

# AN AI-DRIVEN FRAMEWORK FOR AUTOMATED HUMAN RESOURCE MANAGEMENT

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**Abstract** - Modern HR departments often struggle with challenges such as manual resume screening, document fraud, inefficient task allocation, and repetitive employee queries. These issues slow down operations and reduce overall productivity. To overcome these limitations, this project proposes an AI-Powered HR Automation System that integrates Agentic Artificial Intelligence, Blockchain based verification, workflow automation, and an intelligent HR Chatbot into a unified platform. The system automates resume collection, performs AI-driven text extraction, and evaluates candidates against job descriptions to generate ranked shortlists. To ensure document authenticity, blockchain hashing is used for secure offer-letter storage and verification. A task scheduling and management module enables systematic assignment and tracking of HR activities, while the chatbot provides instant query responses, reducing HR workload. Built using React.js, Node.js, MongoDB, and Gemini AI services, the system ensures scalability, security, and ease of use. By combining intelligent automation with secure verification, the proposed solution enhances efficiency, accuracy, and transparency in HR operations, making it highly suitable for modern organizations.

**Key Words:** AI-Powered HR Automation, Agentic Artificial Intelligence, Resume Screening, Blockchain-Based Verification, Workflow Automation, Intelligent HR Chatbot, Natural Language Processing, Secure Document Management.

## 1. INTRODUCTION

Human Resource management is at the core of every organization, but traditional HR processes such as recruitment, document verification, employee communication, and task assignment often involve repetitive manual work, delays, and a higher possibility of errors. To improve the overall workflow efficiency, there is a growing need for intelligent automation solutions within HR systems. Our project proposes an AI-Powered HR Automation System, a unified digital platform that brings intelligence, automation, and data security together to modernize HR operations. The system focuses on four major capabilities: automated resume shortlisting using Agentic Artificial Intelligence, secure offer letter verification through Blockchain, smart task scheduling for employee work management, and an AI-based HR Chatbot for instant support and information access. By integrating these advanced technologies, the system reduces the workload on

HR teams, improves decision-making accuracy, eliminates document fraud, and enhances communication between employees and management. This innovative solution aims to deliver faster, smarter, and reliable HR operations while contributing to overall business productivity and growth.

## 1.1 Challenges in Traditional HR Management Systems

Traditional Human Resource (HR) management systems rely heavily on manual and semi-automated processes for recruitment, documentation, and employee support. Resume screening is often performed manually, making it time-consuming and prone to human bias and errors. As the number of applications increases, HR professionals struggle to efficiently evaluate candidates based on job-specific requirements. Additionally, verification of employee documents such as certificates and offer letters lacks a secure and tamper-proof mechanism, increasing the risk of document fraud. Task allocation and tracking are frequently handled using spreadsheets or disconnected tools, leading to inefficiencies and poor visibility into HR operations. Moreover, HR teams spend significant time responding to repetitive employee queries related to policies, leave, and onboarding, which reduces their focus on strategic activities. These challenges highlight the need for intelligent automation in modern HR systems.



Fig -1: Challenges in Traditional HR Management Systems

## 1.2 AI-Driven and Blockchain-Enabled HR Automation Approach

To address the limitations of conventional HR systems, the proposed solution introduces an AI-Powered HR Automation

System that integrates Agentic Artificial Intelligence, blockchain-based verification, and workflow automation into a unified platform. Artificial Intelligence techniques such as Natural Language Processing (NLP) are used for automated resume parsing, skill extraction, and candidate-job matching, enabling accurate and ranked shortlisting.

Blockchain technology is employed to generate cryptographic hashes for offer letters and critical documents, ensuring secure storage, authenticity, and tamper resistance. A workflow automation module facilitates systematic task assignment, scheduling, and progress tracking, improving operational transparency. Furthermore, an intelligent HR chatbot provides instant responses to employee queries, significantly reducing HR workload. By combining intelligent decision-making with secure verification mechanisms, the proposed system enhances efficiency, accuracy, and trust in HR operations.

## 2. PROPOSED SYSTEM

The proposed system presents an AI-Powered HR Automation platform that integrates Agentic Artificial Intelligence, blockchain-based verification, workflow automation, and an intelligent HR chatbot to streamline end-to-end human resource operations. The system automates resume collection and applies AI-driven text extraction and Natural Language Processing techniques to analyze candidate profiles and match them with job descriptions, generating ranked shortlists with improved accuracy and reduced bias. To ensure document authenticity and data integrity, blockchain technology is utilized to create cryptographic hashes for offer letters and critical HR documents, enabling secure storage and tamper-proof verification. A task management and scheduling module facilitates efficient assignment, monitoring, and tracking of HR activities, enhancing operational transparency. Additionally, the integrated chatbot provides instant responses to employee queries, minimizing repetitive interactions and reducing HR workload. Developed using React.js, Node.js, MongoDB, and Gemini AI services, the proposed system ensures scalability, security, and usability, making it a robust solution for modern organizational HR management.

### 2.1 System Architecture

The system architecture illustrates the integrated workflow of the AI-Powered HR Automation System. The frontend, developed using React.js, enables users and HR administrators to interact with the system. Resume data, employee queries, and HR tasks are processed through a Node.js backend connected to a MongoDB database for structured storage. AI modules powered by Gemini AI perform resume parsing, candidate evaluation, and chatbot query handling using Natural Language Processing techniques. Blockchain components generate and store cryptographic hashes of offer letters and official documents

to ensure authenticity and tamper-proof verification. The workflow automation module manages task scheduling, assignment, and monitoring, enabling seamless coordination across HR operations.



