

THE USE OF ARTIFICIAL INTELLIGENCE IN THE ANALYSIS OF THE FIT COMPETENCES AND PERSONALITY OF EMPLOYEES TO THE LABOR MARKET

**Dariusz Mikołajewski¹, Anna Szymanik-Kostrzewska², Dawid Koliński³, Waldemar Wiśniewski⁴,
Piotr Falencik⁵**

¹ Uniwersytet Kazimierza Wielkiego, Wydział Informatyki, ul. Kopernika 1, 85-074 Bydgoszcz

² Uniwersytet Kazimierza Wielkiego, Wydział Psychologii, ul. Staffa 1, 85-867 Bydgoszcz

³ Fundacja Rytm Życia, Bydgoszcz

⁴ Duesxo, Bydgoszcz

⁵ Vivens Group S.A., Bydgoszcz

e-mail: dariusz.mikolajewski@ukw.edu.pl

Abstract: *This article discusses the development of artificial intelligence methods for analyzing the match between employee competencies and personality traits and labor market requirements. The authors point out that machine learning algorithms enable the processing of large datasets from CVs, professional profiles, and job advertisements, enabling more precise skill mapping. Particular attention is paid to analyzing the fit between personality and organizational culture using psychometric tools supported by predictive algorithms. The review of research shows that AI systems can increase the accuracy of candidate selection and reduce recruitment time and costs. At the same time, the authors emphasize the risk of replicating biases present in training data and the problem of transparency in decision-making models. The article also discusses ethical and legal issues related to personal data protection and the need to ensure transparency in recruitment processes. The review indicates that properly designed AI systems can support more objective and effective matching of employees to the labor market, provided that rigorous methodological and ethical standards are applied.*

Keywords: *intelligence, machine learning, optimization, objectification, feature analysis.*

WYKORZYSTANIE SZTUCZNEJ INTELIGENCJI W ANALIZIE DOPASOWANIA KOMPETENCJI I OSOBOWOŚCI PRACOWNIKÓW DO RYNKU PRACY

Streszczenie: *Artykuł omawia rozwój metod wykorzystujących sztuczną inteligencję do analizy dopasowania kompetencji i cech osobowości pracowników do wymagań rynku pracy. Autorzy wskazują, że algorytmy uczenia maszynowego pozwalają na przetwarzanie dużych zbiorów danych pochodzących z CV, profili zawodowych oraz ogłoszeń o pracę, co umożliwia bardziej precyzyjne mapowanie umiejętności. Szczególną uwagę poświęcono analizie dopasowania osobowości do kultury organizacyjnej z wykorzystaniem narzędzi psychometrycznych wspieranych przez algorytmy predykcyjne. Przegląd badań pokazuje, że systemy AI mogą zwiększać trafność selekcji kandydatów oraz ograniczać czas i koszty rekrutacji. Jednocześnie autorzy podkreślają ryzyko powielania uprzedzeń obecnych w danych treningowych oraz problem przejrzystości modeli decyzyjnych. W artykule omówiono także kwestie etyczne i prawne związane z ochroną danych osobowych oraz konieczność zapewnienia transparentności procesów rekrutacyjnych. Przegląd wskazuje, że odpowiednio zaprojektowane systemy AI mogą wspierać bardziej obiektywne i efektywne dopasowanie pracowników do rynku pracy, pod warunkiem stosowania rygorystycznych standardów metodologicznych i etycznych.*

SŁOWA KLUCZOWE: *sztuczna inteligencja, uczenie maszynowe, optymalizacja, obiektywizacja, analiza cech.*

1. INTRODUCTION

The origins of using artificial intelligence (AI) to analyze employee fit in the job market stem from the

convergence of several fields: labor economics, psychology, data science, and advances in machine learning. Over time, organizations sought better ways to match individual competencies, personality traits, and career potential with job requirements and market demand. AI has become a powerful

tool for automating and streamlining this process. The roots of AI-based job matching lie in occupational psychology and labor market theory.

Early career matching relied on psychological assessments that assessed personality and skills. For example, John L. Holland's work introduced the Holland RIASEC model, which classified people and work environments into six personality types (realistic, investigative, artistic, social, enterprising, and conventional). These models aimed to match personality traits, skills, interests, and career backgrounds. However, the analysis was manual and based on small datasets.

