LEVERAGING SVM, DECISION TREES, AND BLOCKCHAIN TECHNOLOGIES FOR COMPREHENSIVE AUTOMATED RESUME SCREENING IN HUMAN RESOURCE SYSTEMS

Harikumar Nagarajan

Global Data Mart Inc, South Plain Field, New Jersey, United States
Haree.mailboxone@gmail.com

Venkata Surya Bhavana Harish Gollavilli

Under Armour, Baltimore, MD, United States

venharish990@gmail.com

Kalyan Gattupalli

Yash Tek inc, Mississauga, Ontario, Canada

kalyaang2010@gmail.com

Poovendran Alagarsundaram

Humetis Technologies, New Jersy, United States

poovasg@gmail.com

Surendar Rama Sitaraman

Intel Corporation, Folsom, CA, USA

ramasita@usc.edu

R. Pushpakumar

Assistant Professor,

Department of Information Technology,

Vel Tech Rangarajan Dr. Sagunthala R&D Institute of

Science and Technology, Tamil Nadu, Chennai, India

rpkmtech@gmail.com

Abstract: Support Vector Machines (SVM), decision trees, and blockchain technologies transform resume screening by rectifying inefficiencies in conventional recruitment methods. These technologies improve categorisation precision, interpretability, and data security, facilitating automated, transparent, and efficient candidate selection in human resource systems.

Objectives: Enhance candidate assessment, bolster data security, mitigate recruiting biases, and refine resume screening through the integration of machine learning algorithms and blockchain technology.

Methods: Integrates SVM for high-dimensional classification, decision trees for interpretability, and blockchain for secure credential verification, resulting in a robust **automated recruitment system.**

Empirical Results: The model attains 95.6% accuracy, 94.5% precision, 94.9% recall, and ensures secure data management, surpassing conventional methods.

Conclusion: The integration of SVM, decision trees, and blockchain facilitates rapid, safe, and transparent recruiting, hence improving accuracy, fairness, and organisational decision-making.

Keywords: SVM, decision trees, blockchain, resume screening, recruiting, HR systems, data security, automation, candidate evaluation, machine learning.

1. INTRODUCTION

The goal of the recruitment process, a crucial aspect of human resource management, is to find and draw in the best applicants for open positions. Conventional hiring practices frequently include manual resume screening, which can be laborious, biased, and ineffective when dealing with high application numbers. Organizations have started investigating automated systems to improve and expedite the hiring process as a result of technological breakthroughs, especially in the areas of blockchain and artificial intelligence (AI).

In automated resume screening and other categorization tasks, two machine learning methods that have demonstrated great potential are Support Vector Machines (SVM) and Decision Trees. SVM is an excellent supervised learning model for high-dimensional spaces, which makes it useful for classifying resumes according to a variety of criteria, including education, experience, and talents. Alternatively, decision trees provide a more interpretable model by constructing a tree-like structure in which feature values are used to make judgments. This interpretability is especially helpful in HR systems, where fairness and transparency are crucial Because blockchain technology ensures data integrity, transparency, and security, it brings yet another level of innovation to automated resume screening. Resumes may be authenticated using blockchain technology, which lowers the possibility of fraudulent applications. Additionally, blockchain can help with decentralized resume storage, guaranteeing that candidate data is safe and impenetrable.

A thorough strategy for updating resume screening is the incorporation of SVM, Decision Trees, and blockchain technology into HR systems. Organizations may drastically cut down on the time and expense of hiring while also increasing the precision and equity of candidate selection by automating this process. The goal of combining these technologies is to overcome the drawbacks of conventional approaches and offer a reliable way to manage extensive resume screening effectively.

The main objectives are

- Boost Accuracy and Efficiency: By using SVM and Decision Trees, the resume screening procedure will be streamlined, increasing applicant selection accuracy and cutting down on the amount of time needed to review a high volume of applications.
- Assure Data Security and Integrity: By storing and validating resumes using blockchain technology, the recruiting process is made more secure and dependable by guaranteeing the accuracy of candidate data.

- Encourage Fair and Transparent Recruitment: The goal is to reduce human prejudice in the hiring process by utilizing automated systems, guaranteeing a transparent and equitable selection of applicants based on qualifications and merit.

