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Research article

Enhancing E-selection of Faculty Teaching Staff by Using the Applications of Artificial Intelligence: Applied on Egyptian Higher Institutes

Yasmeen Abdel Riheem Sayed [1*], Marwa Abdel Moez [2], Hanan Youssef Aly [3]

[1] Business Administration Lecturer at Higher Institute of Marketing, Commerce &Information Systems, Cairo, Egypt, yasmeenabdelriheem000@gmail.com.

[2] Business Administration Lecturer at Higher Institute of Marketing, Commerce &Information Systems, Cairo, Egypt, marrooshawer1712@gmail.com.

[3] Public Administration Lecturer at Higher Institute of Marketing, Commerce &Information Systems, Cairo, Egypt, hananzomzom@yahoo.com.

*** Correspondence:** sanaelnagar6@gmail.com

Abstract: The process of selecting faculty teaching staff in higher education institutions traditionally relies on complex procedures, including resume reviews, interviews, and assessments of academic and teaching proficiency. This study aims to explore the potential of implementing an e-selection system as an innovative solution to improve the efficiency and accuracy of recruitment processes. By leveraging Artificial Intelligence (AI) and Artificial Neural Networks within the framework of Electronic Human Resource Management (e-HRM), the study seeks to automate and streamline multiple stages of the hiring process, such as initial screening and applicant evaluation. Data was collected from 512 applicants for academic positions, where 301 were accepted, and 211 were rejected by the human resource manager. The e-selection system was based on these data to train a neural network using predefined criteria for selecting faculty staff, including academic, personal, professional, and linguistic skills. The model achieved an accuracy of 97.7% in automatically evaluating applicants, reducing the need for human intervention and accelerating the decision-making process. This study highlights multiple benefits of using AI in e-selection, such as increasing efficiency in terms of time and cost, improving selection accuracy, reducing bias, and ensuring greater transparency and fairness in decisions. The research also discusses the challenges and ethical considerations related to implementing AI systems in this context, including privacy and transparency concerns. The findings of this study provide significant insights into how technology can be used to enhance traditional recruitment processes in higher education institutions.

Keywords: Artificial intelligence, e-HRM, Decision making, Electronic Selection, Machine learning.

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Background: Traditionally, faculty teaching staff selection involves labor-intensive and time-consuming processes, including reviewing resumes, conducting interviews, and assessing teaching capabilities. AI applications can automate multiple stages of this process, allowing institutions to assess a larger pool of candidates while minimizing biases and ensuring fairness.
Objective: The objective of this research is to explore the capabilities and potential of using AI applications (a neural network) for e-selecting faculty teaching staff. By examining the advantages, challenges, and implications, this study aims to provide insights into the effectiveness of AI in improving the efficiency and quality of faculty selection.
Methodology: To achieve the objectives of the study, a questionnaire was prepared to measure the criteria used in selecting faculty teaching staff, and it was uploaded to Google forms. 512 answers were collected from applicants for the position of a faculty member, 301 were approved, and 211 were rejected by the human resource manager. Then by using our AI model, we can automatically evaluate the faculty member afterwards using the neural network pre-trained on the data.

Introduction:

In today's digital age, Electronic human resource management (E-HRM) becomes crucial, it is the planning, implementation and application of information technology for both networking and supporting at least two individual or collective actors in their shared performing of HR activities the process of an organization integrating its human resource department with information technology specifically designed to help with tasks associated with human resources. By doing this, businesses can streamline its human resources, or HR, departments and become more efficient in terms of both costs and production. Different tasks that can be handled by E-HRM include staffing, training, and payroll. Software installed can handle various time-consuming jobs, allowing HR employees to save time on those tasks and concentrate on strategic maneuvers designed to improve the business.
Technological advancements such as artificial intelligence (AI) have transformed various sectors, including education. One noteworthy application of AI in academia is the e-selection of faculty teaching staff. Leveraging the power of AI can streamline and enhance the traditional selection process, offering numerous benefits for both educational institutions and potential candidates.
Higher education institutions are considered centers of knowledge production, transfer, and application. They are also one of the main pillars on which the progress and growth of society is based, due to the change and improvement of the educational system in general.
The advent of digital technologies and the increasing availability of artificial intelligence (AI) have revolutionized various aspects of human resources management, including the recruitment and selection processes.
This research seeks to explore the utilization of e-selection methods and AI in the context of faculty teaching staff recruitment within educational institutions. The study investigates the potential benefits, challenges, and ethical considerations associated with e-selection and AI in the hiring of faculty members. By examining existing literature, case studies, and conducting interviews with relevant stakeholders, the research aims to provide insights into the current practices, opportunities, and potential future developments in e-selection and AI for faculty recruitment. The findings of this research will contribute to the understanding of how educational institutions can leverage technology to optimize their selection processes and ensure a qualified and diverse teaching staff.

The Research Problem:

The study started from a basic problem, which is the multiplicity and diversity of criteria for selecting the accepted faculty teaching staff and their assistants, and in order to save the time of the applicants and those in charge of selection and appointment to fill the position, the idea of research was to design a program that enables applicants to apply for the job and selecting those who are accepted.
The research problem of this study is to investigate the potential of AI applications in enhancing the e-selection process as one of the dimensions of e-HRM and evaluate their impact on the efficiency and effectiveness of candidate selection. Specifically, the study aims to address the following key questions:

1. How can AI applications be integrated into the e-selection process to streamline and automate candidate screening, shortlisting, and evaluation stages?
2. What are the potential benefits and challenges associated with the adoption of AI applications in e-selection, in terms of time efficiency, cost-effectiveness, and accuracy?
3. What are the ethical considerations and legal implications that need to be taken into account while implementing AI applications in e-selection, particularly regarding privacy, bias, and transparency?
4. How do candidates perceive and respond to the use of AI in the e-selection process, and what are their attitudes towards the fairness and trustworthiness of AI-driven decision-making?