Economic theories of job matching also shaped this field. The Nobel Prize-winning work of Christopher A. Pissarides, Peter A. Diamond, and Dale T. Mortensen (2010) on search and matching theory explained how employees and companies find suitable matches in labor markets. These theories highlighted the asymmetry of information between employees and employers, the inefficiencies of recruitment processes, and the need for better matching mechanisms. This laid the conceptual foundation for automated matching technologies.

With the development of computers in the 1980s, organizations began to digitize HR processes. Key developments included human resources information systems (HRIS), early expert recruiting systems, and computer-based psychometric testing. At this stage, AI primarily utilized rule-based systems, decision trees, and simple statistical models. These systems attempted to match candidates' qualifications with job descriptions but lacked the ability to analyze complex behavioral or personality data.

The next phase came with the explosion of online job platforms and big data in the early 21st century. Companies like LinkedIn, Indeed, and Glassdoor collected vast datasets on career history, skills, recruitment results, and job demand. Machine learning algorithms began to predict career success, analyze career paths, and recommend job offers. Artificial intelligence can now assess not only skills but also behavioral patterns, such as career mobility and learning speed.

Since 2015, modern AI systems have been using natural language processing, psychometrics, and behavioral analytics. AI tools analyze CVs and LinkedIn profiles, video recordings and voice patterns from job interviews, text communications, and psychometric assessments. Some systems infer personality traits using frameworks like the Big Five personality traits. Advanced AI can assess soft skills, predict cultural fit, estimate leadership potential, and forecast future job market demand. HR-AI companies such as HireVue, Pymetrics, and Eightfold AI are developing

platforms that match candidates to positions based on behavioral and cognitive data [1].

Integrating with labor market analytics, AI is now increasingly being used not only for recruitment but also for strategic workforce planning. AI systems integrate macroeconomic data on the labor market, skill demand forecasts, educational profiles, and employee performance data. Organizations such as the World Economic Forum and the OECD are exploring how AI-based talent analytics can support future labor market policies and skills development strategies [2].

The aim of this article is to discuss the development of methods using artificial intelligence to analyze the match between employees' competencies and personality traits and the requirements of the labor market.

2. CURRENT CHALLENGES

Despite its benefits, AI-based job matching has raised concerns about algorithmic bias in hiring decisions, privacy issues related to behavioral data, transparency of AI models, and the potential for exacerbating social inequalities. Regulatory discussions in regions such as the European Union are increasingly addressing the responsible use of AI in employment.

1.1. Technological implications

AI enables the broad integration of heterogeneous data sources, such as psychometric tests, CVs, behavioral logs, and labor market statistics, to model employee competencies and personality traits. Advanced machine learning models, including deep neural networks and ensemble methods, can detect nonlinear relationships between individual attributes and labor market demand. Natural language processing techniques enable the automatic extraction of skills and personality indicators from unstructured text, such as curriculum vitae (CVs) or interview transcripts. AI systems can continuously update competency profiles using real-time labor market data, improving adaptation to dynamic economic conditions. Recommender systems can match individuals to positions by optimizing similarity metrics between candidate profiles and job requirements. However, the use of AI presents challenges related to data quality, requiring robust preprocessing to handle missing, biased, or noisy input data. Interpretability of models becomes crucial, especially when decisions impact employment or career progression, requiring the use of explainable artificial intelligence (XAI) techniques such as SHapley Additive

exPlanations (SHAP) or Local Interpretable Model-agnostic Explanations (LIME). There are also concerns about algorithmic bias, as training data can encode historical inequalities that translate into predictions. Privacy and security constraints require the use of techniques such as differential privacy and secure multiparty computation when processing sensitive personal data. System implementation requires scalable architectures and continuous monitoring to ensure model performance, fairness, and compliance with changing labor market conditions [3].

Natural language processing (NLP), a branch of AI, enables systems to interpret and analyze unstructured text such as CVs, cover letters, and online profiles to assess employee competencies. By extracting skills, experience, and semantic patterns, NLP helps match candidates to job market requirements more accurately than traditional keyword-based methods. It also supports personality analysis by examining linguistic cues in written or spoken communication, often based on models related to the Big Five personality traits. Through sentiment analysis and discourse assessment, NLP can infer soft skills such as communication style, adaptability, and emotional intelligence. Furthermore, NLP-based tools can process large-scale labor market data, identifying emerging trends and matching individual profiles to current and future job requirements. Thus, NLP enhances AI systems by providing deeper, contextual insights into both competencies and personality, improving decision-making in recruitment and development.