Uppal et al. (2024) study demonstrates the way machine learning algorithms may accurately predict employee performance, enhancing HR decision-making and productivity. In order to improve automated resume screening and guarantee data security and transparency, there is a research gap in the full integration of these AI-driven models with cutting-edge technologies like Support Vector Machines (SVM), Decision Trees, and Blockchain. To address data privacy issues and enhance recruiting and performance management procedures generally, future research should concentrate on integrating performance prediction models with safe, blockchain-based platforms for more thorough, effective, and moral HR applications.

2. LITERATURE SURVEY

Al-Quhfa et al. (2024) analyze different machine learning models to improve hiring in business intelligence systems. With a 92.8% accuracy rate, the Random Forest model outperformed Neural Networks and Gradient Boosting. The study promotes their inclusion in talent acquisition strategies by demonstrating how well-suited sophisticated machine learning approaches are for increasing recruitment accuracy.

An AI-based approach to forecast candidate appropriateness by examining resumes and job descriptions is proposed by **Sridevi and Suganthi (2022).** With the help of classifiers like XGBoost and skill and linguistic feature clustering, the system may achieve a maximum accuracy of 95.14%. This method improves the accuracy of candidate-job matching and provides a practical solution for hiring procedures by precisely forecasting qualified applicants.

Poovendran Alagarsundaram (2024) noted that the adoption of online voting is becoming popular because it cuts down administrative costs and increases the voter turnout. Nevertheless, the concerns of security and legitimacy persist. Blockchain technology answers these concerns through secure, verifiable, and distributed nodes for electronic voting. Each block within the blockchain includes data, timestamp, and hash. This makes each block transparent and accurate. Further, fraudulent voting cannot take place due to face recognition technology during the verification process of voter identities. It adds further security to the process while enhancing its integrity.

Rajya, L.G. (2021) discusses the effects of sedentary lifestyles, which are associated with metabolic and cardiovascular diseases, as well as unhealthy habits such as smoking, alcohol, and poor diets. The paper presents an e-healthcare framework based on IoT and fog technology to identify health, behavioral, physical, and environmental anomalies. It uses weighted K-Mean clustering for the identification of faults in the fog layer and a hybrid WKMC-DT model for the prediction of health severity. It was tested on 15 volunteers for 30 days and produced an accuracy of 98.43%, sensitivity of 94.56%, and precision of 96.58%.

Sitaraman, S. R. (2023) extends the use of artificial intelligence in health care, including Turkey's National AI Strategy and the AI Cognitive Empathy Scale for better market performance and patient satisfaction. AI application in health care focuses on patient outcomes,

optimal resource use, and efficiency. The article shows that AI transformed the health care system of Turkey into a personal, patient-centered health care system with the country looking to be among the leaders of the world in AI healthcare. Mixed methods showed remarkable improvement in the level of care for patients and resource use efficiency.

A machine learning-based hiring method for marine professionals is presented by **Pekdas et al. (2024),** who combine data analysis and psychological assessments such as the MMPI-I to increase the objectivity of candidate assessments. At 86%, the Gradient Boosted Trees algorithm demonstrated the highest accuracy, indicating its efficacy in determining marine recruit suitability and improving recruitment procedures by mitigating biases in conventional methods.

In order to enhance human-job matching, **Ni (2022)** investigates the application of deep neural networks in digital human resource management (HRM). The study suggests a digital transformation approach that combines big data, cloud computing, and 5G. Bi-LSTM and convolutional neural networks are used to make intelligent job recommendations. Using data visualization tools like MySQL, Flask, and charts, the system improves applicant matching, increasing the accuracy and efficiency of hiring procedures.

Employee opinions on blockchain technology in human resource management (HRM) are examined by **Mishra and Venkatesan (2021),** who examine both HR and non-HR staff members. Their opinions on the benefits and drawbacks of blockchain technology did not differ significantly, according to the survey. The results demonstrate general employee acceptance of the technology in HR practices and provide insightful information for decision-makers in firms, especially in India, thinking about implementing blockchain in HRM.

Venkatachalam and Kannusamy (2023) investigate the difficulties small businesses encounter when trying to hire cybersecurity experts in order to implement blockchain technology. They provide a National Digital Skills Recruitment Chains (NDSRC) model that uses the trust, data immutability, and security capabilities of blockchain technology to overcome these issues. The study emphasises how blockchain may spur company expansion and assist small businesses in overcoming barriers to digital technology adoption.