By addressing these research questions, the study aims to contribute to the understanding of how AI applications can enhance the e-selection process, identify potential benefits and challenges, and provide insights into the ethical and practical considerations that organizations should consider when implementing AI-driven e-selection systems.

Research Importance:

Theoretical importance

The study holds several theoretical importance within the field of human resources, recruitment, and artificial intelligence. Some of the theoretical implications include:

1. Advancement of Knowledge: The study contributes to the existing knowledge by exploring the integration of AI applications in the e-selection process. It expands the understanding of how AI can be leveraged to improve candidate selection, shedding light on the potential benefits, and challenges.
2. Bridging Theory and Practice: The research helps bridge the gap between theoretical concepts and practical implementation. The study provides insights into how theoretical frameworks and algorithms can be translated into real-world HR practices, leading to more efficient and effective selection processes.
3. Future Research Directions: The study sets the stage for further research in the field of e-selection and AI. It identifies gaps in current knowledge, highlights areas for improvement, and suggests potential avenues for future investigation. This can stimulate further research and exploration of novel AI applications in HR and recruitment processes.

Practical importance

The importance of the study comes from the importance of the selection process of faculty teaching staff, artificial intelligence in the life of individuals, the importance of the field of application, which

is the Egyptian higher institutes, and the need to take the appropriate decision in a timely manner and search for auxiliary methods to reduce error rates and reach the targeted results accurately and quickly, as this study sets a general framework that enables leaders to effective move to keep pace with the technological development and the information revolution. In light of this development, machine learning techniques and neural networks were relied upon that affect decision-making through the application and use of a smart program that selects faculty teaching staff in the Egyptian higher institutes. Moreover, The research delves into the ethical considerations surrounding the use of AI in e-selection. It explores issues such as privacy, bias, and transparency, addressing the ethical implications of relying on automated decision-making systems in HR processes. This understanding can inform the development of ethical guidelines and best practices for organizations implementing AI-driven e-selection systems.

The Research Hypothesis:

The research hypothesis can be stated as follows:

Main Hypothesis:

There is a significant relation between AI applications and enhancing the e-selection processes of faculty Teaching staff

The Research Objectives

Based on the research problem, the study seeks to achieve the following objectives:

1) Disclosure of the nature of the criteria adopted to determine the criteria for selecting a faculty teaching staff and their assistants in the field of higher institutes in Egypt.

2) Learn about the application and use of artificial intelligence methods and their role in the selection of Faculty Teaching staff in higher education

3) Designing a program to develop and improve the selection criteria for faculty teaching staff and their assistants.

4) Improving E- Human Resources Practices

5) Contribute to the development of higher education performance in general**.**

Criteria for selecting faculty teaching staff:

The procedural definition of the standard for faculty staff: It is a document as a result of a consensus that defines the requirements that must be met by faculty staff and the faculty with assistance from the point of view of the selection and appointment committee in the higher institutes under study.

Literature Review:

E-selection:

The Effect of Electronic Human Resource Management (E-HRM) and its elements including E-selection, was discussed in several studies. (Friedrich & Wahba, 2021) conducted a study that aimed at studying the impact of electronic human resources management E-HRM on organizational effectiveness; the study was applied on employees of Egyptian petrochemical companies. The sample size was (450) employees, and (372) were collected, with a response rate of (82%). Results indicated that there is a statistically significant positive effect of electronic human resources management, with its combined dimensions, on organizational effectiveness.

A study by (Farhan, A.F., Salamzadeh, Y., & Richardson, C, 2021) also aimed at determining the

impact of electronic human resources management on employee productivity in light of the presence of organizational creativity as an intermediary variable, the study was applied on employees of more than (50) organizations within the United Arab Emirates. A survey was used for collecting data, and was distributed to a number of (58) of the leaders of those organizations. Results showed a statistically significant positive effect of E-HRM on employee productivity in light of the presence of organizational creativity as an intermediary variable.

(Raman, A, 2020) aimed at finding out the impact of electronic human resources management on job satisfaction for employees working in the field of information technology in the state of India, which is the first country in the world in the production and export of information technology and programming, in the New Delhi metropolitan area. The questionnaire was used as a method to collect data, and 320 questionnaires were distributed. The results indicated that there is a positive, statistically significant effect of electronic human resources management on job satisfaction. The results also showed that there is a positive, statistically significant relationship between resource management and E-humanity and job satisfaction.

(Almashrafi , 2020) aimed at knowing the impact of the practice of electronic human resources management (E-HRM) and the importance of the electronic human resources management system (E-HRM and the court system), including electronic recruitment, electronic training and development, electronic performance evaluation, and electronic compensation, in the courts of first instance in Sultanate of Oman. The study found that the importance of electronic human resources management (E-HRM) and court systems was important in employee performance. The results also indicate that attention to the importance of electronic human resources management (E-HRM) and court systems Courts Improves staff performance in trial courts.

Nikolaou 2021 explored a number of new developments in the field of employee recruitment and selection with a focus on technological developments. The study discussed examples of technological developments across the four stages of the recruitment and selection process. In the attraction stage and how on-line/internet recruitment and especially social networking websites have changed the focus of attracting candidates effectively. The study also discussed how cyber vetting and applicant tracking systems offer opportunities and threats for recruiters and candidates. the focus was on two new selection methods; the asynchronous/digital interview and gamification/games-based assessment, along with the critical role and impact applicant reactions have on the selection process.

