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APPLICATION OF ARTIFICIAL INTELLIGENCE IN HUMAN RESOURCES SECTOR PROCESSES

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Abstract: This paper deals with the possibility of adequate use of artificial intelligence (AI) in the sphere of human resources (HR) sector activities. All positive aspects of such use are considered, the advantages offered by the application of artificial intelligence in practice in the part of jobs covered by human resources are explained. All the reasons why the use of AI would be significant are highlighted and explained. All those reasons and dilemmas that entail the application of AI are mentioned, both in jobs covered by human resources, and the dilemmas that the use of AI brings as a whole. Logical organization of AI application in HR sector activities is proposed. It is also shown through a couple of imaginary examples how that use would look concretely in applied in practice. Some of the currently most commonly used AI algorithms, which are already used in practical applications, are mentioned.

Keywords: AI – Artificial Intelligence, HR – Human Resources, AI algorithm, AI software

INTRODUCTION

The development of artificial intelligence (AI) and its application opens up many opportunities for research and discussion, including the advantages and challenges of applying AI in general, but also in the field of human resources (HR) sector activities in many enterprises and institutions. Some of the challenges, dilemmas and issues are: ethical issues, issues of defining adequate algorithms and decision-making software, as well as the impact on traditional recruitment processes and the role of HR professionals.

There are a lot of different definitions for AI and HR, which can be found in books and the Internet. Definitions presented here are the ones that can be found most often. Intelligence can be defined as the ability to learn and perform appropriate techniques to solve problems and achieve goals. Artificial intelligence (AI) is a term coined by Stanford Professor John McCarthy in 1955. He defined it as "the science and engineering of making intelligent machines". [1]

Human Resources Management (HR) is the process of recruiting, selecting, introducing employees, providing orientation, providing training and development, evaluating employee performance, deciding on compensation and benefits, motivating employees, maintaining fair relations with employees and their trade unions, ensuring employee safety, welfare and health measures in accordance with the labour laws of the country. [2]

The application of AI technology can prove to be very useful when using it as a Human Resource sector aid. This enables more efficient filtering and evaluation of candidates, as well as the identification of the best profiles for specific jobs. In particular, AI algorithms can automatically review and analyse the CVs of all candidates, while recognizing their key skills and qualifications, and based on that, rank candidates according to certain criteria.

If used in practice, and properly trained and used, the application of AI technologies in the field of human resources processes could bring a number of advantages, such as greater objectivity in the selection process, more efficient linking of candidates with appropriate workplaces, reducing the time required to process applications and reducing human error. But in addition to these listed advantages, certain challenges and issues that necessarily arise regarding the use of AI in HR should be considered, such as data privacy issues, the possible bias of algorithms, and the need for human surveillance and intervention.

USAGE OF AI

In general, there are reasons for and against the use of artificial intelligence. The use of artificial intelligence brings with it advantages and challenges.

Some of the key advantages of using artificial intelligence over the classical way of working, using human labour could be: [3,4,5]

- Faster decision-making capability: AI algorithms can quickly analyse large amounts of data and make faster and more accurate decisions based on that information.
- Modelling at an analytical and predictively advanced level: AI can use complex models and algorithms to analyse data and predict future events and trends.
- Demonstrated greater efficiency and a higher degree of automation: AI can automate routine tasks and processes, leading to greater efficiency, fewer errors and higher productivity.
- Making good decisions in a very short period of time: AI algorithms can analyse large amounts of data and make quick and accurate decisions in a very short time.
- Customer experience is enhanced: AI can personalize and improve the user experience by providing relevant recommendations, support, and interaction.
- Discovering patterns and trends: AI can reveal hidden patterns and trends in large datasets, providing useful insights for strategic decision-making.
- However, as with all new technologies, there are also dilemmas here, and some new questions and fears are being raised, primarily from the misuse of AI:
- Social problems caused by job losses: The introduction of AI can lead to job automation and potential job losses for people employed in those areas.
- Prejudices and ethical dilemmas: AI algorithms can be susceptible to prejudice and dishonesty, which can lead to unfair decisions and discrimination.
- Data protection and privacy protection: The use of AI involves processing large amounts of data, which may raise user concerns about privacy and data protection.
- Lack of necessary human interaction: In some cases, the use of AI can lead to less human interaction, which can affect the quality of relationships and experiences.
- Technical challenges and errors: AI systems are complex and can be susceptible to technical faults, requiring additional resources and support for maintenance and troubleshooting.

