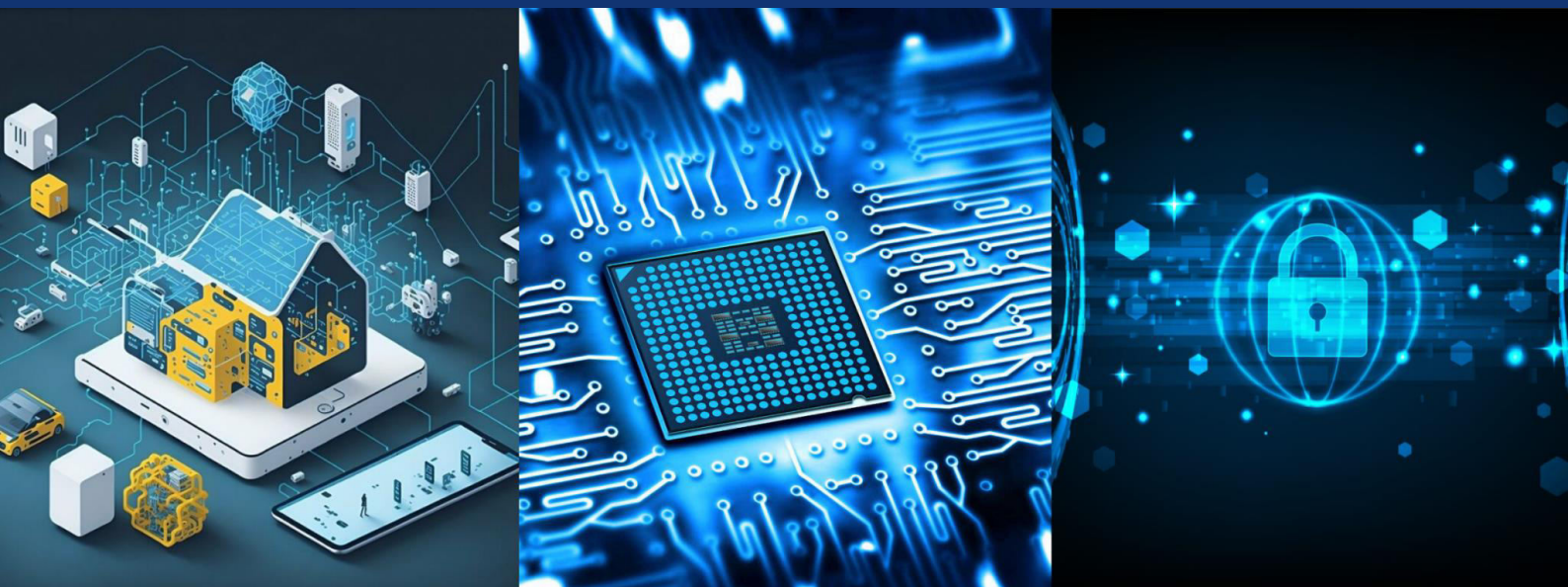




International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)





International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

LLM Powered Resume Relevance Engine for Automated Job Matching

Dr. Shailesh Bendale¹, Akash Bhagat², Atharva Joshi³, Dinesh Kashiwant⁴, Ajinkya Ladkat⁵

Guide, NBN Sinhgad Technical Institutes Campus, Pune, India¹

Student, NBN Sinhgad Technical Institutes Campus, Pune, India^{2, 3, 4, 5}

ABSTRACT: The recruitment process has become increasingly challenging due to the large volume of job applications received by organizations. Traditional Applicant Tracking Systems (ATS) primarily rely on keyword-based matching techniques, which often fail to accurately evaluate candidate suitability because they lack contextual understanding. To address these limitations, the Resume Matcher System is developed as an AI-powered platform that leverages Artificial Intelligence (AI), Natural Language Processing (NLP), semantic analysis, and Large Language Models (LLMs) to improve resume evaluation and job matching accuracy.

The system enables users to upload resumes and job descriptions, automatically extracts and structures relevant information, and performs semantic similarity analysis to determine candidate-job compatibility. Advanced features such as resume parsing, section detection, semantic score generation, skill gap analysis, resume strength and weakness identification, and AI-powered resume tailoring help users optimize their resumes according to job requirements. Additionally, the system provides career assistance through interview question generation, LinkedIn headline generation, cover letter creation, outreach message generation, and professional PDF resume generation.

