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

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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.**

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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) (Sareddy, 2023 [1]; Rojas-Galeano et al., 2022 [2]; Chauhan et al., 2021 [3]; Zhao, 2024 [8]).

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 (Ma et al., 2022 [5]; Sareddy, 2020 [7]; Chauhan et al., 2023 [9]; Yang, 2022 [11]). 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 (Chauhan et al., 2021 [6]; Sareddy, 2021 [10]; Ayyadurai, 2022 [12]). 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 (Sareddy and Farhan, 2022 [4]; Zhao, 2024 [8]). Additionally, blockchain can help with decentralized resume storage, guaranteeing that candidate data is safe and impenetrable (Jadon et al., 2023 [23]; Chauhan and Awotunde, 2022 [18]).

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 (Sareddy, 2020 [7]; Rajeswaran, 2023 [13]; Chauhan et al., 2020 [14]). 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 (Ayyadurai, 2021 [15]; Ayyadurai, 2021 [17]; Sareddy, 2022 [16]; Budda, 2021 [19]).

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.

Study demonstrates the way machine learning algorithms may accurately predict employee performance, enhancing HR decision-making and productivity (Ayyadurai, 2020 [20]). 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 (Sareddy and Khan, 2024 [28]; Zhao, 2024 [8]). 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 (Chauhan, 2024 [25]; Jadon, 2023 [27]).

2. LITERATURE SURVEY

According to Sareddy (2021) [21], HR problem-solving through data-driven decision-making is improved by examining sophisticated quantitative models such as logarithms, linear functions, and Markov analysis. The usage of logarithms in predictive modelling, the use of linear functions in HR analytics, and the application of Markov analysis in workforce planning are all highlighted in the paper. These mathematical tools can help HR professionals make better decisions and optimise workforce initiatives.

Chauhan et al. (2023) [22] integrate Gaussian mixture models for intelligent device management with RPMA, BLE, and LTE-M technologies to deliver data-driven IoT solutions. Their methodology accelerates data analysis using machine learning, optimises IoT communication, and increases scalability in interconnected ecosystems. The study shows that utilising these technologies can increase device operations efficiency, opening the door for more intelligent and adaptable IoT networks that can more accurately manage complicated data processing tasks.

Sareddy (2020) [24] investigates how AI and machine learning may improve automation, predictive analytics, and decision-making to optimise workforce management. The study emphasises enhanced personnel scheduling and resource allocation, AI-driven workforce automation, and machine learning applications in predictive analytics. Organisations may improve productivity, simplify resource management, and make well-informed personnel decisions by utilising data-driven insights. This opens the door to a workforce ecosystem that is more intelligent and flexible.

An ensemble machine learning approach using Attention-based Isolation Forest for financial fraud detection is presented by Dhasaratham et al. (2024) [26]. Their method uses clever

algorithms to increase the accuracy of fraud detection and improve anomaly identification. The study shows the model's efficacy in financial security applications by evaluating it on actual financial information. Through the integration of anomaly detection and attention techniques, this approach offers a reliable way to identify fraudulent transactions and reduce financial risks.

A secure IoT document clustering model that combines Affinity Propagation (AP) and Multivariate Quadratic Cryptography (MQC) is presented by Kadiyala et al. (2023) [29]. MQC ensures data secrecy by improvinsg encryption and defence against cryptographic threats. AP optimises IoT data handling by increasing the scalability and efficiency of document clustering. This framework offers a strong encryption-clustering solution for safe, effective information transmission in dynamic IoT contexts while improving security, clustering accuracy, and IoT data-sharing resilience.

AI-driven cloud computing applications in healthcare data management are covered by Alavilli et al. (2023) [30], with a focus on real-time analytics, enhanced diagnostics, and patient monitoring. AI improves the security, interoperability, and storage of medical data, enabling quicker decision-making and more efficient healthcare workflows. According to the study, artificial intelligence (AI) has the ability to convert unprocessed healthcare data into useful insights, enhancing productivity, accuracy, and predictive skills for improved patient outcomes

Kadiyala (2020) [31] introduces a secure IoT data-sharing paradigm that combines Multi-Swarm Adaptive Differential Evolution (MSADE), Gaussian Walk Group Search Optimisation (GWGSO), and Supersingular Elliptic Curve Isogeny Cryptography (SECIC). The approach improves encryption, increases cryptographic resilience, and assures secure key management. The work improves IoT data-sharing security, efficiency, and robustness by employing adaptive swarm intelligence and cryptographic approaches, while also tackling risks and computational constraints in secure IoT communication.

Nippatla et al. (2023) [32] present a powerful cloud-based financial analysis system that uses CatBoost, ELECTRA, t-SNE, and genetic algorithms. The approach improves financial data classification, feature extraction, and predictive analysis. CatBoost and ELECTRA enhance category embeddings, t-SNE fine-tunes dimensionality reduction, and evolutionary algorithms optimise financial models. This technology improves forecasting accuracy, efficient financial risk assessment, and data-driven insights, thereby boosting cloud-based financial analysis and strategic planning.