Bina et. Al.,2021 examined the current state of research on GBA (game based approach) in the context of HR with a focus on recruitment and selection. This way of attracting and selecting talent offers advantages for practice. While the research findings align in some ways with prior literature reviews, they also reveal context-specific areas of misalignment. Considering the limited empirical research conducted on GBA in recruitment and selection, this area is ripe with opportunities to apply fresh theoretical perspectives, conduct rigorous empirical studies, and explore new ways to attract and optimize talent. GBA can contribute to finding diverse and high-quality applicants, and to helping organizations and individuals find the right fit.

Georgiou2019 discussed converting a traditional SJT (situational judgment test) to a gamified assessment, the study focused on the use of game elements in employee selection as well as to SJT research and practice. By eliciting job-relevant behaviors within the context of a gamified assessment, increased prediction of future work behaviors may be possible compared to traditional psycho- metric tests. In order to effectively assess candidates' soft skills, such as resilience, adaptability, and decision-making, first the development of a SJT to form the basis of the gamified assessment method was

presented. Second, the SJT's construct validity was explored in order to transform it into a gamified assessment method, and third, the construct validity of the gamified assessment was established.

Priyadharshini et.al., 2020, provide an adequate MCDM (Multi-Criteria Decision Analysis) on an employee selection. In order to achieve consensus among the decision-makers, all pair-wise comparisons were converted into triangular fuzzy numbers to adjust the fuzzy rating and the fuzzy attribute weight. Academic staff selection is a process that also contains uncertainties. This problem can be overcome by using fuzzy numbers and linguistic variables to achieve accuracy and consistency. The study suggested that recruitment within an academic environment is a complex issue and, thus, human resources and/or other authorities need to take appropriate measures when recruiting.

Pham 2020, added that Some companies choose to apply green criteria when selecting candidates while others do not. In any case, communicating a company's environmental values and orientation is worth practicing during GRS. Previous studies have identified four mediators (anticipated pride, perceived value fit, expectation of favourable treatment, perceived organisational green reputation/prestige) that intervene between signals of a company's CES and a job seeker's perceptions of organisational attractiveness. However, the strength of this effect is influenced by five moderators (pro-environmental attitude, socio-environmental consciousness, desire to have a significant impact through one's work, environmental-related standard registration, job seeker's expertise).

Rozario 2019, investigated the critical aspects of recruitment and selection process in the TAFE/Dual education sector covering both urban and regional Victoria in Australia. An important contribution was made through providing descriptive empirical evidence on the various dimensions of the employee selection process followed by the VTA members operating in Australia. In addition the study provided an agenda depiction of the process involving the critical aspects from the perspective of the hiring member and an applicant. This research contributes to the growing literature on talent acquisition's employee selection processes by providing empirical evidence on existing selection operations amongst the VTA members in Australia.

Suwarto 2019, conducted a study to determine the effect of recruitment on performance, selection and placement on performance, the effect of recruitment on selection, and the effect of selection on placement. Depreciating number of employees at PT Green Glovers Indonesia in Klaten was caused by employees entering retirement, death or dismissal. Newly-hired employees are required to improve their performance. Technical data processing was conducted using Structural Equation Modeling (SEM) with Partial Least Square (PLS) approach. The results showed that recruitment has no effect on performance; selection affects performance; placement affects performance; recruitment affects selection; and that selection affects placement.

Some studies were conducted to discuss the relationship between e-selection and technology

Rathore 2023 conducted a study to investigate the function of AI in HRM practices using qualitative biblio-metric analysis. Results showed that a constant improvement and introduction of new technological conveniences. In accordance with the present market climate, that promotes process management and people management practices targeted at making the organization economically viable and different from competitors. This work introduced a theoretical understanding of AI's growth in the HR sector in light of this reality.

Johnson et.al., 2020 discussed how service organizations can use electronic human resource management (e-HRM) and artificial intelligence (AI) have the potential to transform and help recruit

and select qualified employees, increase individual retention rates and decrease the time needed to replace employees. The study also discussed how e-recruiting and e-selection and AI tools can help hospitality and tourism organizations improve recruiting and selection outcomes. However, care must be taken to ensure that the insights gained and the decisions made are well received by employees and lead to better employee and organizational outcomes

Mirowska 2020 studied how information provided prior to the application stage of the selection process affects applicants' intentions toward organization and the job. Information revealed prior to application may cause candidates to self-select themselves out of the process. using a randomized experimental design, participants read a job ad specifying that their prerecorded interviews would be reviewed by a human or an artificial intelligence-based evaluator. The results show increased intentions to apply and pursue the job in the human evaluation condition.

The concept of decision making and its importance:

The decision, in fact, is a choice between a group of alternatives offered to solve a problem or crisis or conduct a specific work after identifying the strengths and weaknesses of each alternative in preparation for choosing the best alternative. The decision is the essence of the administrative process and its main means in achieving the goals of the organization. and Ibrahim knew it "Structural formulation that has an applied nature that is achieved through a set of procedures, operations, or performances that move the work towards the goals set for it. This is done through a realistic study of the information and data related to this situation".(GuoL. et al., 2024)

Decision making steps:

The opinions of management scholars differed regarding defining the decision-making steps or the number of its stages, but there are common steps among them and they are irrelevant for decision-making, and the most important are the following: (YangG. et al., 2023)

1- Diagnose and identify the problem:

When identifying the problem, it must be studied to find out the real problem and not the apparent symptoms that suggest to the administration that it is a major problem, especially since a misdiagnosis of the problem may lead to a defect in the stages that follow.

2- Analyze the problem:

At this stage, its nature, size, complexity, quality of the optimal solution, and the data and information required to solve it are determined.

