



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



Impact Factor: 8.699

Volume 14, Issue 5, May 2025

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www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 5, May 2025

DOI: 10.15680/IJIRSET.2025.1405314

Skill Enhancement and Freelancing using AI Approach

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ABSTRACT: An AI-powered platform designed to enhance user skills and connect individuals with freelance opportunities in a secure, intelligent environment. It analyzes resumes to identify skill gaps, recommends relevant job roles, and delivers personalized learning pathways. An AI chatbot powered by Gemini offers real-time support, while Razorpay ensures seamless payment transactions. Freelancers must pass an AI-generated quiz tailored from their resumes to register. The platform uses React.js (frontend), Spring Boot (backend), and Python-based AI models. Resume analysis combines BERT-based models, spaCy, and S-BERT for semantic matching and dynamic skill scoring, enabling personalized, automated, and efficient user experiences.

KEYWORDS: AI-powered platform, Resume analysis, Skill gap identification, AI-generated quiz, Job role recommendation, BERT-based models, AI chatbot.

I. INTRODUCTION

The rise of online freelancing has transformed the global workforce by offering flexible job opportunities in fields such as software development, writing, marketing, and data analysis. Platforms like Upwork, Fiverr, and Freelancer.com have enabled connections between clients and freelancers worldwide, fueling the growth of the gig economy.

Simultaneously, artificial intelligence (AI) is reshaping the freelancing landscape by automating routine tasks, enhancing job-role matching, and assessing freelancer capabilities. While these developments bring clear benefits, they also introduce challenges. Freelancers must constantly update their skills to stay relevant in an increasingly AI-driven market.

Existing freelancing platforms often lack integrated tools for skill assessment, personalized learning, or AI-driven career support. As a result, freelancers are largely left on their own to navigate career development. Some initiatives attempt to address this gap but often fall short in providing scalable and intelligent solutions.

A notable shortcoming is the absence of intelligent and automated systems for extracting and evaluating skills from resumes and project histories. Many platforms rely on simple keyword matching or manual assessments, which are often inaccurate and fail to capture the full range of a freelancer's capabilities.

Modern NLP and machine learning technologies offer promising solutions in this area, particularly for resume parsing and job compatibility analysis. However, their application remains inconsistent across freelancing platforms.

Another pressing issue is the reliability of payment systems. While escrow-based payment models are known to protect both clients and freelancers, many platforms either underutilize them or implement them poorly, leading to disputes and a lack of trust.

This project proposes an AI-driven freelancing platform designed to address these gaps by combining intelligent skill assessment, personalized job matching, continuous learning pathways, and secure payment systems within a unified framework.





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The platform leverages NLP techniques using spaCy for resume parsing, applies a Random Forest model for skill classification, and incorporates a BERT-powered chatbot to offer real-time career guidance. A secure escrow payment system is built in to ensure smooth financial transactions.

The frontend is developed using React.js, with a Spring Boot backend, and AI functionalities deployed as modular Python-based microservices.

This platform aims not only to connect freelancers with job opportunities but also to support their career growth through AI-powered tools. By addressing current limitations, it provides a more adaptive, intelligent, and secure environment for both freelancers and clients.

II. LITERATURE SURVEY

In Artificial intelligence (AI) is significantly transforming freelancing platforms by introducing intelligent automation, skill assessment, personalized learning, and secure transactions. Tools like ChatGPT are shifting demand toward creative and high-cognition roles, requiring freelancers to constantly upskill to stay competitive [1]. BERT-powered chatbots have enhanced natural language understanding, improving project matching and user engagement through context-aware recommendations [2]. Machine learning models, including Random Forest, have proven effective in identifying skill gaps and generating personalized learning paths, enabling adaptive training support [3]. Natural Language Processing (NLP) techniques, particularly using spaCy, have shown high accuracy in parsing resumes and extracting structured information from unstructured text, improving skill tagging and project alignment [5]. NLP-based systems also enhance freelancer-client matching by analyzing semantic patterns in resumes and job descriptions, outperforming traditional keyword-based approaches [4]. Furthermore, secure escrow-based payment systems play a crucial role in ensuring trust and reducing disputes in freelance transactions [6]. Despite these individual advancements, existing platforms lack a unified framework. This project addresses that gap by integrating AI-driven resume analysis, skill evaluation, intelligent job matching, chatbot guidance, and secure payments into a comprehensive, microservices-based freelancing platform.