It is necessary to carefully consider all these advantages and challenges when applying AI and make informed decisions that strike a balance between the usefulness of using AI and the risks of using AI. It is also very important to, carefully and with measure, align the application of AI with ethical standards, legislation and regulations in order to ensure the responsible and purposeful use of this technology.

The usage of AI technologies in the field of human resources sector could give a number of advantages. Some of the advantages in HR sector are: greater objectivity in the selection processes, more efficient linking of candidates with appropriate workplaces, reducing the time required to process applications and reducing human error. In addition to the advantages, certain problems arise regarding the use of AI in HR sector, as data privacy issues, the used algorithm, the possible bias of algorithms, the need for human surveillance and intervention. Proper use of AI in HR sector activities required appropriate organization of implementation of AI application in the HR tasks and jobs. It could be used the different types of algorithms that can be applied in data analysis and decision-making. The algorithms use artificial intelligence and machine learning to process large amounts of data and extract useful information. There are a few specific AI algorithms and AI software that can be applied in HR processes. Proposed way of logical organization of use of AI application for activities in HR sector is shown in Figure 1.
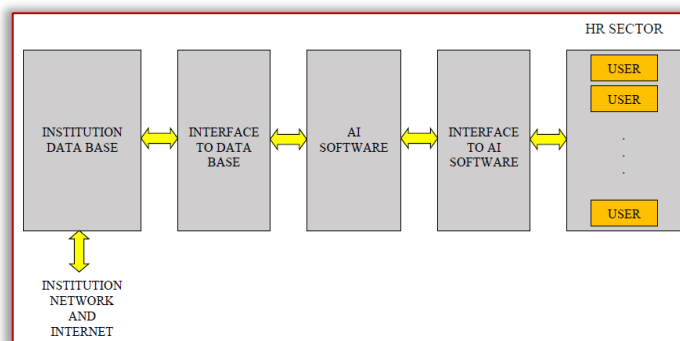

Figure 1. Logical organization of AI application in HR sector

HYPOTHETICAL EXAMPLES OF USING AI IN HR

It will be described three possible examples of application AI in HR activities.

- First example: A company called "NoName1" wants to hire a system engineer of a specific profile and the knowledge of a specific operating system. There is a lot of interest and HR sector has received a very large number of applications. The fact that an HR team has to review each CV individually can be very time-consuming and susceptible to human error. If the company decides to use AI technologies, it can use AI algorithms and software to automatically view CVs. The AI system and software can select and analyse key information such as skills, education, qualifications and work experience of each candidate. Then, the collected data can be compared by the AI software with data on previously successful candidates for similar positions, in order to establish a success template. After completing the analysis, the AI system can rank candidates according to their professional eligibility for that position, according to the defined criteria by the employer. A well-designed and properly used AI algorithm and AI software can identify candidates with appropriate skills and experience, as well as those who have achieved good results in similar

roles. This helps the HR team to focus only on the best qualified candidates and speed up the selection process. However, it is important to note that this use of AI in recruiting new employees is not a substitute for the human knowledge and experience of HR team. HR professionals continue to play an important role in making the final decision and assessing candidates' soft skills that AI may not be able to adequately assess, such as teamwork or communication skills.