3- Finding alternatives:

Several alternatives are developed as an alternative solution. Each problem has several solutions. The alternative solution has two conditions. In the event that the aforementioned conditions are not available, the decision-maker must exclude this alternative and replace it with another alternative.

A- This alternative leads to achieving some of the results sought by decision makers.

B- Choosing this appropriate alternative that has the necessary capabilities to implement it.

4- Evaluation of alternatives:

This stage is considered one of the difficult intellectual stages. Here, the decision maker makes a comparison between the alternatives.

5- Choosing the appropriate solution (decision making):

Choosing an alternative or a solution from the proposed alternatives, provided that it is appropriate and can lead to good results.

6- Follow up on the implementation of the decision:
The decision-maker must follow up and monitor his decision if it is an ideal solution to the problem at hand. The researcher must convey his decision to others, explain its dimensions and convince them of this alternative.
Machine learning:
Machine learning (ML), a form of artificial intelligence (AI), has seen widespread use for making predictions. By learning from data rather than following explicit instructions, machine learning algorithms enable systems to automatically identify patterns and make decisions with minimal human intervention or programming. (Sharifani et al 2023) Machine learning is broadly divided into two major categories: supervised learning and unsupervised learning. In supervised learning, the model is trained using a labeled data analysis and then predicts the output for new input data. Here, the output variables are known during training. In contrast, for unsupervised learning, the training data analysis contains only input variables while the output or response variables are either unknown or undefined. The model must learn the underlying pattern directly from the input data. (Xu etal ,2023)

Related work:

The study aimed to identify the role of artificial intelligence in administrative decision-making in light of the Covid 19 epidemic in Saudi Arabia, and it relied on the descriptive correlational approach. The study found several results, the most important of which is the existence of a statistically significant relationship between the use of artificial intelligence methods and the quality of administrative decision-making. It was also found that there is a statistically significant relationship between the ability of the system and the quality of decision-making. The study recommended the need to develop the skills of workers in order to deal with the different methods of artificial intelligence, and work to determine the scientific and objective foundations that must be adopted in decision-making. (Parrenin, & Beauchemin, R. ,2023)
This study aimed to identify the effect of applying artificial intelligence and emotional intelligence on decision-making in commercial banks, and analyzing the impact of artificial intelligence on decision-making, as well as analyzing the impact of emotional intelligence on decision-making. administrative. As well as the existence of a correlation between emotional intelligence and management decision-making. (Sáenz-RoyoC. *et al.,2023).*

This study aimed to identify to analyze the impact of artificial intelligence on the quality of administrative decision from the point of view of secondary school leaders in the Al-Jouf Educational Administration in the Kingdom of Saudi Arabia, using the descriptive analytical approach, and the study sample consisted of (60) male and female leaders from secondary schools in Al-Jouf region for the academic year 2019-2020, The study reached a set of results, the most important of which is the presence of a statistically significant effect of the dimensions of artificial intelligence on the quality of administrative decision. Holding training courses for its employees and recommended the need to update and develop the artificial intelligence programs used to enable the various departments to make appropriate decisions at the right time. (Alnawafleh,et al., 2022)
This study aimed to identify to know the roles of artificial intelligence and humans in decision-making within knowledge-intensive companies, and a study sample was in two large information technology companies and two real estate startups that use artificial intelligence. The study concluded that the role of artificial intelligence in the decision-making process is an auxiliary and supportive role for humans

in analyzing and formulating alternative decisions and an effective tool for dealing with complex situations, but it cannot currently replace humans in the decision-making process. Where human capabilities are more important in situations of uncertainty and ambiguity. (Dorian and Mélanie, 2018) And the current study agrees with previous studies on the importance of the role of artificial intelligence in improving decision-making, but it differs from previous studies in preparing an application using neural networks to evaluate applicants for the position of a staff member in Egyptian higher institutes.

Data analysis:

In this study, the researchers relied on two types of data sources:

1- Primary data sources: To address the analytical aspects of the research topic, primary information was collected through (questionnaire) as a main tool, and it was designed specifically for this purpose, and the three-point Likert scale was used.

2- Secondary data sources: The theoretical framework was addressed by resorting to secondary sources of information, which are relevant Arabic and foreign books and references, periodicals, articles, reports, research, and previous studies that dealt with the subject of the study, research and reading on various internet sites.

- The most important indicators were formulated within a set of criteria that were collected and agreed upon from the survey conducted by the researchers through personal interviews with staff of the selection and appointment committees in the institutes under study, in addition to Law No. (49) of 1972 regarding the organization of universities, and Law No. (52).) for the year 1970 regarding the organization of private higher institutes, and the quality of accreditation guide according to the latest publications of the National Authority for Quality Assurance of Education and Accreditation 2015, and some previous studies. (TangM. et al. , 2023)

In addition to the studies that dealt with the tasks of the faculty member in achieving the goals entrusted to them, whether in preparing students, training them, helping them in facing change and directing them to new things in the field of specialization, or in enriching scientific research, developing society, spreading, and strengthening the culture of the local and national society in general.(Hasyim, M.,Prastyo, D.D.,2018).

And identifying the personal and professional qualities that a university professor must possess in terms of possessing the capabilities and skills of scientific thinking, enjoying physical and psychological health, controlling emotions and behavior in emergency situations, in addition to appreciating the learning profession and being proud of it, knowing the goals of higher education and how to achieve them, and developing human relations with Students and work on the growth and self-development and develop the academic and administrative performance of the faculty member (Sacoto, M.M., Velasco,2018).