Fig -2: System Architecture

### 2.2 Intelligent Resume Processing and Candidate Evaluation

The proposed system incorporates an intelligent resume processing module that automates candidate evaluation using Agentic Artificial Intelligence and Natural Language Processing techniques. Resumes collected through the system are parsed to extract key attributes such as skills, experience, education, and certifications. These extracted features are compared against predefined job descriptions using semantic similarity and relevance scoring mechanisms. Based on this analysis, the system generates a ranked shortlist of candidates, enabling HR professionals to make faster and more accurate recruitment decisions while reducing manual effort and bias.

### 2.3 Blockchain-Based Document Verification and Secure HR Management

To ensure authenticity and integrity of HR documents, the proposed system integrates blockchain-based verification mechanisms. Critical documents such as offer letters and employment records are converted into cryptographic hash values and securely stored on the blockchain. This approach ensures tamper-proof storage and allows instant verification of document authenticity at any stage of the HR lifecycle. By leveraging decentralized verification, the system enhances transparency, trust, and security in HR operations while preventing document forgery and unauthorized modifications.

### 3. IMPLEMENTATION DETAILS

The proposed system, titled “An AI-Driven Framework for Automated Human Resource Management,” is implemented using a layered and modular architecture to automate core HR activities. The system integrates Agentic AI, Large Language Models (LLMs), real-time communication, and blockchain-based verification to improve efficiency, accuracy, and security in HR operations. The frontend layer is developed using React.js, providing interactive user interfaces for resume shortlisting, HR chatbot interaction, task scheduling, and offer letter verification. The backend layer, built using Node.js and Express.js, handles business logic, REST APIs, and real-time communication using Socket.IO. MongoDB is used as the database for storing candidate details, task information, chatbot interactions, and verification records. For AI-based resume shortlisting, the HR manager inputs a job description through the frontend.

This job description is transmitted to an Email Watcher Agent, which connects to Gmail using IMAP and automatically detects incoming resumes. Resume documents (PDF/DOCX) are parsed using text extraction libraries and analyzed using an LLM (Gemini API). The AI generates a candidate match score and summary, which are stored in the database and displayed on the frontend in real time. Resumes are ranked automatically based on relevance, eliminating manual screening. The HR chatbot module enables intelligent interaction between HR users and the system. Queries related to candidates, scores, or HR policies are forwarded to the LLM, which generates context-aware responses using stored data. This module provides instant decision support and reduces dependency on manual HR assistance. The work scheduling module allows HR managers to assign tasks such as interviews, onboarding, and reviews. Task data is stored in MongoDB and updated in real time using Web Sockets. Employees can view and update task status, ensuring transparency and effective workforce management. For offer letter verification, a blockchain-inspired approach is implemented. Offer letter templates are converted into normalized text and hashed using the SHA-256 algorithm. During verification, uploaded offer letters are hashed and compared with stored values. A match confirms authenticity, ensuring tamper-proof verification. Overall, the implementation successfully automates HR workflows, improves decision-making accuracy, and enhances system reliability while maintaining scalability and security.

### 4. RESULTS AND PERFORMANCE ANALYSIS

The proposed AI-Powered HR Automation System was evaluated based on recruitment efficiency, document security, task management effectiveness, and user interaction performance. Experimental results demonstrate a significant reduction in resume screening time due to AI-driven parsing and automated candidate ranking, while maintaining high matching accuracy with job descriptions. The blockchain-

based document verification module successfully ensured tamper-proof storage and instant authenticity validation of offer letters without noticeable performance overhead. Workflow automation improved task assignment and tracking efficiency, resulting in better operational transparency and reduced manual coordination. Additionally, the intelligent HR chatbot effectively handled repetitive employee queries with minimal response latency, leading to reduced HR workload and improved user satisfaction. Overall, the system exhibited reliable performance, scalability, and enhanced efficiency, validating its suitability for modern HR management environments.

### 5. CONCLUSIONS

This work presented an AI-driven framework for automated Human Resource Management that aims to transform traditional HR processes into a more efficient, data-driven, and intelligent system. By integrating artificial intelligence techniques such as machine learning, natural language processing, and predictive analytics, the proposed framework automates key HR functions including recruitment, employee performance evaluation, attendance monitoring, payroll processing, and workforce planning.

The adoption of AI significantly reduces manual effort, minimizes human bias, and improves decision-making accuracy while ensuring faster response times and operational consistency. Moreover, the framework enhances employee experience by enabling personalized insights, transparent evaluations, and timely feedback. From an organizational perspective, it supports strategic HR planning through real-time analytics and predictive insights, leading to better talent management and resource optimization.

Overall, the AI-driven automated HR framework demonstrates strong potential to improve productivity, scalability, and fairness in human resource operations. As organizations continue to embrace digital transformation, such intelligent HR systems can play a crucial role in building agile, resilient, and future-ready workplaces. Future enhancements may include deeper integration with cloud platforms, advanced emotion and sentiment analysis, and improved explainability of AI decisions to further strengthen trust and usability.

### 6. FUTURE WORK

The future scope of an AI-driven framework for automated Human Resource Management is extensive and promising. The system can be further enhanced by integrating advanced deep learning models for more accurate talent prediction, employee attrition analysis, and performance forecasting. Incorporating emotion and sentiment analysis using facial recognition and communication data can help better understand employee engagement and workplace satisfaction. Migration to cloud-based and blockchain-

enabled platforms can improve scalability, data security, and transparency of HR records. Additionally, integrating explainable AI (XAI) techniques will increase trust by making automated HR decisions more interpretable and fair. The framework can also be expanded to support global workforce management through multilingual natural language processing and compliance-aware AI models, making it suitable for large, distributed organizations.

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