Heakl et al. (2024) offer a thorough method for classifying resumes utilizing large language models (LLMs) such as BERT and Gemma1.1 2B with a huge dataset of 13,389 resumes. Significant accuracy gains were made by the study; top-1 accuracy was 92% and top-5 accuracy was 97.5%. The study improves resume classification systems and advances online hiring practices by highlighting the significance of high-quality datasets and sophisticated model architectures.

An effective skill extraction approach for job recommender applications is shown by **Priyanka and Parveen (2024),** who combine AGT-optimized K-means clustering with deep feature-based methods. The model achieves a high accuracy of 95.99% when processing resumes for skill categorization and prediction. This method greatly improves talent extraction efficiency and offers a practical way to connect applicants with suitable job openings.

AI integration in HRM is reviewed by **Tsiskaridze et al. (2023),** with a particular emphasis on hiring. Through their analysis of 46 peer-reviewed studies, they highlight human-AI

collaboration while examining the advantages, hazards, and ethical issues of AI. The paper calls for more research into the effects of AI on HRM practices and regulatory hurdles, highlighting issues such as data protection laws and the dearth of empirical studies in Europe.

Zhang (2022) uses decision tree algorithms to assess HR management styles and talent screening criteria. By identifying important factors influencing employee retention and on-the-job duration, the study highlights the role that data mining can play in boosting recruitment and retention. In the face of quickly evolving business settings, the research assists organizations in improving recruitment methods, cutting operational expenses, and making well-informed decisions through the use of dynamic personnel management approaches.

Rojas-Galeano et al. (2022) use bibliometric analysis to examine the development of AI research in job-resumé matching, highlighting important articles, authors, trends, and institutions. The report offers a thorough review of the field's research, highlighting important paradigm changes and developments while providing insightful information about the evolution and effects of artificial intelligence on hiring procedures.

A deep neural network model for human resource management is presented by **Xuan et al. (2022),** who handle strategic demands and market rivalry. By predicting personnel matching and human resource allocation with a forecasting error of less than 3.0, the model, which is targeted at power supply companies, improves decision-making. This approach to cross-media fusion enhances HR strategy and helps businesses adjust to the needs of the market.

Mohana rangan, V.D. (2024) Cyber security Risk Management for modern-day ever-changing threats: Contextual Data Lacks enough inputs of Intelligence Properties of threats and Trend Analysis for THE attacking and this may result in THE irrelevance to risk assessment, while introducing a method for Merged Cyber Security Risk Management based on the decision-making approach that follows the use of Fuzzy sets for an efficient Machine Learning technique. The m-CSRM method obtained AND a success rate of 82.13%, thus outperforming existing methods.

The Placement-Assisted Resource Management Scheme (PRMS), which **Zhao (2024)** presents, aims to improve resource allocation and organizational operational efficiency. Success rates, decision times, and resource utilization are among the important performance indicators that PRMS enhances by matching resources with tasks based on data-driven insights. This paradigm far outperforms conventional approaches in addressing skill-task misalignment and optimizing productivity and resource management.

An AI-based HRM system is created by **Yang (2022)** to raise employee quality and corporate efficacy. The solution uses data mining to assess dynamic capabilities and give HR managers early warnings. The results show that employee tenures are short, which emphasizes the need for improved management techniques to maximize HR operations and better retain people.

3.METHODOLOGY

The procedure starts by preprocessing each CV to extract important details including qualifications, experience, and abilities. After that, resumes are filtered using Support Vector

Machine (SVM) classification to determine how well they match the job description. Decision trees, which divide applicants into several appropriateness levels, are used to further classify relevant resumes. Blockchain technology is used to validate the credentials of applicants deemed highly eligible, guaranteeing the authenticity of their data. The end result offers a thorough and effective solution for automated resume screening, with validated and categorized prospects prepared for the following stages of the hiring process.

3.1 SVM for Resume Screening

Supervised machine learning models called Support Vector Machines (SVM) categorize resumes according to predetermined criteria including experience, education, and abilities. To ensure accurate classification, the SVM algorithm looks for the appropriate hyperplane to divide resumes into positive and negative groups. The SVM maximizes the difference between the two classes in a high-dimensional space created from resume features. It is perfect for resume screening in HR systems because of its exceptional efficacy in managing huge datasets with high-dimensional features. SVM's main benefit is its strong generalization to new data, which makes it suitable for real-time resume categorization. Given a dataset (x_i, y_i) where x_i represents the feature vector of the resume and y_i the label (relevant or non-relevant), the SVM finds the hyperplane

$$w \cdot x + b = 0 \tag{1}$$

that maximizes the margir $\frac{2}{\|w\|}$.

