significant advantage by the experts.

Likewise, the automatic screening of CVs was also approved by experts. Screening CVs is a time-intensive task that requires careful attention from HR personnel. AI-based screening saves a significant amount of time and resources. Unlike humans, AI does not get tired after reading numerous CVs, thereby minimizing errors when compared to human intelligence. However, experts emphasized the importance of clear guidelines regarding job requirements and the selection process for the effective use of such AI tools.

When discussing video interviews using AI, experts described them as an interesting innovation with potential. However, experts agreed that human interaction during interviews is essential, and AI should not be the sole decision-making tool in the interview process. Trust in this tool was lower compared to the previous two tools, and concerns were raised about potential discrimination, such as accurately interpreting expressions and gestures of applicants with disabilities. Similar to screening tools, the issue of defining required criteria and the need for explainable and interpretable AI systems was raised.

An additional topic of discussion was candidate experience. Applicants are not yet widely accustomed to such tools, although this is expected to change with the increased use of AI in recruiting. Depending on the target group, applicants may have negative perceptions of the use of video conference AI tools.

## C. Experts' opinion on data protection and legal issues

Contrary to the previous questions, this topic showed differences in attitudes between the experts from Austria and the USA. Austrian experts placed a strong emphasis on data protection and regulations. They highlighted the need for clearer specifications regarding the section in the General Data Protection Regulation (GDPR) stating that decisions should not be based solely on AI. They advocated for more regulation in this area. In contrast, the experts from the USA had a slightly more relaxed approach to data protection and data security regulations. While they agreed that regulating the AI's power in the final decision of recruiting would be a good idea, they did not perceive it as a priority compared to the European context.

Ethical issues were also discussed with all experts, with opinions once again overlapping regardless of country of origin. Fairness was unanimously acknowledged as a central and important topic when considering the use of AI tools. The experts agreed that AI must be fair, ethical, and as unbiased as possible to ensure a fair selection process, which is also in the best interest of the hiring company. However, opinions differed on whether AI systems can truly be unbiased. Some experts believed that AI can reduce or eliminate human bias, while others expressed skepticism, noting that human bias can find its way into AI tools since humans are responsible for creating and training these systems.

## D. The future of recruiting

According to the insights gathered from expert interviews, there is a unanimous consensus among experts that AI tools will play an increasingly significant role in the future of recruiting. The experts anticipate that AI tools,

including chatbots and screening tools, will become the norm in the recruitment process. Consequently, the job profile of recruiters is expected to undergo a transformation, characterized by a reduction in manual tasks and an increased focus on more advanced responsibilities during the application process. This transformative process, referred to as "job enrichment," holds the potential to empower recruiters with additional responsibilities, possibly also extending to the administration and training of AI tools for recruitment in the future.

The acceptance of AI systems and tools in the recruiting process is dependent on various factors, as highlighted by the experts. It is crucial for companies to assure the neutral and objective nature of the tools employed. This assurance contributes to the overall acceptance and integration of AI systems in the recruitment domain.

Another significant aspect discussed during the expert interviews concerned the replaceability of human resource personnel. While all experts agreed that a complete elimination of human intelligence in recruiting is not a realistic prospect, they acknowledged the increasing prominence of hybrid intelligence, which denotes the combination of human and artificial intelligence. In this envisioned future, AI would assume responsibility for repetitive tasks during the outreach and preselection phases, while humans would retain their role in training AI models and conducting essential communication with applicants, including interviews and the final selection process. Many experts concurred that personal interviews remain indispensable, as values and attitudes of applicants are best assessed by empathetic humans rather than machines.

#### IV.CONCLUSION

Based on the comprehensive analysis of expert interviews and research findings, it is evident that AI tools have a significant role in the present and future of the recruiting process. The use of AI tools, such as text analysis software, CV screening algorithms, and video interview analysis, offers numerous advantages, including increased efficiency, reduced manual tasks, and enhanced objectivity in the selection process. However, several critical considerations must be addressed to ensure the successful integration and acceptance of AI in recruiting.

Data protection and compliance with legal regulations, particularly in regions with stringent data protection laws like Europe, are paramount. Clear guidelines and transparent explanations regarding the requirements for AI tools and their decision-making processes are necessary to instill confidence in their usage. Moreover, ethical concerns related to bias and fairness in AI systems must be effectively addressed to ensure a fair and unbiased selection process. As AI tools continue to evolve and become more prevalent in recruiting, it is crucial to foster a balance between the benefits offered by AI and the ethical considerations surrounding their implementation. Achieving this balance requires ongoing research, collaboration between human resources professionals and AI developers, and adherence to ethical guidelines and regulations.

While AI tools demonstrate great potential for improving recruiting processes, it is important to recognize the value of the human factor in the respective decision-making process. The concept of hybrid intelligence, combining human and artificial intelligence, emerges as a promising approach in recruiting, where AI systems can handle repetitive tasks while humans contribute their empathetic judgment and expertise during interviews and final selection.

In conclusion, the integration of AI tools in recruiting holds immense potential for enhancing efficiency and objectivity. However, it is essential to address challenges related to data protection, bias, explainability and the importance of human judgment in the selection process. By effectively navigating these considerations, organizations can leverage the power of AI while maintaining a fair and human-centric approach to recruiting in the future.

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