III. METHODOLOGIES

This paper presents an AI-powered platform aimed at enhancing user skills while connecting individuals with freelance opportunities in a secure and intelligent ecosystem. The methodology for this project follows a well-defined pipeline involving data acquisition, preprocessing, model selection, training, evaluation, and integration into the freelancing platform. This process ensures the development of a highly personalized platform capable of analyzing resumes, identifying skill gaps, recommending job roles, and facilitating continuous learning. The platform utilizes machine learning, Natural Language Processing (NLP), and secure transaction systems to provide an efficient and user-friendly experience.

1. Dataset Collection

The dataset used in this study was compiled from publicly available resume repositories, simulated freelancer profiles, and skill assessment results gathered from online platforms. It was specifically crafted to represent the freelancing market across various fields such as software development, graphic design, data science, and business analytics. The data includes both technical skills (e.g., Python, SQL, machine learning) and soft skills (e.g., communication, problem-solving), along with educational qualifications, professional experience, certifications, client feedback, and project success rates. The resumes were collected in different formats (PDF, DOCX) to replicate real-world scenarios. To avoid model bias, the dataset was balanced, containing freelancers categorized as 'aligned' or 'not aligned' based on their skills' relevance to job roles in the freelancing market. The dataset also included job descriptions and roles to enhance resume parsing and skill matching.

2. Data Preprocessing

The preprocessing of data involved several steps to improve the quality and consistency of the input data. Initially, resumes were converted from various formats (PDF, DOCX) into plain text. Unnecessary content, such as headers, footers, and other irrelevant sections, was removed. The text was then standardized by converting it to lowercase and





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eliminating punctuation. Tokenization and lemmatization were performed using the spaCy library to ensure uniformity across the dataset.

Named Entity Recognition (NER) techniques were used to extract vital entities like job titles, skills, qualifications, and years of experience, transforming unstructured data into structured feature vectors suitable for machine learning. For feature engineering, semantic analysis was conducted using BERT-based models (paraphrase-mpnet-base-v2) to evaluate the semantic similarity between resumes and job descriptions. Additionally, spaCy and S-BERT models were utilized for skill assessment, ensuring that freelancers were matched to appropriate roles.

3. Machine Learning Algorithms

The platform's machine learning models were designed to classify resumes, assess freelancers' profiles, and recommend relevant job roles. A hybrid approach combining traditional machine learning models and advanced NLP techniques was adopted to create a comprehensive resume scoring system.

Traditional Machine Learning Models: Initial models explored include Random Forest, Support Vector Machine (SVM), and K- Nearest Neighbors (KNN). These models classified resumes based on skill alignment with job roles and were trained using structured data extracted from resumes.

NLP-Based Models: To enhance semantic matching, BERT-based models (paraphrase-mpnet-base-v2) were used for semantic similarity analysis. These models compared resume content with job descriptions, assessing the degree of alignment with job roles. Additionally, spaCy and S-BERT were used to evaluate resumes based on specific skill sets, facilitating accurate role matching.

Stacking Classifier: To optimize the overall model performance, a Stacking Classifier was implemented, combining the predictions of Random Forest, SVM, and KNN models. Logistic Regression was used as a meta-classifier in the ensemble, improving accuracy by leveraging the strengths of each base model. Hyperparameter tuning was performed through Grid Search to optimize the model's performance.

4. Model Training and Evaluation

The models were trained on 70% of the dataset, and 5-fold stratified cross-validation was used to ensure robust performance and minimize overfitting. Various performance metrics, including accuracy, precision, recall, F1-score, and confusion matrix analysis, were used to evaluate the models.

Model Performance Comparison:

The Stacking Classifier consistently outperformed the other models across all performance metrics. The following table summarizes the results:

Model	Accuracy	Precision	Recall	F1-Score
Support Vector Machine	91.4%	90.7%	92.1%	91.4%
K-Nearest Neighbors	88.2%	86.9%	89.0%	87.9%
Naïve Bayes	84.6%	82.3%	85.0%	83.6%
Stacking Classifier	94.5%	94.2%	95.1%	94.6%

The Stacking Classifier demonstrated superior recall (95.1%) and F1- score (94.6%), which is essential for accurately identifying highly skilled freelancers while balancing both precision and recall.