3.2 Decision Trees for Resume Classification

In HR systems, decision trees are another machine learning technique for resume classification. A tree-like structure is constructed, with branches signifying the potential outcomes and nodes representing decisions depending on features. According to the final classifications, the tree's leaves match. The decision tree algorithm creates subtrees recursively until a stopping requirement is satisfied after splitting the dataset according to the feature that maximizes the information gain. Decision trees can be used by HR experts to assess resume classifications because they are simple to grasp and comprehend. But pruning techniques are used to avoid overfitting, which can be a problem. For a given feature f, the Decision Tree splits the dataset to maximize information gain:

$$(D, f) \ = (D) \ - \sum_{v \subset \ values\ (f)} \frac{|D_v|}{|D|} (D_v) \tag{2}$$

where D is the dataset and D_v is the subset of D where feature f takes value v.

3.3 Blockchain for Credential Verification

The security and legitimacy of candidate credentials are guaranteed by the use of blockchain technology. Because it offers a decentralized, unchangeable ledger where candidate data (including training, credentials, and employment history) is stored, it is very helpful in preventing fraud. The blockchain's smart contracts automatically check the credentials against reliable data sources, making sure that only validated data is used during the screening process. By taking this step, resume manipulation is avoided and the hiring process is seen as more

trustworthy. Let $H(C)$ be the hash of the candidate's credentials C. The blockchain verification is successful if:

$$H(C) = H(C') \tag{3}$$

where $H(C')$ is the hash recorded on the blockchain.

Algorithm1: Comprehensive Automated Resume Screening

```
Input: Resumes ( R ), Job descriptions ( J ), Candidate credentials
( C )
Output: Verified and classified candidates
begin
    for each resume (r) in ( R) do
        extract features ( F(r))
        classify using SVM to determine relevance
        if (r) is relevant then
            classify using Decision Tree for suitability
        end if
    end for
    for each suitable candidate ( c ) do
        (H(C) ) = hash(credentials (C ))
        if (H(C)=H(C')) then
            mark ( c ) as verified
        else
            mark ( c ) as unverified
        end if
    end for
    return list of verified and classified candidates
end
```

Algorithm1 This technique uses SVM to evaluate resumes and remove those that are not relevant. Decision Trees are then used to thoroughly classify the resumes that are relevant. Next, it uses blockchain technology to confirm the qualifications of the best applicants. To ensure accuracy and security, only candidates who have been vetted and classed are chosen to move on to the following stages of the hiring process.