- **Example 2**: Some company "NoName2", which deals with software development, has a need to fill a position for a programmer – senior developer. Instead of the traditional process of manually reviewing hundreds of applications, the company decides to apply AI in the selection process of candidates. Using AI software specializing in application processing, HR team sets criteria such as relevant education, experience in software testing, knowledge of certain programming languages, and skills in automated testing. AI software automatically analyses candidates' CVs and evaluates them according to the set criteria. For example, the algorithm recognizes words such as "software testing", "manual testing", "automatic testing", "Python", "Java", etc. Also, the algorithm can provide a relevance rating of each candidate based on the matching of keywords from their work experience and CVs. After analysis, the AI software generates a ranked list of candidates according to how much they are suitable for the position. The company HR team can then access and assess this list, review AI scores, and focus on top-rated candidates. It is clear that this achieves savings of time and resources of the HR team, all those who participate in the evaluation, focusing attention on the most qualified candidates for the process of further evaluation. Probably the next stage is an interview with these candidates.

- **Example 3**: Some company "NoName3" has a large team of developers and wants to improve its teamwork process. They decide to use AI to analyse and evaluate team performance to identify the strengths and weaknesses of each team member. Using AI software, the company collects each team member activity data from a variety of sources, such as project management tools, communication channels, and code versioning system. The AI software analyses this data and provides insight into team efficiency, collaboration, communication, and each member's contribution. For example, AI can identify team members who often solve complex problems, suggest innovative solutions, or communicate effectively with other team members. Also, AI can recognize team members who have low productivity or are often late in delivering their tasks. Based on AI analysis, the company HR team can identify areas where the team

has exceptional results and support that dynamic. They can also identify weaknesses and provide additional training or support to team members facing challenges. Using AI to analyse team performance allows a company to make informed decisions about resource allocation, training, and team development. It also helps identify highly performing individuals and supports the company's human resource management strategy.

Adequate application of artificial intelligence (AI) in HR can result in the following basic advantages: [6,7]

- Evident process acceleration and efficiency: AI can automate a number of tasks that otherwise require time and resources, such as reviewing and analysing a large number of candidates applications. This allows the HR team to focus on key activities, such as interviewing candidates and making final decisions.

- Reducing the risk of human error: Using AI in HR can reduce the possibility of human error in processes such as filtering applications, data analysis, and decision making. AI algorithms work based on preset criteria and have greater precision in data processing compared to manual processes.

- Better pairing of candidates and jobs: AI can quickly analyse data on candidates' qualifications, skills and experience to find the best matching profiles for a specific job. This helps reduce the time and resources required to manually search for applications and increases the likelihood of finding highly qualified candidates for specific positions.

- Performance and productivity increase: Through the application of AI in team performance analysis, HR can identify areas where teams are achieving high scores and support that dynamic. They can also identify weaknesses and provide support or training to team members facing challenges. This leads to increased productivity and performance of teams.

- Decrease in bias/increase objectivity: AI relies on preset criteria and algorithms, which reduces the impact of human prejudices or subjective decisions. This can lead to fairer decisions, if the AI criteria are well set.

- The quality of human resource management strategy is improving: Through the use of AI, the HR team can collect and analyse extensive data on employees, performance, trainings and other aspects of work. This enables a better understanding of trends, identification of areas for improvement and making informed decisions about human resource management strategy.

- Improving customer experience: Candidates and employees can have a better experience through the application of AI in HR. Efficiency in processes such as application, grade and training can reduce waiting time and improve the overall experience of candidates.

Also, AI can provide personalized career development and training recommendations to employees based on an analysis of their skills and interests.

- Focus on strategic initiatives: Using AI in the operational aspects of HR can free up the time and resources of HR professionals, enabling them to focus on strategic initiatives. Instead of spending time on administrative tasks, the HR team can be more engaged in hiring strategies, talent development, and shaping corporate culture

This example shows how AI can be applied in HR. People are essential for interpreting AI results, making final decisions, evaluating certain skills, and establishing human connections with candidates and employees.

