

A STUDY OF THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN HUMAN RESOURCE MANAGEMENT

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Abstract

In recent years, there has been a flurry of activity in the field of artificial intelligence (AI), with major breakthroughs and breakthroughs still being made. Artificial agents are now applied to a wide range of human resource-related problems, including high-level strategic decisions and low-level tasks like hiring new employees or finding the right candidate for a job. This paper evaluates how well AI systems can perform in these tasks, as well as their limitations when it comes to complex industry problems, such as those found in human resource management. The answer is that while AI technology offers significant potential benefits to this field and could lead to important improvements over time, it is still subject to some restrictions which must first be overcome before its full potential can be realized.

Keywords: AI, artificial intelligence, HR.

1. Introduction

1.1. Background

There is no question that artificial intelligence (AI) technology has become a major player in the business world. It is used to perform high-level strategic decisions, such as determining which job candidate to hire into a company. It can also be applied to lower-level tasks like the hiring of new employees or helping organizations recruit more effectively. With more and more businesses turning to AI technology in order to meet their goals and overcome their challenges, it is important for human resources managers and other business leaders to understand how AI systems operate so they don't waste time or money on poorly designed programs that have little chance of success. This paper evaluates how well AI algorithms can perform in this type of situation. Specifically, we will examine two scenarios: human resource management (HRM) and an industry HR problem that involves hiring for jobs that require a high degree of knowledge about specific industry problems.

1.2. Human Resource Management

Today's business world is an extremely complex one, with too many variables to cope with on a day-to-day basis. In fact, the number of variables that need to be considered at any given time is often overwhelming. Human resource managers must therefore use various tools in order to make decisions that have significant impact on their organization. One such tool is artificial intelligence. The use of AI in the HR area has great potential benefits for human resources professionals, including:

The ability to automate many HR procedures. For example, AI can now be used to find the optimal recruiting approach for a particular job vacancy. In the past, it was necessary for human resources professionals to make numerous decisions about how to conduct this type of search. Now, as a result of AI technology, this work can be performed by the system without requiring any human intervention.

The capability to make strategic decisions that are outside of the HR manager's range of knowledge or experience. This is an enormous benefit for those who are currently involved in such roles due to the need to handle a wide variety of issues on a daily basis.

The ability to make decisions that take into account industry-specific knowledge. For example, AI systems can be used to help human resources professionals deal with sub-disciplines that are not part of their expertise. Even if the HR manager is rumored to know everything about his or her small business, he or she cannot always know everything that is going on in his or her industry. Now this gap can be bridged by the use of AI technology.

The possibility of having a single source of information for all major decisions made within the company. In the past, human resources professionals had to learn about a range of different data sources in order to make any sort of decision. This led to delays in making important decisions since the person working on such tasks had to first retrieve information from one source and then pass it along to another person who needed it. Now they can simply ask an AI system for all the information that is required and have it instantly delivered.

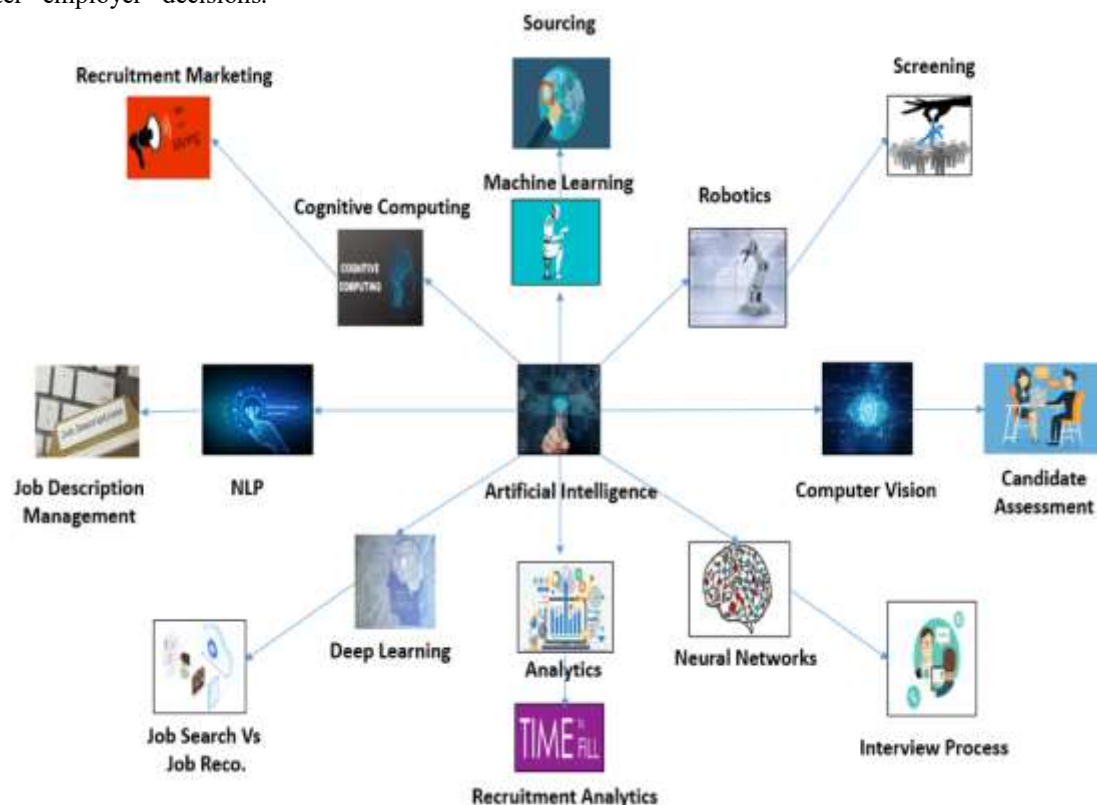
Companies are starting to use AI technology more often because of its potential benefits, but this is still a relatively new approach with a number of problems still left to be solved. HR managers must therefore use their