Multimodal signal processing, within AI, integrates data from multiple sources, such as text, audio, images, and physiological signals, to create a more comprehensive profile of an individual's competencies. By combining verbal content with tone of voice, facial expressions, and body language, AI systems can assess both technical skills and behavioral traits relevant to the job market. This approach enhances personality analysis by linking observable signals to established frameworks such as the Big Five personality traits, enabling more nuanced and reliable predictions. Multimodal processing also improves the detection of soft skills, such as teamwork, leadership, and stress management, which are difficult to capture using single data modalities. Furthermore, it allows AI to reduce bias and uncertainty by cross-validating signals across channels, rather than relying on isolated inputs. Overall, multimodal signal processing enhances the matching of employee profiles to job market needs, providing richer, contextual insights for recruitment and career development.

The most advanced explainable digital twins (DTs) of emotional people are AI-based models that simulate and interpret an individual's affective states in a transparent and

interpretable way. In the context of employee competency analysis and personality-market fit, they enhance traditional assessments by incorporating emotional intelligence, stress responses, and motivational patterns. Their explainability ensures that HR professionals and candidates understand how specific emotional traits influence job matching decisions. This transparency helps build trust and reduces the risk of opaque or biased AI-based recruitment practices. By combining emotional patterns with performance data, these digital twins can identify roles in which candidates are more likely to thrive and remain engaged. They also support personalized career development by identifying emotional strengths and areas for development aligned with market demands. They enable more holistic, equitable, and flexible employee matching in AI-powered job market ecosystems.

1.2. Social implications

Using AI to analyze employee competencies and personality could significantly transform how individuals access job offers, potentially increasing the efficiency of matching candidates to suitable positions. This could increase perceived objectivity in the recruitment process by reducing some forms of human bias, but it could also introduce new, less visible algorithmic biases. Employees may feel limited by data profiles, which can impact their sense of identity and autonomy in career development. The growing reliance on AI assessments could pressure employees to adapt their behavior and self-presentation to algorithmic preferences.

There is a risk of reinforcing existing social inequalities if AI systems are trained on biased historical labor market data. At the same time, such systems could help identify undervalued talent, offering new employment and promotion opportunities to groups or individuals previously overlooked. Privacy concerns could intensify over time as sensitive psychological and behavioral data is collected and analyzed at scale. Trust in employers and institutions could be undermined if AI-driven decisions are not transparent or understandable to employees (as discussed earlier in the XAI case). The use of AI could also shift the power dynamics in the labor market, giving employers greater control over selection and assessment processes. Widespread adoption of these technologies could redefine norms around work, merit, and fairness in society [4].

1.3. Economic and organizational implications

Using AI to analyze employee competencies and personality can reduce recruitment costs by automating selection and matching processes at scale. Organizations can increase productivity by assigning employees to roles that better

match their skills and behavioral characteristics. AI-powered HR analytics enables more accurate talent forecasting, helping companies anticipate skill shortages and adapt recruitment strategies accordingly. This can lead to more efficient allocation of human capital across industries and sectors.

At the organizational level, decision-making will become increasingly data-driven, potentially improving the consistency and strategic alignment of HR practices. However, implementing such systems requires significant upfront investments in technology infrastructure, data management, and expertise. Companies may also face increased reliance on third-party providers of AI algorithms and systems, raising concerns about vendor lock-in and long-term costs. Implementing AI can transform organizational structures by emphasizing analytical and technical roles within HR departments.

From a broader economic perspective, AI-powered matching could reduce unemployment by connecting workers with suitable jobs more quickly. At the same time, it could intensify competition in the labor market by standardizing evaluation criteria across organizations. There's also the risk that efficiency gains will disproportionately benefit large companies with access to advanced AI capabilities, potentially exacerbating economic inequality between organizations [5].