NEGATIVE SIDES OF AI USAGE IN HR

Despite the listed some of the basic, so far recorded, advantages of the application of artificial intelligence (AI) in HR, it is necessary to point out the potential problems that can be expected with this application: [6,7]

- Human interaction is missing or underutilized: Using AI systems in HR can lead to a lack of human interaction and personalization. Candidates and employees may feel a lack of empathy or the ability to ask questions or express their specific needs. It is important to maintain a balance between process automation and human factor maintenance in HR to ensure employee satisfaction and engagement.
- Human skills and knowledge are slowly being lost: As AI is increasingly used in HR, there is a possibility of losing certain human knowledge and skills. Process automation can lead to less engagement of HR professionals in certain tasks and a decrease in the need for certain skills. It is important that the HR team continuously develops its skills in order to adapt to changes in technology and maintain its relevance.
- Choosing the wrong algorithms that reinforce the possibility of prejudice and discrimination: AI systems work on the basis of preset algorithms based on existing data. If this data contains prejudice or discrimination, the AI system can convey and reinforce those prejudices when making decisions. AI algorithms need to be carefully designed and monitored to ensure fairness and avoid discriminatory decision-making.
- Privacy breach and insufficient data protection: When AI systems are used to analyse data on candidates and employees, there is a risk of privacy breaches and inadequate data protection. It is important to carefully manage data, comply with relevant privacy regulations and implement appropriate data security measures to minimize the risk of data misuse or leakage.
- Overdependence on technology and technical errors: When we rely on AI systems, there is a risk of technical errors or failures. Errors in algorithms or technical problems can lead to inaccurate or unfair decisions. It

is important to have precautions, such as regular testing and monitoring of AI systems, to minimize the risk of technical errors and ensure proper functionality.

However, the mentioned negatives should not in any way discourage the use of AI in HR sector activities. The goal is to point out the importance of carefully selecting criteria that guide AI algorithms, planning, monitoring and management in order to take advantage of the benefits of AI, while at the same time working to reduce potential risks and disadvantages.

When AI algorithms are mentioned in the context of HR systems, we mean the different types of algorithms that can be applied in data analysis and decision-making. These algorithms use artificial intelligence and machine learning to process large amounts of data and extract useful information. A few specific AI algorithms and AI software that can be applied in HR are:

- **Application filtering algorithms**: These algorithms can analyse CV or application data and automatically select candidates based on predefined criteria, such as relevant experience, skills, or education. Some of the most famous such algorithms are:
— Random Forest (Scikit-learn library [8] in Python): An algorithm that combines multiple decision trees to classify candidates based on different attributes. [9, 11] (Figure 1).
— Support Vector Machines (SVM) (Scikit-learn): An algorithm used to classify candidates based on defined criteria. [10]
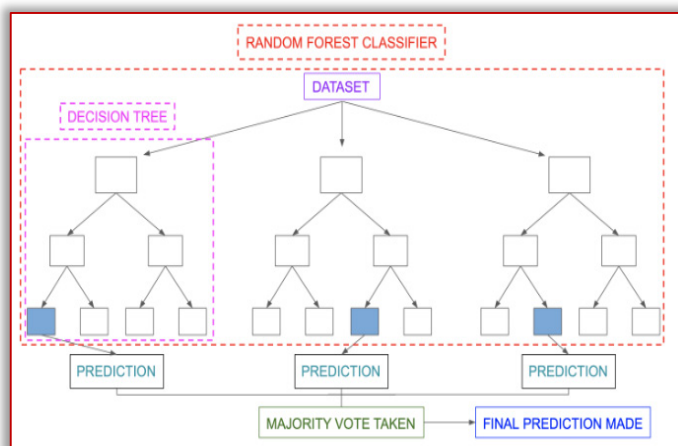

Figure 1. Random Forest Classifier View [11]