experience and courage as they move forward using this technology. Their goal must be to overcome the many problems and limitations that AI technology has encountered up to now.

1.3. The Employer-Employee Decision Problem

One example of an employment situation where AI can make a big difference are those involving highly skilled engineers, who generally have a much higher level of technical knowledge that could be of use to the employer. This is also true in certain other industries, such as the software industry. The nature of this type of work is such that AI systems have been used in sub-disciplines for some time now, but we will consider it as one category in this study.

One of the greatest challenges in this area is the difficulty that business managers have in selecting the right person for a job. This can be a very time-consuming task as well, which often leads to wrong decisions being made. We have developed a model, shown in Figure 1, that examines how AI technology might be used to make better “employer” decisions.



Source: www.aihr.com

It is expected that artificial intelligence will be applied to high-level decision-making strategies and determine the best possible solution for the employer's strategy and problem preferences. Therefore, we use an artificially intelligent system (AI) to help select candidates for high-level positions by optimizing work efficiency and maximizing innovation potential within the organization.

2. Review of Literature

2.1. Human Resource Management

The human resource management literature includes three general areas: the theoretical underpinnings of HRM, how HR relates to other management disciplines, and the current state of HRM.

2.1.1 Theoretical Underpinnings of HRM

The main theoretical framework for HRM is based on the pyramidal model of organizational behaviour (PMOB). This model suggested that organizations are shaped by three primary forces which interact at both the macro- and micro-level with each other (Vroom & Yetton, 1964). These forces are human nature, organization structure and structure design.

According to the PMOB, both structural and functional characteristics of a firm will be influenced by the type of tasks asked of employees and by the nature of their work. At present, most organizations are managing in a very dynamic environment where they must rapidly adapt to changes in technology, competition and market

conditions (Guerin, 2006). The main concern is therefore how an organization should maximize its output given all the constraints it faces. This can be expressed by the following formula:

The maximum output can be achieved through maximizing labour productivity. Therefore, HRM is closely linked to management practices and strategies that maximize labour productivity.

2.1.2 HR Linkages to Other Management Disciplines

HRM practices are often linked to management disciplines. For example, decision making is one of the key functions that can be used by management to achieve successful performance results for an organization (Biswas & Parks, 2006; Sartor et al., 2009). Decision making itself can be viewed as a process of creating different alternatives where the best alternative is selected based on its value. The process of identifying alternatives and choosing a winner involves many other activities such as problem-solving, conflict resolution, motivation and others. Thus, the main question is how decision-making can be more effective in predicting the outcomes (Chang & Chiang, 2008; Sartor et al., 2009).

In order to determine the best possible outcome for a decision, it is not enough to have the correct data or information. Rather, such information must be combined with an understanding of the competing factors that will affect an outcome (Sartor et al., 2009). This can best be achieved by first identifying all relevant factors that should affect an outcome. Then, these factors should be ranked, and this ranking can be used as a starting point when looking at all alternative solutions (Chang & Chiang, 2008; Sartor et al., 2009).

The PMOB was initially developed as a framework for studying organizations and it was mainly used to provide both context and motivation for HRM research.