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5. Case Study and System Integration

The platform's functionality was demonstrated through a case study where a freelancer uploaded their resume. The AI module parsed the resume using spaCy, extracting key entities such as job titles and skills. This parsed data was then processed by the Stacking Classifier to predict the freelancer's alignment with job roles. The system then prompted the freelancer to complete an AI-generated quiz, designed based on their resume. The quiz results, in combination with the parsed resume data, were analyzed to compute a composite skill score.

Based on this analysis, the system provided personalized learning pathways, recommending AI-curated courses and certifications that targeted the freelancer's skill gaps. These learning recommendations were dynamically adjusted according to the job role's complexity and the freelancer's existing competencies.

The AI models were integrated into the freelancing platform, which was built using React.js for the frontend, Spring Boot for the backend, and Python-based AI models. Razorpay was used for secure payment processing, ensuring smooth financial transactions. A Gemini-powered chatbot provided real-time user assistance, guiding users through the platform's features.

IV. CONCLUSION

The AI-powered platform offers an innovative approach to freelancing by automating skill assessments, recommending personalized learning paths, and providing real-time support. By leveraging machine learning and NLP techniques, the platform ensures efficient resume parsing, job role recommendations, and skill development. The integration of secure payment systems and real-time AI chat support further enhances the user experience, making it an intelligent and user-friendly platform for both freelancers and clients.

V. RESULTS AND DISCUSSIONS

The performance of the AI-powered freelancing platform was evaluated using a structured and balanced dataset consisting of real- world inspired resumes and freelancing job role descriptions. The system was designed to parse resumes, evaluate the alignment of skills with specific job roles, and recommend personalized learning paths. To validate the effectiveness of the models implemented, a detailed analysis of classification metrics was performed.

A. Evaluation Metrics Overview

To assess the model performance, four evaluation metrics were used: Accuracy, Precision, Recall, and F1-score. These metrics were chosen because they provide a comprehensive view of how well each model can correctly classify freelancer resumes as either aligned or not aligned with job requirements.

The Stacking Classifier, which combines multiple base learners (Random Forest, SVM, and KNN) using Logistic Regression as a meta-classifier, consistently outperformed other models across all evaluation metrics. Its high **recall** indicates that it effectively identifies freelancers who are well-suited for specific job roles, while the balanced **F1-score** suggests that it maintains accuracy even when faced with complex, overlapping data features.





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Figure 1: ROC Curve Comparison

The Receiver Operating Characteristic (ROC) curves plotted for all models illustrate the trade-off between true positive and false positive rates. The area under the curve (AUC) was largest for the Stacking Classifier, reflecting its superior performance in binary classification tasks.



Fig.1 ROC Curve for multiple Models

B. Visualization of Model Performance

Figure 2: Model Accuracy Comparison

A bar chart comparison of model accuracies revealed the following:

- Stacking Classifier: Highest accuracy at 94.5%
- SVM: Competitive performance with 91.4%
- KNN: Moderate accuracy at 88.2%
- Naïve Bayes: Lowest performance at 84.6%







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VI. CONCLUSION

The proposed AI-driven freelancing platform presents a comprehensive solution to streamline talent acquisition, skill assessment, and personalized career development. By combining traditional machine learning techniques with state-of-the-art Natural Language Processing models like BERT and S-BERT, the system accurately analyzes resumes, evaluates candidate-job alignment, and generates tailored learning pathways to address skill gaps, Among the evaluated models, the Stacking Classifier demonstrated superior performance, achieving the highest F1-score of 94.6%, reflecting both high precision and recall. This indicates the model's strong capability to identify qualified freelancers without overlooking potential talent, The integration of Gemini-powered AI quizzes, spaCy-based resume parsing, and dynamic skill scoring created a robust end-to-end pipeline from resume upload to upskilling recommendations. Features such as real-time chatbot support, secure Razorpay transactions, and a seamless React.js and Spring Boot architecture further enhance the platform's usability and functionality, Overall this project successfully illustrates how artificial intelligence can be leveraged to build intelligent, scalable platforms that support freelancers in their professional growth while ensuring clients receive qualified and well-matched candidates.

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