The application is developed using Next.js, FastAPI, PostgreSQL, and Ollama-based language models. By combining semantic understanding with explainable AI recommendations, the Resume Matcher System enhances recruitment efficiency, reduces manual screening effort, and helps candidates improve their chances of securing relevant job opportunities. The proposed system provides an intelligent, scalable, and user-friendly solution for modern recruitment and career development processes.

KEYWORDS: Artificial Intelligence (AI), Natural Language Processing (NLP), Large Language Models (LLMs), Resume Matcher, Semantic Analysis, Resume Parsing, Job Description Matching, Skill Gap Analysis, Resume Tailoring, Applicant Tracking System (ATS), Semantic Similarity, Career Assistance, Recruitment Automation, FastAPI, Next.js.

I. INTRODUCTION

In today's competitive job market, organizations receive a large number of applications for every job opening, making the recruitment process time-consuming and challenging. Recruiters often rely on Applicant Tracking Systems (ATS) to automate resume screening and shortlist candidates. However, traditional ATS solutions primarily depend on keyword matching techniques and frequently fail to understand the contextual relevance of a candidate's qualifications, skills, and experience. As a result, qualified candidates may be overlooked despite possessing the required competencies for a particular role. Recent advancements in Artificial Intelligence (AI), Natural Language Processing (NLP), and Large Language Models (LLMs) have enabled the development of more intelligent recruitment systems capable of understanding semantic relationships and contextual information within resumes and job descriptions.

The Resume Matcher System is an AI-powered web application developed to address these limitations by providing intelligent resume analysis, semantic job matching, and career assistance features. The system enables users to upload resumes and job descriptions, automatically extracts and structures relevant information, and performs semantic similarity analysis to evaluate candidate-job compatibility. Unlike traditional ATS systems, the proposed solution utilizes embedding-based semantic matching techniques to understand the meaning and context of candidate qualifications rather than relying solely on exact keyword matches.



International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The system incorporates advanced functionalities such as resume parsing, section detection, semantic score generation, skill gap analysis, resume strength and weakness assessment, AI-powered resume tailoring, interview question generation, LinkedIn headline generation, cover letter creation, outreach message generation, and professional PDF resume generation. These features help candidates optimize their resumes according to job requirements while assisting recruiters in identifying suitable candidates more effectively.

The project is implemented using Next.js for the frontend, FastAPI for the backend, PostgreSQL for database management, and Ollama-based Large Language Models for AI-powered processing. By integrating semantic analysis with explainable AI recommendations, the Resume Matcher System provides an intelligent, scalable, and user-friendly solution for modern recruitment and career development.

II. LITERATURE SURVEY

The evolution of automated recruitment systems has progressed from manual screening processes to advanced AI-driven candidate evaluation platforms. Early recruitment systems relied on rule-based filtering and keyword matching techniques that compared resume content against predefined job requirements. Although these methods improved screening speed, they lacked contextual understanding and frequently failed to identify relevant candidates whose qualifications were expressed using different terminology [1][2]. To overcome these limitations, researchers introduced machine learning algorithms such as Support Vector Machines (SVM), Random Forests, and Naive Bayes classifiers for resume classification and candidate ranking. These approaches utilized feature extraction methods such as TF-IDF and Bag-of-Words representations to improve classification accuracy. While machine learning techniques enhanced recruitment automation, they still struggled with semantic interpretation and contextual reasoning [1][5]. Recent studies have demonstrated that transformer-based architectures and Large Language Models significantly outperform traditional machine learning approaches in text understanding tasks. Models such as BERT, GPT, and T5 can capture contextual relationships between words and sentences, enabling more accurate matching between resumes and job descriptions [3][4]. Research has further shown that embedding-based semantic similarity techniques improve candidate-job matching accuracy by analyzing contextual meaning rather than exact keyword occurrences [4][6]. Despite these advancements, concerns regarding fairness, transparency, explainability, and bias in AI-driven hiring systems remain important research areas. Several studies emphasize the need for explainable recruitment systems capable of providing interpretable recommendations and transparent decision-making processes [6][7]. The proposed Resume Matcher System addresses these challenges by combining semantic analysis with explainable AI-generated recommendations, skill gap identification, and actionable resume improvement suggestions.