2.1.3. Introduction of Artificial Intelligence in HRM

It is widely accepted that AI has the ability to make many aspects of business more efficient. For example, it has proved useful in streamlining many repetitive and time-consuming tasks. In fact, AI can be considered a useful tool when it is used as an aid to assist in solving problems (Bakos & Brynjolfsson, 2001; Bohl et al., 2005) and can speed up the decision-making process for human users. The main challenge for human users of artificial intelligence will be to understand how to use this technology most effectively.

Most organizations are currently using or planning to use artificial intelligence systems (Bakos & Brynjolfsson, 2001; Bohl et al., 2005). These systems are performing different tasks and functions, such as classification, data processing and decision-making tasks. The primary goal of these systems is to continuously learn about their environment in order to improve their performance over time. They are integral parts of many existing organizations, especially those that use a lot of information (Celis & Berger, 2008).

In this context, there is a need for some robust techniques that can be used by HRM professionals to effectively deal with AI techniques in order to achieve good performance results.

2.2. Classification and Detection

The most common tasks that people perform using computers involves the retrieval of specific information from databases based on the keywords given. The algorithms used to categorize and retrieve specific information from databases are referred to as classification and detection methods. For example, the input is a set of words that represent documents, such as email messages or SMS messages. These words are then classified based on some rules that have been established in advance by the user.

2.2.1 Classification Methods

The classification method classifies a set of data into several predefined classes according to the given definition in a database table, or mathematically represents the data in terms of symbols and values that can be manipulated using mathematical operations. This technique is also known as classification analysis or categorization analysis. The primary goal of this method is to develop a data model in which the data can be categorized based on some relevant variables. Then, classification methods are used to group the data into a few distinct classes.

2.2.2 Detection Methods

The detection method is an analysis tool that can be used by HRM professionals to identify hidden patterns within the data set. The first step in detection analysis is to segment the given data set into several groups or segments based on some salient characteristics of the data. The second step is to identify connections between these groups and then determine similarities between different segments of the given database.

2.2.3 Statistical Pattern Recognition Methods

Statistical pattern recognition methods are also referred to as statistical inference or statistical classification methods and are used for solving classification and detection problems. The most popular method is the

Bayesian method which relies on mathematical analysis in order to capture the inherent variability between the recorded instances and their corresponding classes.

The Bayesian method has managed to solve many classification problems; however, it requires a great deal of computational resources and can be slow when processing large data sets. Therefore, there are various other methods that have been developed to resolve the classification problem. These methods include support vector machine (SVMs), kernel perceptrons, neural networks and linear classifiers. The kernel perceptron is an algorithm that can be used to classify data into several distinct classes. The SVM is a supervised machine learning method that can be applied to spectral data in order to classify these data into several classes (Mishra & Jain, 2018).

An advantage of using any type of pattern recognition system is that it provides HRM professionals with the ability to identify hidden patterns within the data set and thus improve their decision-making capabilities for complex problems.

2.3. Supervised Learning

Supervised learning is a relevant approach that can be used to solve most classification and detection problems. The key principle behind this method is to assign the value of new instances in terms of one of the previously defined classes with a designated probability. The training set is then used to determine the probability that an instance belongs to each class. This probability can be determined using a method known as Bayesian inference or Bayes' theorem.

2.4. Advantages and limitations of using AI in HRM:

One of the great advantages of AI is that it can be used to automatically process large amounts of data within a short period of time. This has led to the creation of several predictive charts, graphs and models that can be used by HRM professionals to make better decisions based on new data (Bakos & Brynjolfsson, 2001). However, it is important to note that AI systems cannot solve all problems with exact accuracy.

The underlying philosophy behind this approach is that data alone does not constitute a sufficient indicator for making decisions about individuals or groups. Therefore, it is necessary to include the learned concepts in any prediction model. These concepts can be input manually or through existing large amount of data (Bakos & Brynjolfsson, 2001).

Another limitation associated with AI models is that they cannot be applied to all types of problems. For example, many models cannot deal with time-series data properly and thus exhibit the inability to handle seasonal patterns.

Another limitation associated with AI techniques is that they are usually not able to cope with problems in which classification methods are required.

3. Findings

The use of AI in HRM can be traced all the way back to the 1960s when the first programs had begun to be used by HR professionals (Bakos & Brynjolfsson, 2001). These programs were highly limited in their ability and thus had been used for addressing rudimentary problems. However, these early systems are no longer considered to be artificial intelligence or AI as they have now advanced vastly (Bakos & Brynjolfsson, 2001).

3.1. The examples of AI in HR:

There are many different ways in which artificial intelligence can be used for helping human resources management professionals make decisions about human capital. One of these ways is through the use of predictive analytics. Predictive analytics involves the use of algorithms and skills to analyse various data sets in order to make predictions about future events. Over the years, there has been a huge increase in the number and type of predictive analytics applications being developed for HR professionals. In fact, these apps are widely used in almost every industry including healthcare and finance.