In the current study, the triple Likert Scale was relied upon, which gives three answers for each paragraph of the questionnaire, and three answers are presented to the applicants against each paragraph that determine their level of approval, so that the approval of the paragraphs is in accordance with what was determined by the Universities Organization Law and the National Authority for Quality Assurance of Education Accreditation, as well as previous studies, agree to some extent and disagree with some paragraphs that may differ from one institute to another according to the needs of each institute.

Pointers	Criteria
1) Desire to work in the teaching profession, respect the profession's laws and regulations, and be proud of the teaching profession 2) Possessing the physical qualities necessary for work, physical and nervous ability, endurance, activity and vitality 3) The ability to build good human relations with students and bosses	**1) Personal criteria**
4) Obtaining all academic degrees through regular study 5) Obtaining all scientific degrees from public universities, other universities, or scientific institutes recognized in Egypt and considered by the Supreme Council of Universities to be equivalent to those awarded by Egyptian universities. 6) Work as lecturer assistant after obtaining a master's degree	**2) Academic criteria**
7) perform a presentation in front of the Selection and Appointment Committee in English 8) The ability to teach in English 9) Developing language skill 10) Speed of thinking and good behavior in emergency situations and finding appropriate exits	**3) Skills criteria**
11) Applying new ideas in the teaching process, employing all developments in the field of specialization, and linking the course content objectives with real-life problems. 12) Distribution of the study plan in the first meeting with the students 13) Using different methods and methods of teaching according to the requirements of each course 14) Apply the course description or report form and benefit from applying the course report form in the improvement plan 15) Diversifying the methods of measuring and evaluating student achievement 16) Encouraging students to learn, encouraging distinguished students, and helping students who are failing academically and those with special needs 17) Taking into account individual differences among students, providing opportunities for self-learning, and transferring scientific research skills	**4) professional criteria**
18) Understand students' problems and circumstances and help solve their personal problems 19) Support students academically and set office hours that suit their different circumstances 20) Commitment to office hours and encourage students to review you during them 21) Effective communication with students and providing advice and guidance 22) Participate in student activities and student support committees	**5) Relations with students**

23) There is a benefit from scientific research or attending scientific conferences in the field of specialization 24) Publish research in local or international scientific journals 25) Looking for details Waiting for the day I become a professor	**6) Scientific research**
26) Participate in the implementation of research, awareness seminars, or workshops that serve the community 27) Work on the participation of the parties of society in formulating the mission of the institution 28) Participate in organizing the graduation ceremony	**7) community activities**
29) Using digital educational technologies in teaching 30) The use of educational technology in evaluating students' academic performance 31) Encourage electronic correction 32) Allocate a specific time to respond to students' inquiries through communication sites 33) Follow the Institute's website to learn about the administration's instructions	**8) Technical criteria**
34) Difficulty in dealing with the administrative staff of the institute 35) Initiating ideas for the development of the scientific department 36) The participation of your colleagues in their various events 37) Join the work teams of the Quality Assurance Unit at the Institute	**9) Relations within the institute**
38) The years of work in the specialty are not less than one year 39) Preparing scientific literature in the field of specialization 40) Obtaining training courses in methods and methods of teaching or quality	**10) Efficiency and experience**
41) Benefiting from student evaluations in self-development 42) Commitment to attend training courses 43) Ensuring to improve the scientific level by continuing to read and know everything that is new	**11) Self-development**

Proposed method:

the following are the steps of our method:
we 512 applicant 301 was approved by HR and 211 was refused by HR we split this data set into train, validation, and test as follows:
306 for training, validation 103 (80% of full data analysis) and test 103 (20% of full data analysis) for test, Then we try several machine learning algorithm as we mention in table 1. and the best validation accuracy was for ANN

Artificial neural network:

One of the most important supervised machine learning approaches is artificial neural networks, inspired by biological neural systems. A neural network is like how human brains learn through experience and training; artificial neural networks must also be trained with data to become skilled at performing tasks. Neural networks function by mimicking the web of neurons in the brain and nervous system, learning in a similar way through exposure to vast amounts of data. (Allam Z., 2019).

An artificial neural network consists of layers of artificial neurons called units. The input layer receives information that is passed on to one or more hidden layers. The hidden layers then send information to the output layer.

Within each unit, the inputs are combined using weights that simulate the strength of connections between biological neurons. The weighted inputs are summed and passed through an activation function to produce the output. For example, the inputs X1, X2,.. are multiplied by weights W1, W2,... and summed for hidden neuron Ji. This sum is then passed through an activation function to produce the output of that hidden neuron.

The number of hidden layers and neurons in each layer varies based on the complexity of the problem. More layers and neurons generally improve performance but at the cost of complexity and training time. (Madhuri D et al 2022)

The output zj for neuron j can be calculated as:

$$z_j = b_j + \sum_{i=1}^{n} w_{i,j} x_i \quad (1)$$

Where:

bj is the bias term for neuron j

wi,j is the weight for input i to neuron j

xi is input i

This linear combination is then passed through an activation function g() to obtain the output aj of the neuron. Common activation functions include the sigmoid function, defined as:

$$g(z) = 1/(1+ e\text{-}z) \quad (2)$$

The activation function decides whether a neuron should be activated or not, scaling the output of the neuron between 0 and 1 in the case of the sigmoid function.

In summary, the inputs are multiplied by weights, added to a bias, and passed through an activation function to get the final output of an artificial neuron. This process simulates the way biological neurons send signals in the brain.

$$(z) = \frac{1}{1+ e^{-z}} \quad (3)$$

Another activation function is RELU (The rectified linear activation function) is a simple calculation that returns the value provided as input directly, or the value 0.0 if the input is 0.0 or less.