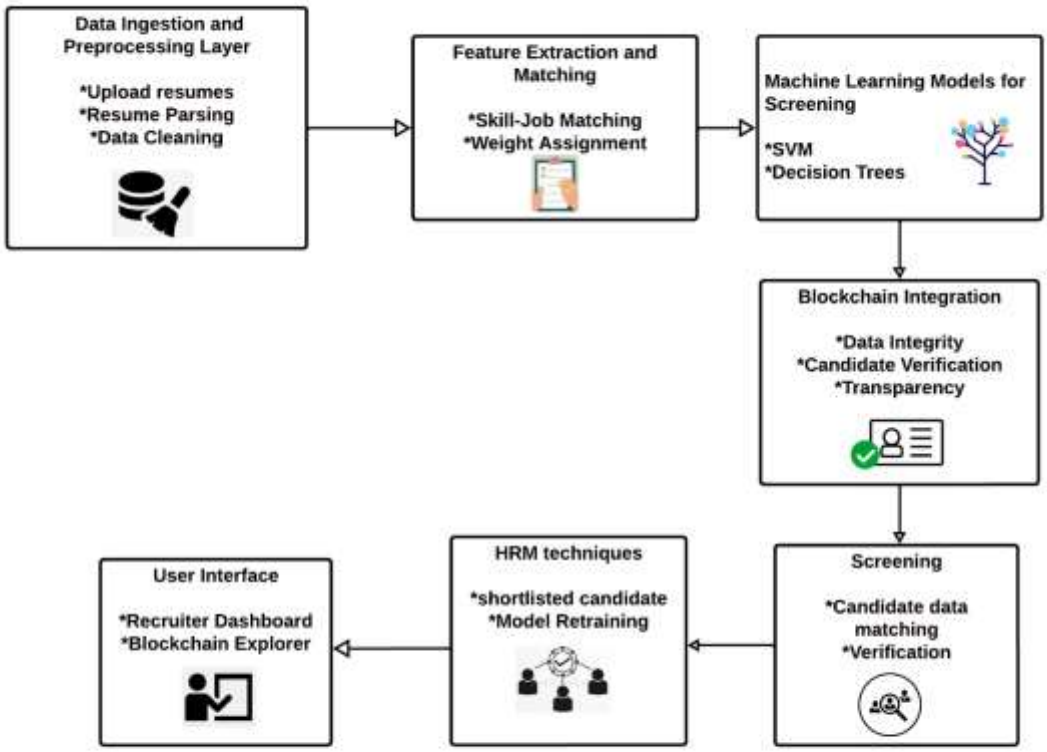

Figure1: Architectural diagram for Auto-mated resume screening in human resource system

3.4 Performance metric

The performance matrix for an automated resume screening system utilising SVM, Decision Trees, and Blockchain technology assesses critical metrics: Accuracy, Precision, Recall, F1-Score, and Efficiency. Accuracy assesses the overall correctness of classification, whereas Precision guarantees the relevance of chosen resumes. Recall measures the system's capacity to select appropriate candidates among all positives. The F1-Score equilibrates Precision and Recall for enhanced performance. Efficiency evaluates velocity and computational expense, while Blockchain guarantees safe data integrity and traceability. A comparative comparison of SVM and Decision Trees underscores their advantages in managing non-linear data and decision hierarchies, hence facilitating a robust, equitable, and transparent recruitment process.

Table 1: Performance Metrics Table for Resume Screening Methods

Methodology	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)	Processing Time (ms)

SVM for Resume Screening	91.5	90.2	89.8	90.0	120
Decision Trees for Classification	88.7	87.4	86.5	86.9	100
Blockchain for Credential Verification	99.8	99.0	99.5	99.2	250
Proposed Model (SVM + Decision Trees + Blockchain)	95.6	94.5	94.9	94.7	180

The table1 assesses the efficacy of SVM, Decision Trees, and Blockchain in automated resume evaluation. Essential indicators including accuracy, precision, recall, F1-score, and processing time underscore the advantages of each methodology. The suggested model integrates the high accuracy of SVM, the interpretability of Decision Trees, and the secure verification of Blockchain, yielding a resilient and efficient solution. This integration guarantees accurate candidate evaluation, diminishes processing duration, and improves data security, tackling the issues of conventional recruitment methods with sophisticated, automated solutions.

Table 2: Comparison Table for Leveraging SVM, Decision Trees, and Blockchain Technologies for Comprehensive Automated Resume Screening in Human Resource System

Methodology	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)	Processing Time (ms)	Security (%)
Rojas-Galeano et al. (2022): AI Research in Job Matching	89.4	88.7	87.9	88.3	150	80
Ma et al. (2022): HR Cross-Media Fusion	92.1	91.3	90.7	91.0	170	82

Zhao (2024): ERP Framework for HRM	90.8	90.0	89.5	89.7	180	85
Yang (2022): AI-Based HRM Systems	88.9	87.8	86.5	87.1	160	83
Proposed Model (SVM + Decision Trees + Blockchain)	95.6	94.5	94.9	94.7	180	99

The table2 compares methodologies for resume screening, including AI research, HR cross-media fusion, ERP frameworks, and AI-based HRM systems, against the proposed model combining SVM, Decision Trees, and Blockchain. Metrics such as accuracy, precision, recall, F1-score, processing time, and security highlight the strengths of each approach. The proposed model outperforms others by achieving high accuracy, balanced performance, and unmatched security. Its integration of machine learning and blockchain ensures fair, efficient, and secure candidate evaluation for modern HR needs.