1.4. Ethical and legal implications

The use of AI to analyze employee competencies and personality raises serious ethical concerns about fairness and non-discrimination in recruitment and assessment processes, as highlighted by the AI Act. AI systems can inadvertently perpetuate biases present in historical data, leading to unequal treatment of certain demographic groups. Ensuring transparency is ethically important because individuals have the right to understand how decisions about their careers are being made. This creates the need for XAI methods that can provide understandable justification for recommendations and assessments [6].

From a legal perspective, the processing of personal and psychological data in the EU must comply with regulations such as the General Data Protection Regulation (GDPR), which imposes strict requirements on consent, data minimization, and purpose limitation. Employers must ensure that data collection and analysis respect individuals' rights to privacy and do not go beyond what is necessary to achieve legitimate purposes. There is also a legal obligation

to prevent discrimination under employment law and anti-discrimination laws.

Liability becomes a key issue, as it may be unclear whether liability lies with the employer, the software vendor, or the AI model's creators. The use of automated decision-making in employment may require human oversight to comply with legal standards. Ethical concerns also include the potential for personality assessments to be manipulated or misused in ways that disadvantage employees. Organizations must balance innovation with the protection of fundamental rights and ensure responsible and lawful implementation of AI systems.

3. DISCUSSION

Using AI to analyze the fit between competencies, personality, and labor market needs enables more accurate and scalable candidate assessments through the use of advanced data processing techniques. Methods such as NLP and multi-modal analysis allow for deeper insights into both technical skills and behavioral traits, increasing the effectiveness of candidate selection. Issues related to ethics, data privacy, and potential biases must also be considered, emphasizing the need for transparent and responsible AI implementation.

3.1. Role of interdisciplinary teams

Interdisciplinary research combining psychology and data science could improve the validity of personality inference models. It is also possible to develop adaptive systems that will dynamically respond to changing labor market conditions [7].

Interdisciplinary research teams play a key role in developing AI applications for analyzing the match between competencies, personalities, and labor market needs, combining knowledge from artificial intelligence, psychology, economics, and organizational research. They enable the creation of models that are not only technically robust but also psychologically accurate and socially relevant. Cross-disciplinary collaboration helps identify and mitigate ethical risks, including those related to bias, integrity, and privacy. Such teams also facilitate the translation of research findings into practical tools that align with real-world organizational and labor market contexts. Such interdisciplinary collaboration supports more holistic, reliable, and effective AI-based solutions [8].

3.2. Directions of further studies

Future research should focus on improving the accuracy and robustness of models assessing competencies and personality across diverse populations and cultural contexts. More advanced methods for integrating heterogeneous data sources, including structured and unstructured behavioral data, are needed. Researchers should further explore explainability techniques within AI to ensure model results are interpretable and actionable for both employers and employees. Another important direction is mitigating bias through machine learning (ML) and auditing frameworks that incorporate fairness [9].

Work is also needed on privacy-preserving methods, such as federated learning and secure data sharing, to protect sensitive personal information. Longitudinal studies could examine how AI-based assessments impact career paths and labor market outcomes over time (including wage growth and labor market turnover, especially for Generation Z) [10].

Further research is needed on human-AI collaboration in decision-making, particularly on how recruiters interact with and trust AI recommendations. Standardizing benchmarks and evaluation datasets would improve the comparability and repeatability of research results. Research should incorporate frameworks and methodologies for managing organizations and projects that align technological developments with ethical, legal, and social expectations [11].

4. CONCLUSIONS

The use of artificial intelligence to analyze employee fit in the labor market has evolved from psychological career matching and economic labor market theory, through digital HR systems, to modern machine learning platforms that integrate personality analysis.

The future of AI in analyzing the match between competencies, personality, and labor market needs will be marked by increasingly precise, data-driven conclusions that support better career and recruitment decisions. Advanced methods combining techniques such as NLP and multimodal analysis will enable a deeper and more holistic understanding of individuals, transcending traditional assessment methods. At the same time, ethical considerations (including privacy, transparency, and bias mitigation) will play a key role in shaping responsible onboarding. Ultimately, AI could become a key tool for dynamically adapting employee potential to changing market demands, improving both organizational efficiency and individual professional development. This advantage, thanks to its faster response, could be used as a second-opinion system in many countries,

especially outside the EU, where such strict regulations are less in place.

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