IV. PROPOSED SYSTEM

The proposed Resume Matcher System is an intelligent recruitment assistance platform that leverages Artificial Intelligence, Natural Language Processing, and Large Language Models to improve candidate-job matching accuracy. The system enables users to upload resumes and job descriptions, automatically extract structured information, analyze candidate suitability, and generate personalized recommendations.

The workflow begins with resume upload and parsing, where candidate information such as personal details, education, skills, work experience, projects, and certifications are extracted and organized into structured sections. Advanced section detection algorithms improve parsing accuracy and ensure that information is categorized correctly before further analysis.

After resume processing, the system analyzes the uploaded job description to identify required skills, responsibilities, qualifications, and industry-specific keywords. Semantic embeddings are then generated for both resume content and job descriptions using modern embedding models. These embeddings are compared using similarity algorithms to calculate a semantic score that reflects the contextual relevance between the candidate profile and the target job.

The generated analysis includes ATS compatibility scores, semantic matching scores, skill gap analysis, missing skills identification, resume strengths, weaknesses, and AI-generated recommendations. The platform further enhances user experience through AI-powered resume tailoring, enabling candidates to optimize their resumes according to specific job requirements. Additional features implemented in the current version include interview question generation based on resume content and job descriptions, LinkedIn headline generation, cover letter generation, outreach message generation,

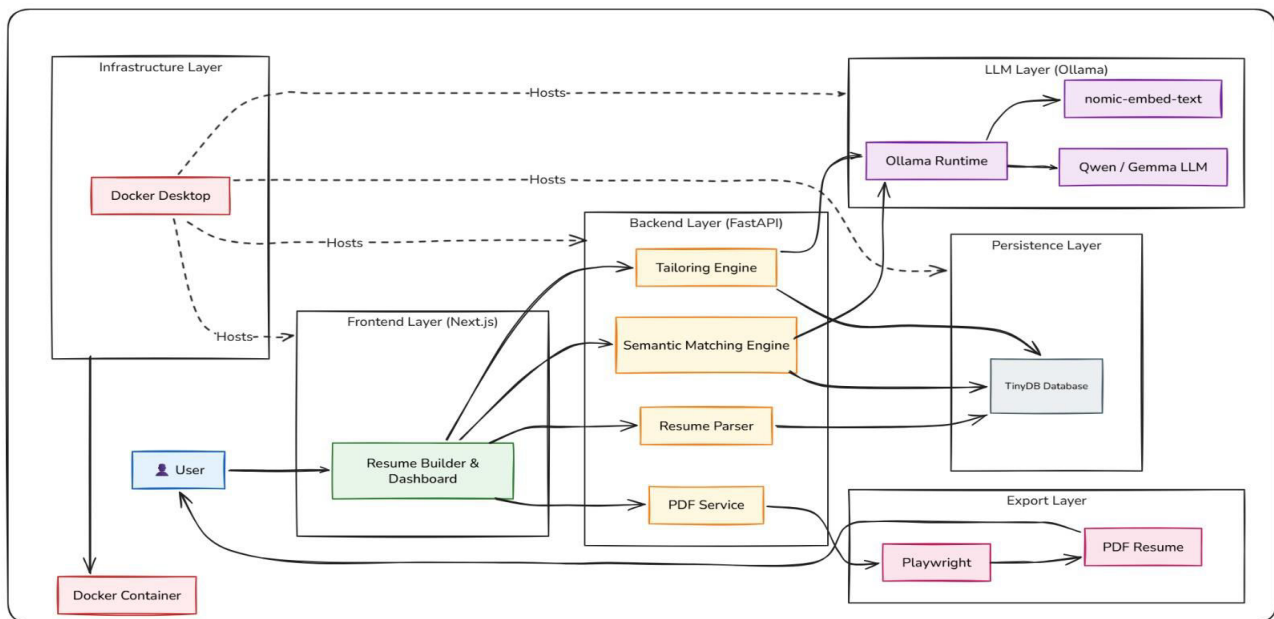


International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

and professional PDF resume generation. These features provide end-to-end career assistance and significantly extend the capabilities described in previous research studies [1][4].