We can describe this function g() mathematically using the max() function over the set of 0.0 and the input z; for example:

$$g(z) = \max\{0, z\} \quad (4)$$

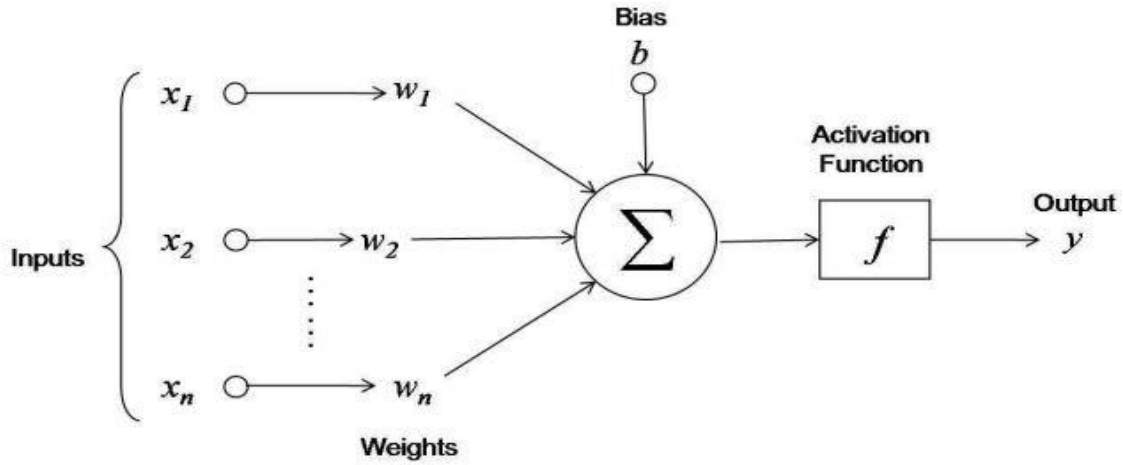

Figure 1: Architecture of multi-layer in ANN

we construct our neural network as follows

Input Layer: the first layer is a dense layer, and we try several neurons as we see in the table 2, ReLU activation, and the input shape is 44 since we have 44 input features. where 'Dense' refers to a fully connected layer, which is what we will be using.

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Output Layer: is a dense layer with 1 neuron, where the output from this architecture is approved or not and using sigmoid activation.

the models were trained with 100 iterations till the result is stable: and the final result with the best model is collected in table 3.

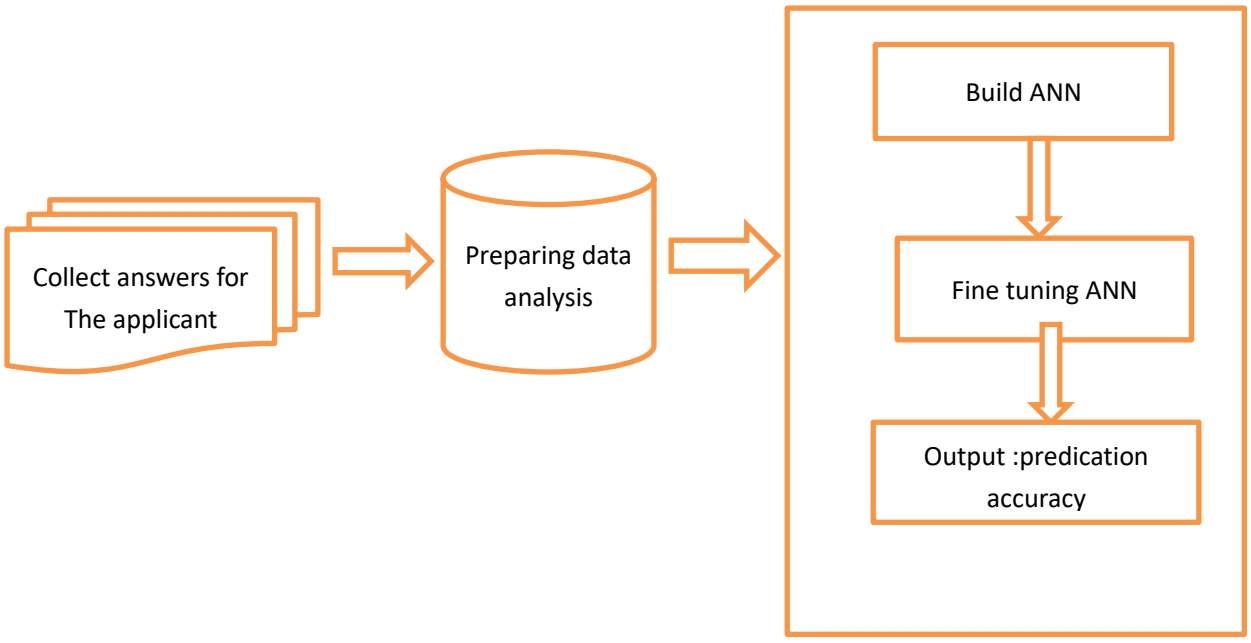

Figure 2.our proposed method.

Performance Metric:

There are four terms that should be defined to get familiar with these criteria(4) (Samira Khodabandehlou et ,al. 2017):

(1) TP (True positives): the number of applicants that should be approved by HR and the prediction algorithm has determined that correctly.

(2) TN (True negatives): the number of applicants that should be refused by HR and the prediction algorithm has determined their category correct.

(3) FP (False positives): the number of applicants who were refused by HR but the algorithm incorrectly categorized them as approved.

(4) FN (False negatives): the number of applicants who were approved by HR but the algorithm incorrectly categorized them refused.