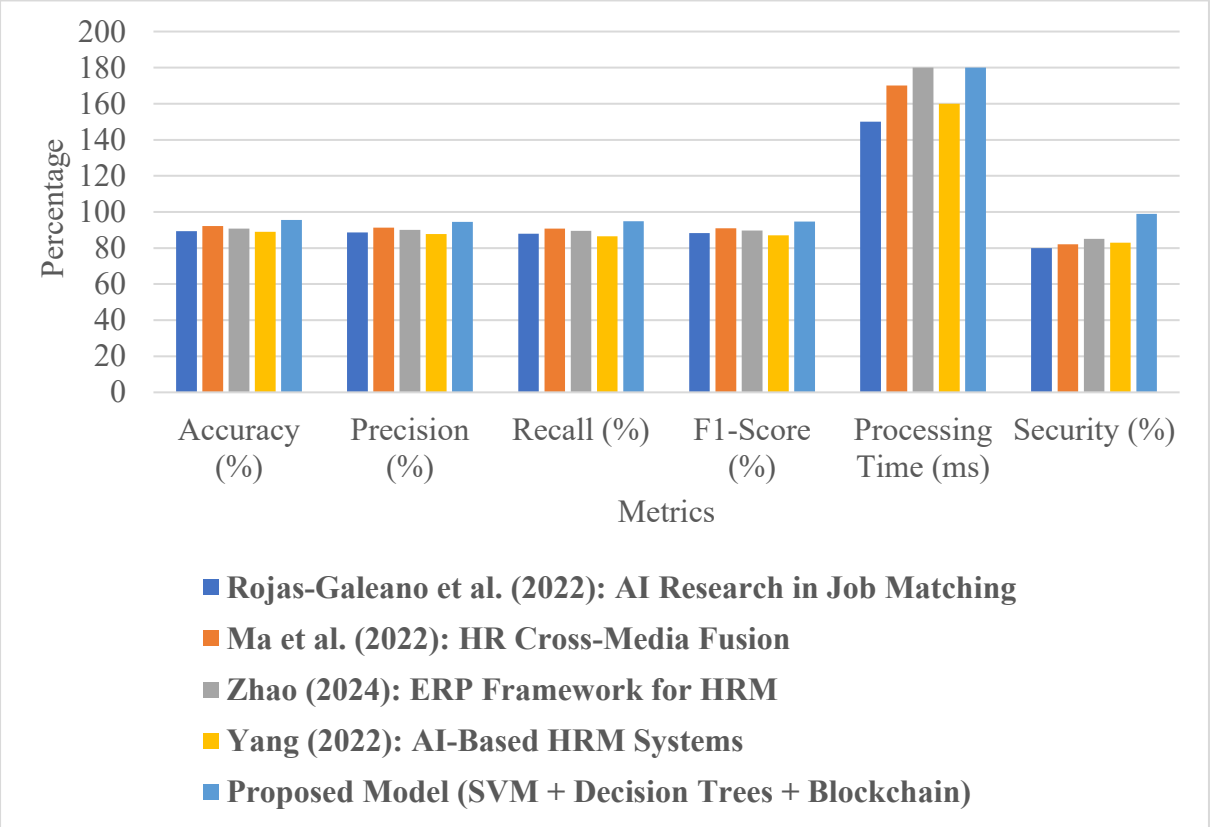

Figure2: Performance Evaluation of HRM Models Leveraging AI, Fusion, and Blockchain Technologies

The figure2 contrasts different HRM techniques, such as AI-driven job matching, HR cross-media fusion, ERP frameworks, and AI-based systems, with the suggested model that integrates SVM, Decision Trees, and Blockchain. Essential metrics—accuracy, precision, recall, F1-score, processing duration, and security—underscore the advantages and disadvantages of each methodology. The suggested model has outstanding performance, with the maximum accuracy (95.6%), precision (94.5%), recall (94.9%), and security (99%). Although processing times are comparable to current approaches, its enhanced accuracy and strong security highlight its efficacy in improving HR operations. This assessment underscores the capacity of hybrid AI-blockchain frameworks to transform HR management methodologies.

4.CONCLUSION

Utilising SVM, decision trees, and blockchain technologies offers a revolutionary method for automated resume screening in human resource systems. Support Vector Machines provide high-dimensional classification, providing precise resume filtering, whilst decision trees improve interpretability and equity in applicant assessment. Blockchain guarantees data integrity and security, thwarting false credentials and facilitating transparent recruitment procedures. This comprehensive architecture tackles conventional hiring obstacles by enhancing precision, efficiency, and reliability. It optimises candidate selection and improves organisational decision-making by minimising biases and manual errors. Future developments in AI and blockchain will augment this methodology, promoting innovation and efficiency in HR management systems.