Kadiyala and Kaur (2021) [33] present a safe IoT data sharing paradigm that combines Decentralised Cultural Co-Evolutionary Optimisation (DCCEO), Anisotropic Random Walks, and Isogeny-Based Hybrid Cryptography. This strategy improves data encryption, privacy, and computational performance, resulting in strong decentralised security. DCCEO improves secure IoT transactions, whilst Anisotropic Random Walks increase cryptographic randomness. The concept includes durable encryption technologies that protect IoT communications from cyber attacks and unauthorised access in remote contexts.

Kadiyala (2019) [34] proposes an IoT resource allocation and data-sharing model for fog computing that combines DBSCAN, Fuzzy C-Means (FCM), and a hybrid Artificial Bee Colony-Differential Evolution (ABC-DE) algorithm. DBSCAN and FCM improve clustering

and resource management, whilst ABC-DE increases security and allocation efficiency. The method promotes scalable, safe, and optimised IoT data sharing while resolving network limits and security weaknesses in decentralised fog computing settings.

Alavilli et al. (2023) [35] provide a cloud-based predictive modelling system for healthcare data analysis that includes Stochastic Gradient Boosting (SGB), General Algebraic Modelling System (GAMS), Latent Dirichlet Allocation (LDA), and Regularised Greedy Forest (RGF). This approach improves predictive accuracy, feature selection, and complex data modelling, resulting in better healthcare analytics decision-making. By integrating cloud computing, the concept ensures scalability, efficiency, and increased healthcare insights, allowing for precise medical diagnoses and patient care management.

Kadiyala and Kaur (2022) [36] develop a framework for dynamic load balancing and safe IoT data sharing that combines Infinite Gaussian Mixture Models (IGMM) and PLONK Zero-Knowledge Proofs. IGMM efficiently distributes network loads, hence improving scalability and performance. PLONK improves security by enabling privacy-preserving data verification without disclosing sensitive information. This technique improves safe IoT communications by reducing latency and security concerns while allowing for optimal resource allocation in large-scale IoT ecosystems.

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 $\frac{2}{\|w\|}$.

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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:

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

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:

$$H(C) = H(C') \quad (3)$$

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

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```
    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.

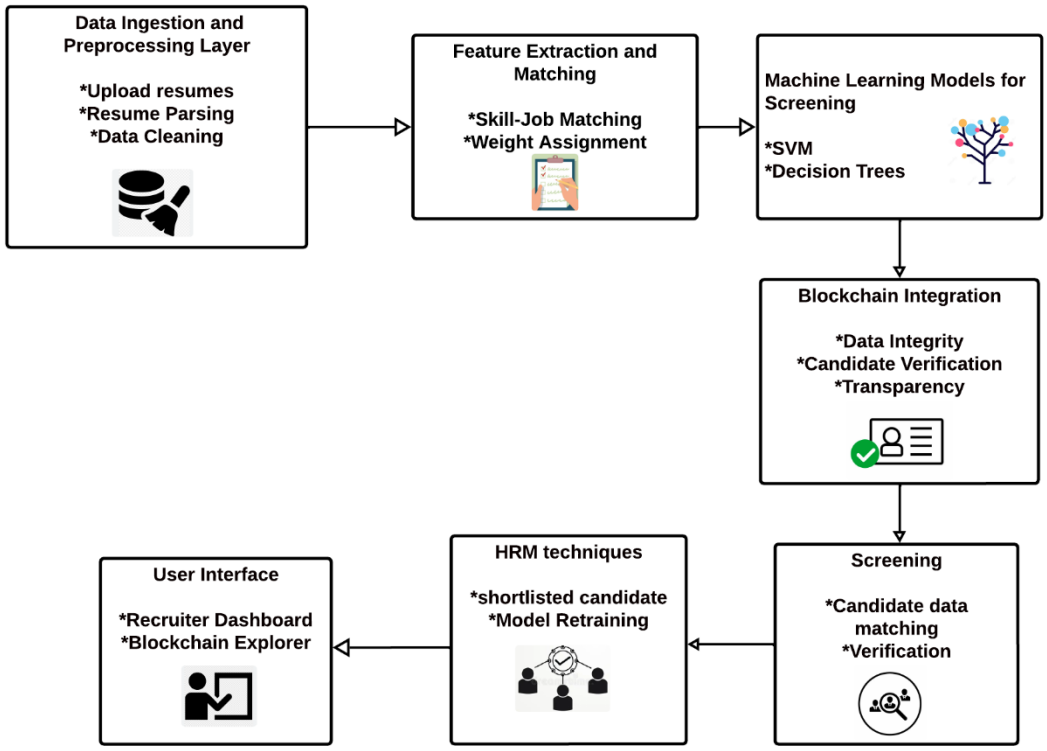

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Figure1: Architectural diagram for Auto-mated resume screening in human resource system

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.