The recall of a classification model indicates its ability to correctly retrieve all relevant instances from a data analysis. It is a summary of the model's performance on the positive class - how many positive cases the model was able to find. A high recall implies that fewer positive cases were missed, meaning fewer false negatives. However, a high recall does not necessarily mean high overall accuracy, as it does not account for false positives (4):

$$\text{Recall}=\frac{TP}{(TP+FN)} \qquad (4)$$

The precision of a classification model evaluates its ability to return only relevant instances among all instances it labeled as relevant. It is a summary of the model's performance on the positively labeled results - how many of those were actually positive. A high precision implies that fewer irrelevant instances were misclassified as relevant, meaning fewer false positives. However, a high precision does not necessarily mean high recall or overall accuracy, as it does not account for false negatives.(5):

$$\text{Precision}= \frac{TP}{(TP+FP)} \qquad (5)$$

Accuracy is the number of all the correct predictions, and it is calculated using Equation

$$\text{Accuracy}= \frac{TP+TN}{(TP+FP+TN+FN)} \qquad (6)$$

F-measure is the harmonic average of precision and recall, and it is calculated using Equation (7):

$$\text{F-measure}=\frac{2\ x\ Precision\ x\ Recall}{(Precision+Recall)} \qquad (7)$$

Results:

After using cross validation with 5 fold

Fine tuning ANN:

ANN model	Validation accuracy
Dense layer 128	0.968932044506073
Dense layer 512	0.9708737850189209
Dense layer 1024	0.9766990184783935
Dense layer 2064	0.9359223365783691
Dense layer 3000	0.9339805722236633

Table 2. validation for ANN with fine tuning

The best tuning data with 1024 and the test data accuracy was: 0.977

Precision for class with approved applicants	0.98%
Precision for class with refused applicants	0.87%
Recall for class with approved applicants	0.90%
Recall for class with refused applicants	0.98 %
F-measure for class with approved applicants	0.94%
F-measure for class with refused applicants	0.92%

Table 3. model Evaluation

Confusion matrix:

The confusion matrix in machine learning is a table that is used to display the performance of the algorithm. (Çavdar etal 2023)The performance is determined by testing the input data analysis which is given by the user. The below table shows the predicted and the actual values (Shamriz Nahzat etal 2021)

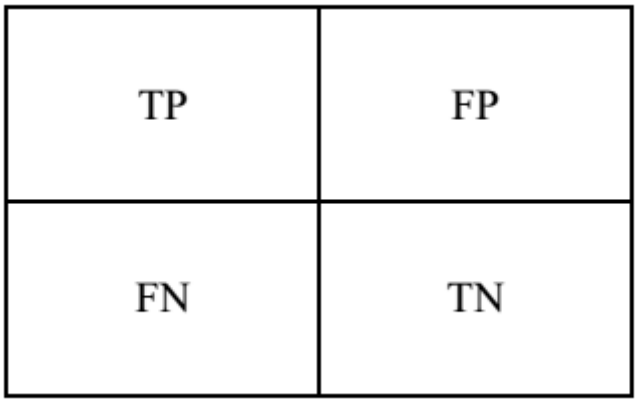

Figure 3. Confusion matrix table

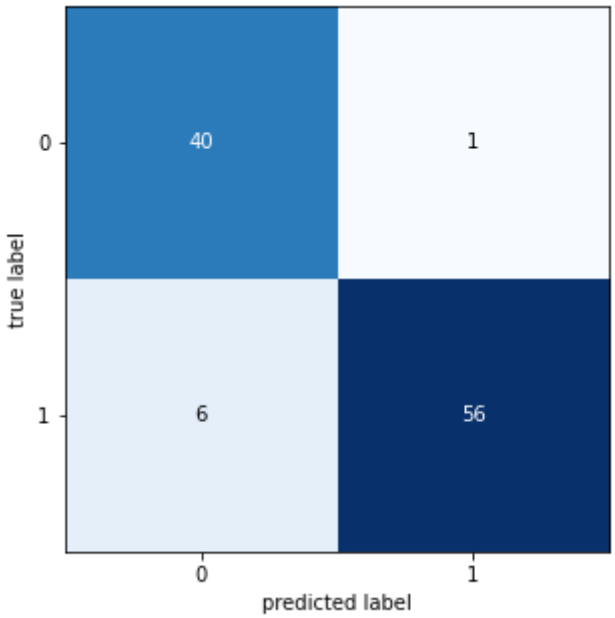

Figure 4. Confusion matrix for ANN algorithm

Conclusion and future work:

AI applications have the potential to revolutionize faculty teaching staff selection processes by offering efficient, precise, and unbiased evaluations of teaching staff candidates. This research ultimately providing valuable insights for institutions seeking to leverage technological advancements to optimize recruitment practices and improve academic standards to gain many advantages as:

1. **Enhanced Efficiency**: AI algorithms can rapidly screen and analyze large volumes of candidate profiles, saving considerable time for the selection committee.
2. **Unbiased Evaluation**: AI-based selection processes reduce the impact of human biases by focusing on objective criteria, such as qualifications, experience, and pedagogical expertise.
3. **Enhanced Candidate Pool**: e-Selection broadens the geographical reach, enabling educational institutions to consider talented candidates from diverse backgrounds, both locally and internationally.
4. **Improved Learning Outcomes**: By integrating AI capabilities, institutions can identify teaching staff with a proven track record of facilitating student engagement and academic success, enhancing overall learning experiences.

In this research, we tried to reach specific and acceptable criteria for selecting faculty staff and their assistants by inferring previous research and the guide of the General Authority for Quality Assurance Issue 2015A questionnaire was made to measure the qualifications of applicants for the position of faculty staff based on the criteria that were selected, then we presented the questionnaire to experts and determine the accepted applicants as well as the rejected ones, then a model was built using neural networks to automatically evaluate future applicants. The accuracy of the model was 97% for validation data, and it was 93% for test data.