- **Employee data analysis algorithms:** These algorithms can analyse employee data, such as ratings, work performance, feedback, and hiring history, to identify patterns and trends. Based on this data, algorithms can provide insight into the efficiency of employees, identify potential talent, or identify risks of employee departure. Some of the most famous such algorithms are:
— K-means clustering (Scikit-learn): An algorithm that groups employees based on similarities in their

attributes, such as performance and ratings. [12, 13] (Figure 2).
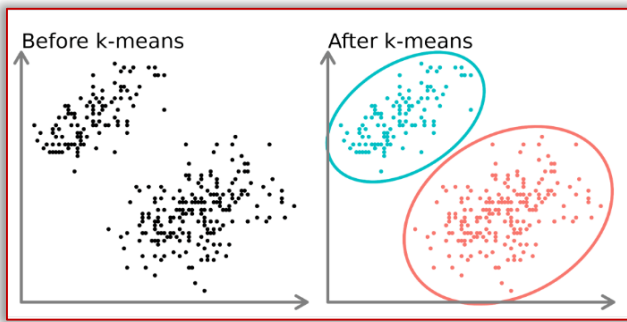

Figure 2. Use of K-means clustering [13]

— Naive Bayes (Scikit-learn): An algorithm that uses probability and Bayes' theorem to classify employees based on their attributes. [14, 15] (Figure 3).
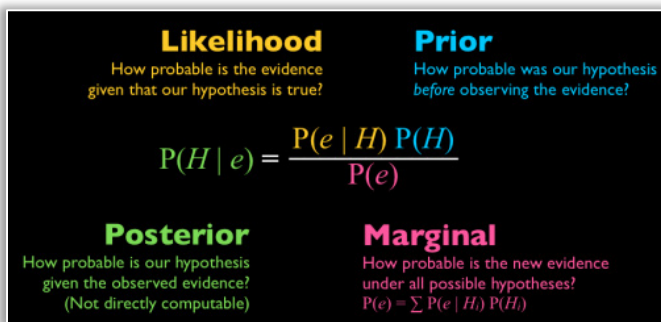

Figure 3. Bayes' theorem [15]

▓ Training and development recommendation algorithms
These algorithms can analyse data on employees' skills, interests, and career goals to recommend relevant training, courses, or mentoring programs that could help them develop further. Some of the most significant such algorithms are:
— Collaborative Filtering (Python Surprise Library) [16]: An algorithm that recommends training based on similarities between the interests and preferences of employees. [17, 19] (Figure 4).
— Content-Based Filtering (Python Surprise): An algorithm that recommends training based on content analysis, such as previous training, experience, and employee skills. [18, 19] (Figure 4).
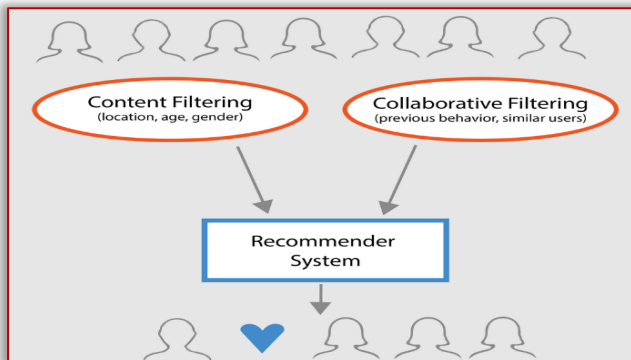

Figure 4. Content and collaborative filtering [19]

These algorithms can analyse employee data, such as work performance, job satisfaction, engagement, and other relevant factors, to predict the likelihood of employees leaving an organization. This allows the HR team to take preventive measures, such as improving engagement or offering development opportunities, to retain key talent. Some of the more commonly used such algorithms are:
— Logistic regression (Scikit-learn): An algorithm used to predict the likelihood of employees leaving based on various factors, such as performance, job satisfaction, and engagement. [20] (Figure 5).
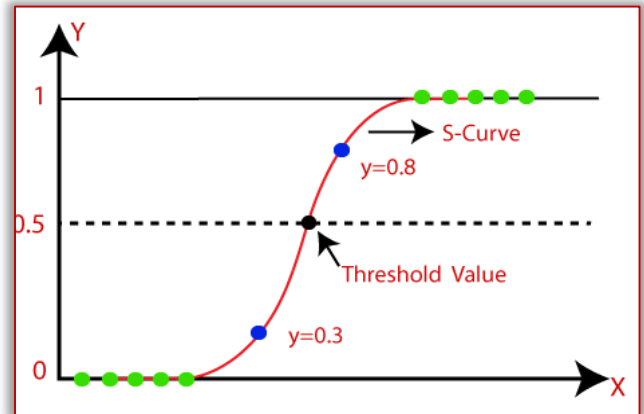