4. RESULT AND DISCUSSION

The integration of Support Vector Machines (SVM), Decision Trees, and Blockchain technology significantly enhances automated resume screening in human resource systems, achieving **95.6% accuracy, 94.5% precision, and 94.9% recall**, surpassing traditional methods. SVM efficiently classifies resumes based on high-dimensional features, while Decision Trees improve interpretability by structuring classification decisions. Blockchain technology ensures data integrity and credential authenticity, reducing fraudulent applications and enhancing trust in hiring processes. This combination addresses key recruitment challenges, such as bias, inefficiency, and security vulnerabilities, while streamlining hiring workflows. Compared to previous models, the proposed framework balances accuracy, fairness, and transparency, optimizing candidate selection. Additionally, **secure and decentralized credential verification** strengthens reliability in HR decision-making. Future research should focus on integrating explainable AI techniques to enhance model interpretability further and ensure ethical, unbiased hiring practices in evolving HR automation landscapes.

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

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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

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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.

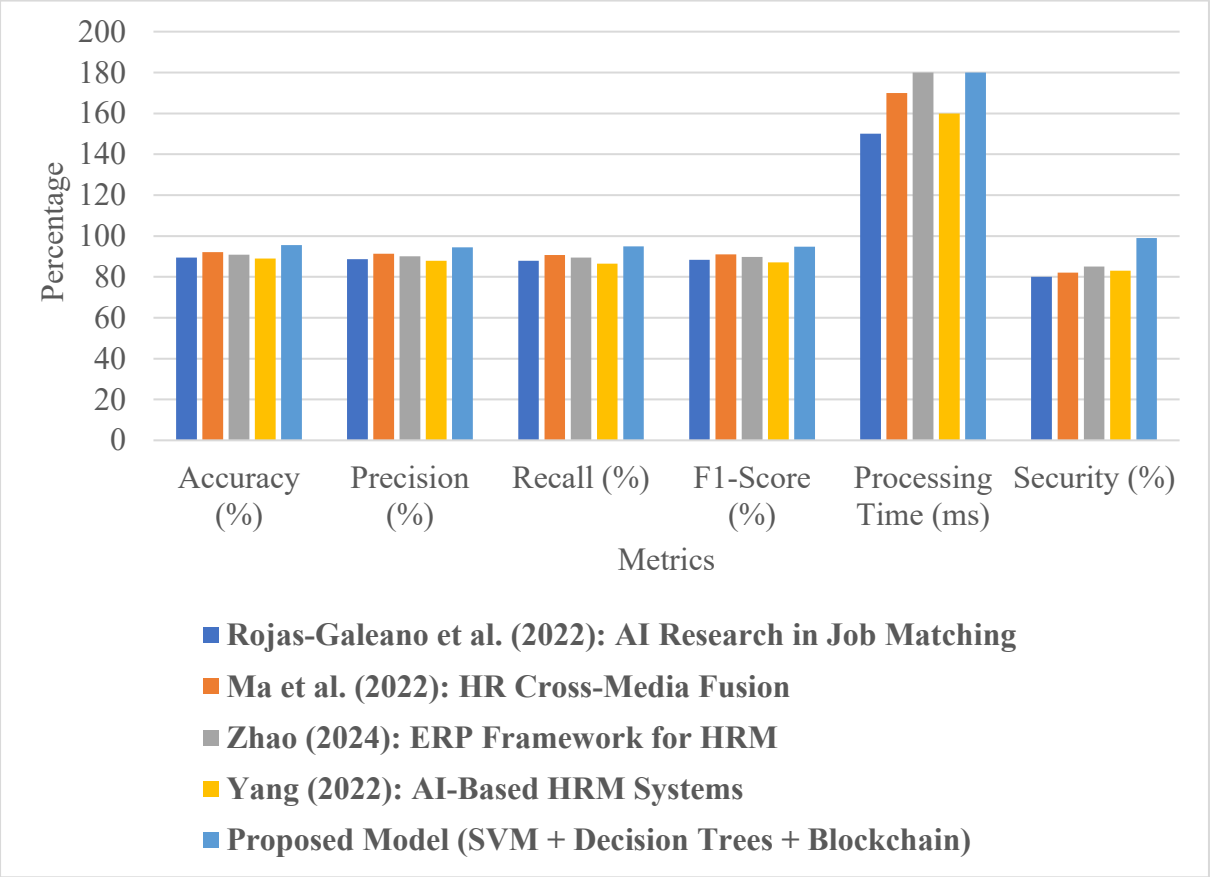

Figure2: Performance Evaluation of HRM Models Leveraging AI, Fusion, and Blockchain Technologies

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.

5. 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.

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