V. SYSTEM ARCHITECTURE



System Architecture

The Resume Matcher system follows a layered architecture consisting of Infrastructure, Frontend, Backend, LLM, Persistence, and Export layers. The user interacts with the Resume Builder and Dashboard built using Next.js, which serves as the frontend interface. User requests are processed by the FastAPI backend, containing key modules such as the Resume Parser, Semantic Matching Engine, Tailoring Engine, and PDF Service. The Resume Parser extracts structured information from uploaded resumes, while the Semantic Matching Engine compares resumes with job descriptions using embeddings generated through Ollama and the nomic-embed-text model. AI-powered tailoring and content generation are performed using Qwen/Gemma LLMs hosted within Ollama. Parsed data, semantic scores, and resume information are stored in a TinyDB database. For resume export, the PDF Service utilizes Playwright to render professional PDF resumes. The entire application can be containerized and deployed using Docker, ensuring portability and simplified deployment.

VI. METHODOLOGY

The Resume Matcher System follows an Artificial Intelligence and Natural Language Processing based methodology to automate resume analysis, job matching, and career assistance. The system is designed to help candidates evaluate their resumes against specific job descriptions and generate personalized recommendations for improvement. The methodology consists of several sequential stages including resume parsing, job description analysis, semantic matching, resume tailoring, and document generation. The process begins when the candidate uploads a resume through the system interface. The uploaded resume is processed by the **ResumeParser** module, which extracts and organizes information such as personal details, skills, education, work experience, certifications, and projects into a structured format. The parser also performs section detection to identify different resume components accurately.

After successful resume processing, the candidate uploads a job description corresponding to the desired job role. The job description is analyzed to identify required skills, qualifications, responsibilities, and domain-specific requirements. Both the resume and job description are then forwarded to the **SemanticEngine** for further analysis.



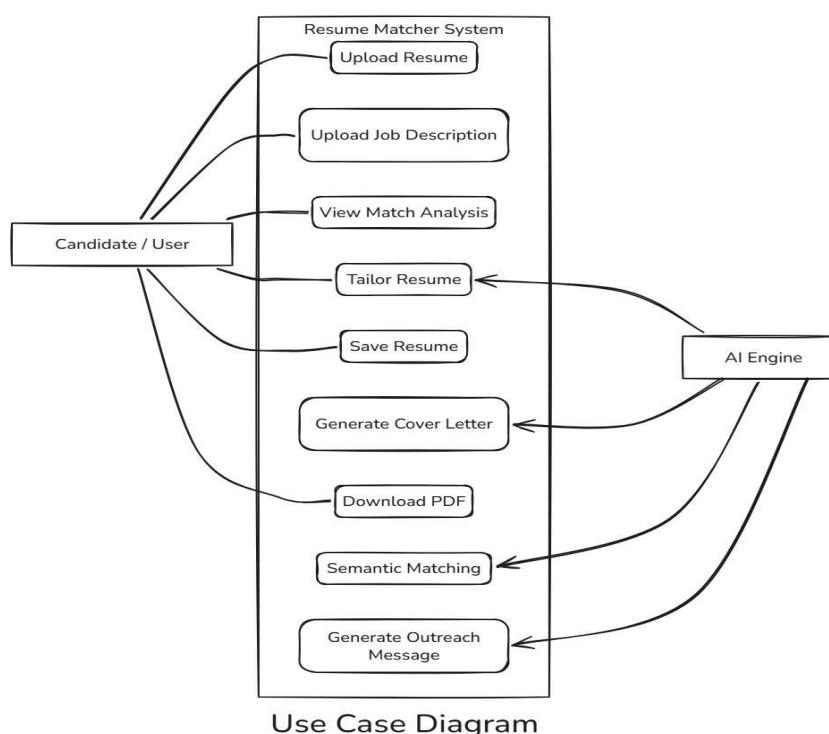
International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The Semantic Engine generates semantic embeddings for the resume and job description using AI-based language models. These embeddings capture the contextual meaning of the text and enable accurate comparison between candidate qualifications and job requirements. Similarity calculations are performed to determine the semantic relevance between the two documents. Based on the comparison results, the system generates semantic scores, keyword scores, and detailed match analysis reports.