Figure 5. Logistic regression [20]

— Gradient Boosting (XGBoost library in Python): An algorithm used to predict employee departures based on multiple factors and attributes. [21, 22] (Figure 6).
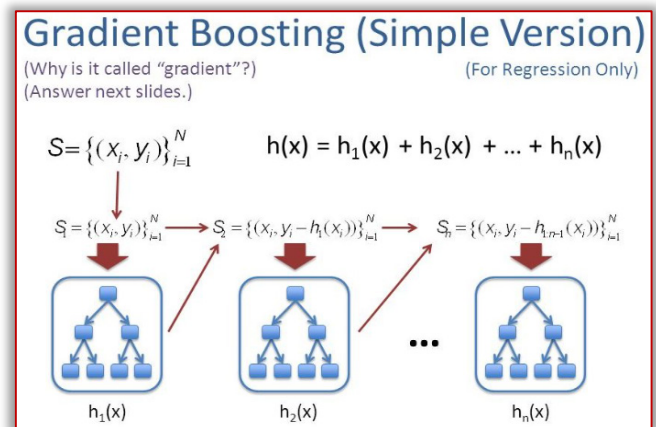

Figure 6. Gradient Boosting [22]

These algorithms can be found in popular programming languages such as Python and libraries such as Scikit-learn, XGBoost and Surprise. These libraries provide implementations of various machine learning and artificial intelligence algorithms that can be used in HR projects. These are just some examples of AI algorithms and AI software that can be applied in the field of HR sector tasks and jobs. Different algorithms can be used depending on the specific needs of the organization and the objectives of the HR process, artificial intelligence and work transformation.

CONCLUSIONS

The application of artificial intelligence (AI) in the human resources (HR) sector can bring a number of advantages. The main advantages include:

- better pairing of candidates,
- efficiency of the complete process,
- objectivity in decision-making,
- increased productivity,
- improvement of human resource management strategy, and
- improvement of user experience.

However, it is also important to be aware of potential negative aspects, such as lack of human interaction, technical errors, loss of human knowledge, privacy and data protection, the possibility of prejudice.

That is why it is crucial to carefully select AI algorithms, the criteria by which they are guided, plan, implement and monitor the implementation of AI in HR sector. It should be implemented respecting relevant privacy and data protection regulations, ensuring fairness and eliminating prejudices in algorithms, maintaining a balance between automation and human interaction, conducting regular testing and supervision of AI systems, and constantly improving the skills of HR professionals.

Implementing AI in HR tasks requires careful planning, proper data management, proper employee selection and training, and transparency in processes. All these measures should be directed towards creating a fair, inclusive and efficient environment for all parties involved. HR professionals need to follow information technology trends, be open to innovation and constantly improve in order to keep up to date with changes and take advantage of all the opportunities that technology provides. With the right approach and careful management, the application of information technology in HR can contribute to achieving better results, more efficient human resource management and creating value for an organization.

Based on the advantages and disadvantages presented, the general conclusion would be that the best results can be achieved by an adequate combination of AI technology and human resources, enabling HR teams to achieve their goals, improve efficiency and provide value to both candidates, employees and the organization as a whole. The integration of information technologies, such as artificial intelligence, into the field of HR has the potential to transform the way human resources are managed. However, it is important to keep in mind that technology should serve as a support for people, not as a substitute for them. The human factor, empathy and soft skills assessment continue to play a key role in HR sector.

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