Algorithms and HR: The Impact of
Machine Learning in Personnel Selection

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Bachelor of Science

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Purpose/Motivation: In recent years, machine learning (ML) has seen rapid adoption across a range of industries, with a particularly transformative impact on human resources (HR). This thesis examines the impact of ML on HR, with a particular focus on its influence on personnel selection processes. Due to the increasing relevance of ML and the rapid increase in scientific work on the topic, the thesis summarizes the current state of research. The objective is to evaluate the potential benefits and constraints of ML in enhancing the efficiency, fairness, and data-driven nature of personnel selection, while also examining the inherent risks of bias and a lack of transparency in automated decision-making processes.

Theories/Hypotheses: This thesis integrates theories from the fields of human capital management and predictive validity to evaluate the role of ML in the hiring and selection process. The principal hypotheses posit that the utilization of ML tools serves to enhance the quality of selection processes, reducing the impact of unconscious bias and human error while facilitating a more effective alignment between candidate competencies and organizational requirements. However, the research also considers alternative hypotheses that the complex and opaque algorithms used by ML may introduce or perpetuate biases if not carefully managed. The relevant theories include human capital theory (Black, 2019), match quality (Edwards, 2008; Kristof-Brown et al., 2005), and the predictive hypothesis (Guion, 1965), each of which provides insights into the potential for ML to improve hiring decisions.

Approach/Methodology: The research employs a literature review methodology to analyze studies that address the integration of ML into personnel selection and recruitment processes. In particular, the review considers a range of ML tools, including NLP (E. D. Campion et al., 2024) for parsing resumes (Leutner et al., 2022), predictive algorithms for candidate scoring, and classification algorithms (Pampouktsi et al., 2021) such as Random Forests and Naïve Bayes. The effectiveness of these tools in key recruitment functions is assessed. Furthermore, the thesis examines the aspects of the recruitment and selection process, drawing upon the case study of Amazon's experience with ML applications (Dastin, 2022) to contextualize the advantages and limitations of these technologies in real-world settings.

Findings: The findings indicate that ML can significantly enhance recruitment efficiency by rapidly analyzing large volumes of applicant data and identifying key predictors of success, including qualifications, personality fit, and experience. The capacity of ML to process a wide range of data types, including resumes and social media profiles, provides HR departments with a comprehensive overview of each candidate's potential. However, the research demonstrates that the quality of ML predictions is contingent upon the integrity of the data, the quality of the input data (Alzubi et al., 2018), the transparency of the algorithms, and the potential for biases embedded within them (E. D. Campion et al., 2024). However, if the data is biased or incomplete, this may result in erroneous predictions. It is imperative that organizations prioritize transparency in order to foster trust (Langer & König, 2023). While ML offers substantial benefits, it should be used to augment, rather than replace, human judgment. The sophisticated comprehension that HR professionals contribute to the field is irreplaceable.

Research Limitations: This thesis is principally based on existing literature and theoretical analysis. The conclusions presented are based on empirical research conducted within the field, without direct experimental verification. It would be beneficial for future research to include empirical studies that test the specific impacts of ML tools in a range of HR settings and under different organizational constraints. A further limitation is the absence of long-term data concerning the impact of ML-driven selection on employee retention and job satisfaction.

Research Implications: The research highlights the necessity for ethical considerations and regulatory oversight in the deployment of ML within HR. Although ML can improve the efficiency of personnel selection processes, its adoption gives rise to concerns regarding fairness (Ingold et al., 2016), transparency, and accountability in automated decision-making. It is therefore recommended that HR professionals should be trained not only in the basic concepts of ML, but also in the recognition and mitigation of potential biases and ethical issues associated with its use. This study proposes a balanced approach, whereby ML should be employed to augment, rather than supplant, human judgment in the recruitment process.

Practical Implications: This thesis demonstrates the potential of ML to enhance the efficiency of recruitment processes by automating repetitive tasks and accurately identifying promising candidates. Nevertheless, due to inherent constraints such as opaque algorithms and potential biases, ML should be regarded as an adjunct rather than a substitute for human decision-making. It is recommended that practitioners exercise caution when implementing

ML, ensuring that there is adequate human oversight, clear communication with applicants, and transparent use of data.

Contribution: This thesis contributes to the field of intersection between HR management and ML by addressing the technological, operational, and ethical considerations associated with ML in the context of hiring. It presents a comprehensive framework for understanding how ML can be integrated responsibly, with a particular focus on transparency, fairness, and effectiveness. The objective of this research is to provide a structured analysis of the applications of ML in recruitment, with the aim of filling gaps in the existing literature on technology-driven recruitment.

Paper type: conceptual

Further readings:

Albert, E. T. (2019). AI in talent acquisition: A review of AI-applications used in recruitment and selection. *Strategic HR Review*, *18*(5), 215–221. https://doi.org/10.1108/SHR-04-2019-0024

Alzubi, J., Nayyar, A., & Kumar, A. (2018). Machine Learning from Theory to Algorithms: An Overview. *Journal of Physics: Conference Series*, *1142*(1), 1–15. https://doi.org/10.1088/1742-6596/1142/1/012012

Campion, E. D., & Campion, M. A. (2024). Impact of machine learning on personnel selection. *Organizational Dynamics*, *53*(1), 101035. https://doi.org/10.1016/j.orgdyn.2024.101035

Campion, E. D., Campion, M. A., Johnson, J., Carretta, T. R., Romay, S., Dirr, B., Deregla, A., & Mouton, A. (2024). Using natural language processing to increase prediction and reduce subgroup differences in personnel selection decisions. *Journal of Applied Psychology*, *109*(3), 307–338. https://doi.org/10.1037/apl0001144

Campion, M. A., & Campion, E. D. (2023). Machine learning applications to personnel selection: Current illustrations, lessons learned, and future research. *Personnel Psychology*, *76*(4), 993–1009. https://doi.org/10.1111/peps.12621

Dastin, J. (2022). Amazon Scraps Secret AI Recruiting Tool that Showed Bias against Women *. In *Ethics of Data and Analytics* (pp. 296-299). Auerbach Publications.

Koenig, N., Tonidandel, S., Thompson, I., Albritton, B., Koohifar, F., Yankov, G., Speer, A., Hardy, J. H., Gibson, C., Frost, C., Liu, M., McNeney, D., Capman, J., Lowery, S., Kitching, M., Nimbkar, A., … Newton, C. (2023). Improving measurement and prediction in personnel selection through the application of machine learning. *Personnel Psychology*, *76*(4), 1061–1123. https://doi.org/10.1111/peps.12608

Van Iddekinge, C. H. V., & Arnold, J. D. (2017). Retaking Employment Tests: What We Know and What We Still Need to Know. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*(1), 445–471. https://doi.org/10.1146/annurev-orgpsych-032516-113349