Challenges and Implications:

1. Ethical Considerations: E-selection using AI demands careful attention to fairness, privacy, and the

potential for algorithmic bias.
2. Human Interaction: Although AI can streamline the selection process, the significance of personal interviews and interactions during recruitment should not be entirely replaced.
3. Scalability and Adaptability: Educational institutions must invest in building robust AI infrastructure that can accommodate future growth and adapt to evolving needs and technologies.

Conclusion:

This study explored the use of AI-driven e-selection methods in the recruitment of faculty teaching staff within higher education institutions. By implementing a neural network model within an e-HRM framework, the research demonstrated that automating the candidate selection process can significantly enhance efficiency, reduce human biases, and increase accuracy. With a 97.7% accuracy rate, the AI model proved capable of screening and evaluating applicants based on predefined academic, personal, and professional criteria. The automation of this traditionally manual process offers substantial time and cost savings, while also ensuring fairness and transparency.
However, despite these promising results, challenges remain, particularly in ensuring that AI-based systems are free from bias, respect privacy, and maintain transparency in decision-making. Ethical considerations such as data security and the potential for algorithmic bias must be continuously monitored and addressed to ensure that AI in recruitment is both equitable and effective.

Future Work:

1. Future research could focus on several areas to expand on the findings of this study:
2. Expanding Data Collection: Broader and more diverse data analysis should be collected from various institutions to ensure the model is generalizable and not overfitted to the data from one specific organization.
3. Integration with Human Evaluation: AI should be combined with human oversight to create a hybrid system where AI handles the initial screening, while final decisions are made with human involvement, ensuring that emotional intelligence and qualitative factors are considered.
4. Addressing Bias: Developing strategies to identify and mitigate potential biases within the AI model is crucial. Future research could explore methods for making the system more transparent and explainable to ensure fair outcomes.
5. Ethical Framework: As AI continues to play a larger role in recruitment, future work should involve developing comprehensive ethical frameworks to ensure the responsible use of AI, with particular attention paid to issues of privacy, transparency, and accountability.
6. Post-Selection Evaluation: Longitudinal studies that evaluate the performance of faculty members selected by AI models over time would provide deeper insights into the long-term effectiveness of AI in recruitment.

By addressing these areas, future work can further enhance the application of AI in e-selection, ensuring it remains an efficient, accurate, and ethical tool in HR management.

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تعزيز الاختيار الإلكتروني لأعضاء هيئة التدريس بإستخدام تطبيقات الذكاء الأصطناعي "بالتطبيق على المعاهد العليا المصرية"

ياسمين عبد الرحيم سيد أحمد [1] ، مروة عبد المعز حسين بكرى [2] ، حنان يوسف على مسعود [3]

[1] مدرس إدارة أعمال بالمعهد العالي للتسويق والتجارة ونظم المعلومات، yasmeenabdelriheem000@gmail.com

[2] مدرس إدارة أعمال بالمعهد العالي للتسويق والتجارة ونظم المعلومات، marrooshawer1712@gmail.com

[3] مدرس إدارة عامة بالمعهد العالي للتسويق والتجارة ونظم المعلومات، hananzomzom@yahoo.com

المستخلص:

تعتمد عملية إختيار أعضاء هيئة التدريس في مؤسسات التعليم العالي تقليديًا على إجراءات معقدة تشمل مراجعة السيرة الذاتية، إجراء المقابلات، وتقييم الكفاءة الأكاديمية والتدريسية. تهدف هذه الدراسة إلى استكشاف إمكانيات تطبيق نظام الاختيار الإلكتروني كحل مبتكر لتحسين كفاءة ودقة عمليات التوظيف. باستخدام الذكاء الاصطناعي (AI) وشبكات الأعصاب الاصطناعية ضمن إطار إدارة الموارد البشرية الإلكترونية (e-HRM)، تسعى الدراسة إلى تبسيط وأتمتة مراحل متعددة من عملية التوظيف، بما في ذلك الفرز الأولي وتقييم المتقدمين.

تم جمع البيانات من 512 متقدمًا لوظائف أكاديمية، حيث تم قبول 301 متقدم ورفض 211 بواسطة مدير الموارد البشرية. استند نظام الاختيار الإلكتروني إلى هذه البيانات لتدريب شبكة عصبية على معايير محددة مسبقًا لاختيار أعضاء هيئة التدريس، مثل المعايير الأكاديمية، الشخصية، المهنية، والمهارات اللغوية. حقق النموذج دقة تصل إلى 97.7% في تقييم المتقدمين بشكل تلقائي، مما قلل من الحاجة للتدخل البشري وسرّع من عملية اتخاذ القرارات.

تقدم هذه الدراسة فوائد متعددة لاستخدام الذكاء الاصطناعي في الاختيار الإلكتروني، منها زيادة الكفاءة في الوقت والتكلفة، تحسين دقة الاختيار وتقليل التحيز، وضمان شفافية وعدالة أكبر في القرارات. كما يناقش البحث التحديات والاعتبارات الأخلاقية المرتبطة بتطبيق أنظمة الذكاء الاصطناعي في هذا السياق، بما في ذلك قضايا الخصوصية والشفافية. توفر نتائج هذه الدراسة رؤى مهمة حول كيفية استخدام التكنولوجيا لتعزيز عمليات التوظيف التقليدية في مؤسسات التعليم العالي.

الكلمات المفتاحية: الذكاء الاصطناعي، إدارة الموارد البشرية الألكترونية، إتخاذ القرار، الأختيار الألكتروني، التعليم الآلي.