The generated analysis is stored in the **MatchResult** component, which contains information such as semantic score, keyword score, and AI-generated recommendations. The candidate can then view the match analysis through the dashboard and identify areas that require improvement. The **TailorService** module uses AI-generated insights to optimize the resume according to the target job description. This module modifies resume content, enhances relevant skills and experiences, and improves overall ATS compatibility. In addition, the Tailor Service generates supporting documents such as cover letters and outreach messages to assist candidates during the job application process. Once the resume optimization process is completed, the **PDFGenerator** module creates a professionally formatted PDF version of the tailored resume. The generated document can be downloaded and used for job applications. The overall methodology integrates resume parsing, semantic analysis, AI-powered tailoring, and document generation into a unified workflow that improves recruitment efficiency and enhances candidate preparedness. The use of semantic matching enables the system to understand contextual relationships between resumes and job descriptions, thereby providing more accurate and meaningful recommendations than traditional keyword-based Applicant Tracking Systems (ATS) [1][4][5].

(A) Use Case Diagram



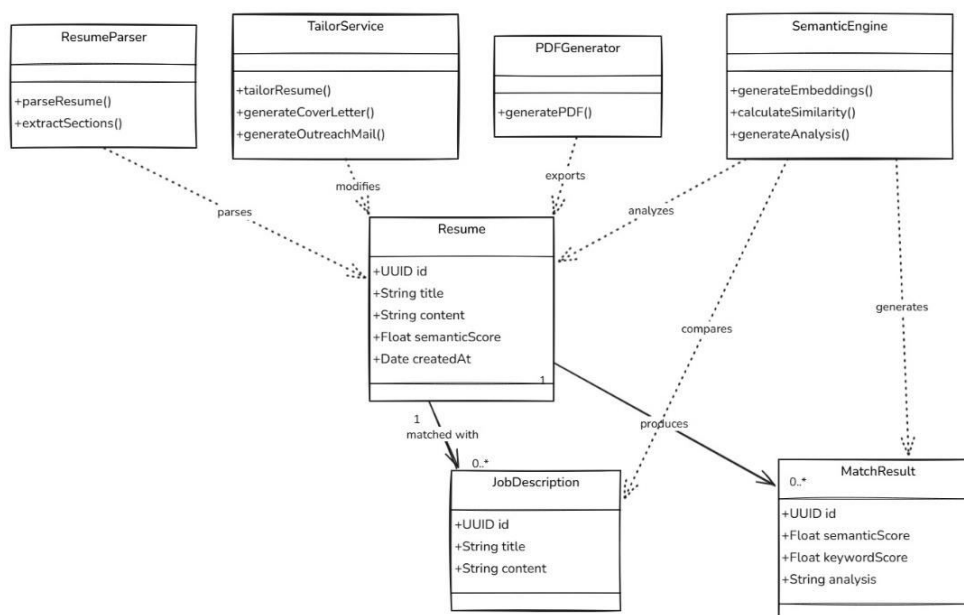
The Use Case Diagram illustrates the interactions between the Candidate/User and the Resume Matcher System. The candidate can upload resumes, upload job descriptions, view match analysis, tailor resumes, save resumes, generate cover letters, perform semantic matching, generate outreach messages, and download PDF resumes. The AI Engine assists the system in semantic matching, resume tailoring, cover letter generation, and outreach message generation.



International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

(B) Class Diagram



Class Diagram

VII. APPLICATION

The Resume Matcher System has wide applications in the fields of recruitment, career development, and talent management. It can be utilized by job seekers to evaluate and improve their resumes according to specific job requirements, thereby increasing their chances of securing interviews and employment opportunities. The system helps candidates identify missing skills, optimize resume content, and receive AI-generated recommendations for improvement. Recruitment agencies and Human Resource (HR) departments can use the system to automate the initial screening process and efficiently shortlist suitable candidates from a large pool of applicants. By leveraging semantic matching and AI-based analysis, recruiters can identify candidates whose qualifications and experience closely align with job requirements. Educational institutions and placement cells can also adopt the system to assist students in preparing industry-ready resumes and improving employability. Furthermore, career counseling platforms can utilize the system to provide personalized career guidance, interview preparation support, and professional profile enhancement services.

VII. FUTURE WORK

The Resume Matcher System provides a strong foundation for intelligent recruitment assistance; however, several enhancements can be incorporated in future versions to further improve its capabilities. One potential enhancement is the integration of real-time job recommendation systems that automatically suggest relevant job opportunities based on candidate profiles and preferences. Multi-language support can also be introduced to enable resume analysis and job matching across different languages and regions.