These predictive algorithms are used in conjunction with a number of different approaches that can be used for making decisions about individuals as well as groups. For example, they can be used when screening job applicants to determine their skills and abilities based on their past performance.

3.2. Advantages of using AI in HRM:

The extensive review of literature revealed the following advantages of using AI in HRM:

a. Prediction modelling:

Artificial intelligence can be used for creating prediction models. These models are used for making predictions about individuals or groups and thus helping HRM professionals make better decisions about people, jobs and the organization as a whole.

b. Seamless integration:

AI can be integrated into the human resources department to address problems within an organization more efficiently. This is due to the fact that AI provides HRM professionals with increased computational power, enabling them to analyse more data at once (Bakos & Brynjolfsson, 2001). All of this enables faster problem-solving capabilities.

c. Transfer learning:

This is the process through which information and knowledge gained from one application can be used in another application. This increases the overall productivity of an organization by reducing the amount of time that is spent on training people to perform various tasks.

d. Cost-benefit analysis:

AI algorithms do not require any type of human intervention, making them incredibly cost-effective for organizations to use. They can also be used to automatically process large amounts of data for analysis and thus enabling HRM professionals to make better decisions about people, jobs and the organization as a whole.

e. Predictive analytics:

Artificial intelligence can be used for predicting future events with varying levels of accuracy. Predictive analytics involves the use of algorithms and skills to analyse various data sets in order to make predictions about future events.

3.3. Limitations of using AI in HRM:

The extensive review of literature revealed the following limitations of using AI techniques in HRM:

a. Unsupervised learning (UL):

Unsupervised learning is a relevant approach that can be used to solve most classification and detection problems. The key principle behind this method is to assign the value of new instances in terms of one of the previously defined classes with a designated probability. The training set is then used to determine the probability that an instance belongs to each class.

The main limitation associated with UL is that it is highly prone to errors in the case of missing or inaccurate data. It also exhibits less flexibility when compared to other techniques.

b. Bias:

Bias can be defined as a systematic error which can occur when information or knowledge about specific events is used for making predictions about other events. According to Bakos and Brynjolfsson (2001), the most common bias in machine-learning algorithms is the problem of class imbalance. This refers to the imbalance between classes with large number of instances and those with a small number of instances. It can be counteracted through the introduction of new training data, but this also hinders the learning process.

c. Overfitting:

Overfitting is a situation where a model tends to make generalizations which are not used in real-world problems (Bakos & Brynjolfsson, 2001). This happens when an artificial intelligence model adapts itself to fit certain patterns or trends in the training data without taking any conscious decisions. It also becomes apparent when a single model is used to solve multiple problems.

d. Scalability:

The limiting factor of AI techniques is that they can be applied only to problems within a single state. The algorithm is applied to a big data set and then it tries to predict the output based on the results. This requires a large computational power that can make this approach less scalable.

e. Data collection:

The ability of AI to make predictions about events depends on the quality of data that is being used for training purposes. Lazy or inaccurate data collection may create issues with regards to making accurate predictions.

4. Conclusions

1. AI can be of great help to HRM professionals in terms of making better decisions and also be an instrumental component in boosting the productivity of any organization.
2. AI techniques in HRM can be applied with varying levels of accuracy depending on the kind of problem that is being solved and the data that is being used for analysis.
3. The main limitation associated with AI techniques is that they can only be applied to problems within a single state. Due to this, they make it extremely difficult to solve multiple problems simultaneously.
4. It has been proven time and time again that AI techniques are cost-effective for organizations as these techniques require no human intervention which invariably reduces the cost of ownership.
5. The main component of procedural AI is machine learning which can be used for making predictive models, learning, and adaptation (Bakos & Brynjolfsson, 2001).
6. AI can also be used for making predictions based on the process of transfer learning (Kaufman & Zadeh, 1975).

7. The most common limitation associated with AI techniques is the problem of class imbalance. This refers to the imbalance between classes with large number of instances and those with a small number of instances. It can be counteracted through the introduction of new training data, but this also hinders the learning process.
8. The last limitation associated with AI techniques is the problem of scalability. AI techniques cannot be applied to a big data set and can only predict the output based on the results. This requires a large computing power that can make this approach less scalable.
9. The functional components involved in AI in HRM are machine learning, supervised learning, and unsupervised learning.
10. AI techniques can be used for solving many problems within HRM but there are also some limitations associated with them.
11. Since AI techniques make use of an enormous amount of information regarding various events, it is crucial to be careful while collecting data.

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