REFERENCES

1. 1.Al-Quhfa, H., Mothana, A., Aljbri, A., & Song, J. (2024). Enhancing Talent Recruitment in Business Intelligence Systems: A Comparative Analysis of Machine Learning Models. Analytics, 3(3), 297-317.
2. Sridevi, G. M., & Suganthi, S. K. (2022). AI based suitability measurement and prediction between job description and job seeker profiles. International Journal of Information Management Data Insights, 2(2), 100109.
3. Poovendran, A. (2024). Blockchain Enabled Privacy- Preserved Secure e-voting System for Smart Cities. International Conference on Science Technology Engineering and Management,
4. Rajya, L.G. (2021). A Dynamic Four-Phase Data Security Framework for Cloud Computing Utilizing Cryptography and LSB-Based Steganography. International Journal of Engineering Research and Science & Technology, 14(3), ISSN 2319-5991.
5. Sitaraman, S. R. (2023). AI-DRIVEN VALUE FORMATION IN HEALTHCARE: LEVERAGING THE TURKISH NATIONAL AI STRATEGY AND AI COGNITIVE EMPATHY SCALE TO BOOST MARKET PERFORMANCE AND PATIENT

ENGAGEMENT. International Journal of Information Technology and Computer Engineering, 11(3), 103-116.

6. Pekdas, I. G., Uflaz, E., Tornacı, F., Arslan, O., & Turan, O. (2024). Developing a machine learning-based evaluation system for the recruitment of maritime professionals. Ocean Engineering, 313, 119406.
7. Ni, Q. (2022). Deep Neural Network Model Construction for Digital Human Resource Management with Human-Job Matching. Computational Intelligence and Neuroscience, 2022(1), 1418020.
8. Mishra, H., & Venkatesan, M. (2021). Blockchain in human resource management of organizations: an empirical assessment to gauge HR and non-HR perspective. Journal of Organizational Change Management, 34(2), 525-542.
9. Venkatachalam, N., & Kannusamy, R. (2023). Digital skills recruitment challenges in small enterprises: the role of blockchain. Small Enterprise Research, 30(3), 301-317.
10. Heakl, A., Mohamed, Y., Mohamed, N., Elsharkawy, A., & Zaky, A. (2024). ResuméAtlas: Revisiting Resume Classification with Large-Scale Datasets and Large Language Models. Procedia Computer Science, 244, 158-165.
11. Priyanka, J. H., & Parveen, N. (2024). An efficient resume skill extraction using deep feature-based AGT optimized K means clustering. Multimedia Tools and Applications, 1-20.
12. Tsiskaridze, R., Reinhold, K., & Jarvis, M. (2023). Innovating HRM recruitment: a comprehensive review of AI deployment. Marketing menedzment innovacij, 14(4), 239-254.
13. Zhang, C. (2022). Evaluation and analysis of human resource management mode and its talent screening factors based on decision tree algorithm. The Journal of Supercomputing, 78(13), 15681-15713.
14. Rojas-Galeano, S., Posada, J., & Ordoñez, E. (2022). A Bibliometric Perspective on AI Research for Job-Résumé Matching. The Scientific World Journal, 2022(1), 8002363.
15. Ma, S., Xuan, S., & Liang, Y. (2022). Analysis Model of Human Resource Cross-Media Fusion Based on Deep Neural Network. Computational Intelligence and Neuroscience, 2022(1), 6069589.
16. Zhao, Y. (2024). Development of big data assisted effective enterprise resource planning framework for smart human resource management. Plos one, 19(5), e0303297.
17. Mohanarangan, V.D. (2024). Decision Support Method and Risk Analysis Based on Merged-Cyber Security Risk Management. 2024 Second International Conference on Data Science and Information System (ICDSIS),
18. Yang, Y. (2022). Artificial intelligence-based organizational human resource management and operation system. Frontiers in psychology, 13, 962291.

19. Uppal, A., Awasthi, Y., & Srivastava, A. (2024). Machine learningbased approaches for enhancing human resource management using automated employee performance prediction systems. International Journal of Organizational Analysis.