Future versions may include AI-powered mock interview modules capable of conducting interactive interview sessions and providing detailed performance feedback. Advanced recruiter dashboards with predictive analytics and candidate ranking mechanisms can further assist organizations in making data-driven hiring decisions. Integration with professional networking platforms and job portals can automate profile synchronization and application tracking. Cloud-native deployment and microservices architecture can enhance scalability and support a larger user base. Additionally, personalized career roadmaps, skill development recommendations, and industry trend analysis can be incorporated to transform the system into a comprehensive career development platform.



International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

IX. CONCLUSION

The Resume Matcher System successfully demonstrates the practical application of Artificial Intelligence, Natural Language Processing, semantic analysis, and Large Language Models in the recruitment domain. The system addresses the limitations of traditional Applicant Tracking Systems by introducing contextual understanding and semantic similarity analysis for more accurate candidate-job matching. Through advanced resume parsing, section detection, semantic score generation, and skill gap analysis, the platform provides meaningful insights that help both recruiters and job seekers make informed decisions.

The integration of AI-powered resume tailoring, interview question generation, LinkedIn headline creation, cover letter generation, outreach message generation, and professional PDF resume creation significantly enhances the overall functionality of the system. These features not only assist candidates in optimizing their resumes but also improve their preparedness for recruitment processes. The project achieves its objective of developing an intelligent, scalable, and user-friendly recruitment support platform capable of automating resume evaluation and career assistance tasks. By combining modern AI technologies with an efficient software architecture, the Resume Matcher System offers a comprehensive solution for contemporary recruitment challenges. With further advancements and integration of emerging AI technologies, the system has the potential to evolve into a complete talent management and career guidance ecosystem..

X. ACKNOWLEDGMENT

We sincerely express our gratitude to all who have supported and guided us throughout the completion of this project. We are deeply thankful to our Principal, **Dr. Shivprasad P. Patil**, for providing the essential facilities, encouragement, and motivation to undertake this work. We extend our heartfelt appreciation to our Head of Department and Project Guide, **Dr. Shailesh P. Bendale**, for his valuable guidance, continuous support, and encouragement during the development of our project titled **"LLM-BASED RESUME RELEVANCE ENGINE FOR AUTOMATED JOB MATCHING."** His insights and suggestions were instrumental in shaping the success of this work. Lastly, We would like to thank all faculty members and peers who contributed directly or indirectly to the completion of this project.

REFERENCES

1. Panagiotis Skondras, George Psaroudakis ,Panagiotis Zervas , Giannis Tzimas "Efficient Resume Classification through Rapid Dataset Creation Using ChatGPT". 2023 14th International Conference on Information, Intelligence, Systems & Applications (IISA).
2. Chuan Qin,Le Zhang, Yihang Cheng, Rui Zha, Dazhong Shen, Qi Zhang, Xi Chen, Ying Sun, Chen Zhu, Hengshu Zhu, Hui Xiong , "A Comprehensive Survey of Artificial Intelligence Techniques for Talent Analytics".arXiv:2307.03195v2 [cs.CY] 6 May 2024.
3. P. Varalakshmi , N. Meena Kumari Bugatha, "AI-Powered Resume Based QA Tailoring for Success in Interviews", 2024 Third International Conference on Intelligent Techniques in Control, Optimization and Signal Processing (INCOS).
4. Frank P.-W .Lo,Jianing Qiu2, Zeyu Wang1 ,Haibao Yu3, Yeming Chen4, Gao Zhang5,Benny Lo - "AI Hiring with LLMs: A Context-Aware and Explainable Multi-Agent Framework for Resume Screening" , arXiv:2504.02870v2
5. Dhanalakshmi R V ,Shivashish Gour , Shashank M , Sushmitha K , K J Nithin , Keerthana S N - "AI-Powered Resume Screening System using NLP and Machine Learning" , 3rd International Conference on Inventive Computing and Informatics (ICICI).
6. M.K.Vijaymeena , K.Kavitha - "A SURVEY ON SIMILARITY MEASURES IN TEXT MINING" ,Machine Learning and Applications: An International Journal (MLAIJ) Vol.3, No.1
7. Dena F. Mujtaba ,Nihar R. Mahapatra - "Fairness in AI-Driven Recruitment: Challenges, Metrics, Methods, and Future Directions" , arXiv:2405.19699v3 [cs.CY]



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

 9940 572 462  6381 907 438  ijircce@gmail.com



www.ijircce.com

Scan to save the contact details