

An Intelligent Job Recommender System for Career Pathing

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Abstract

Choosing a career is a significant challenge for students and job seekers. This is largely due to changing industry needs and a wider variety of skill requirements. Traditional career guidance often depends on fixed assessments and manual counselling. These methods frequently do not offer personalised or data-driven recommendations. This paper introduces an Intelligent Job Recommender System for Career Pathing. It uses machine learning and artificial intelligence to predict suitable job roles based on an individual's skills, interests, and abilities. The system gathers user responses through a structured career assessment quiz and uses a supervised machine learning classification model to recommend appropriate job roles. An AI-driven chatbot is also included to give personalised career guidance, suggestions for skill improvement, and roadmap advice. The proposed system improves decision-making accuracy, scalability, and accessibility, providing a user-friendly platform for career planning. Experimental evaluation shows that the system delivers accurate and relevant job recommendations, helping users make informed career choices.

Keywords: Career Recommendation System, Job Prediction, Machine Learning, Artificial Intelligence, Career Pathing, Chatbot-Based Guidance

1. Introduction

The selection of careers drives an individual's professional development and enduring success. The advancement of technology-based fields poses challenges to students and those seeking jobs when trying to identify potential career options that best suit their competencies, preferences, and the market. Conventional career counselling approaches are largely manual and assessment-based, making them ineffective in addressing the rapidly changing demands of the modern job market. The most recent improvements in artificial intelligence (AI) and machine learning offer the potential for intelligent systems to analyse user information and make individualised recommendations. In contrast to many recommendation systems, which lack dynamic interaction and continuous support, job recommender systems forecast appropriate job roles and recommend options by utilising and learning from user input and historical data. This work focuses on designing a smart career guidance framework that aligns individual competencies with suitable job roles using machine learning techniques. The primary goal of this system is to help users

understand job roles that fit their competencies and the skills necessary to accomplish their career aspirations.

1.1. Methods: Career Recommendation System

Data Collection and Preprocessing:- User information is collected through a structured career assessment quiz that contains questions related to skills, interests, aptitude, and career preferences. The collected data is processed using preprocessing techniques such as handling missing values, encoding categorical data, and normalising numerical features. This step improves the quality and reliability of the dataset before applying machine learning algorithms. **Job Role Prediction using Random Forest:-** The Random Forest algorithm is used to predict suitable job roles based on user responses. Random Forest is an ensemble learning method that builds multiple decision trees using different subsets of the dataset. Each tree produces a prediction, and the final job role recommendation is determined through majority voting. This approach improves prediction accuracy and reduces the risk of overfitting. **AI Chatbot for Career Guidance:** An AI-based chatbot is integrated into the system to provide

interactive career support. The chatbot uses natural language processing techniques to understand user queries and provide relevant responses. It helps users understand job requirements, suggests skill development resources, and provides career roadmap guidance. Voice Assistant Interaction: The system also includes a voice assistant module that allows users to interact with the application using voice commands. Speech-to-text technology converts voice input into text, which is processed by the system. The system can also respond using text-to-speech technology, providing a more natural and accessible interaction experience.

2. Proposed System

The proposed Intelligent Job Recommender System for Career Pathing aims to help make personalised and data-driven career recommendations using machine learning and artificial intelligence techniques. The goal of the system is to help students and job seekers find the right job according to their skills, interests and aptitude. Unlike traditional career guidance methods, the proposed system is based on an interactive and scalable solution by combining machine learning-based prediction and AI-assisted guidance. The system is organised into various interconnected modules that collaborate to gather user information, process user inputs, make appropriate job role predictions, and offer career guidance in an interactive way.

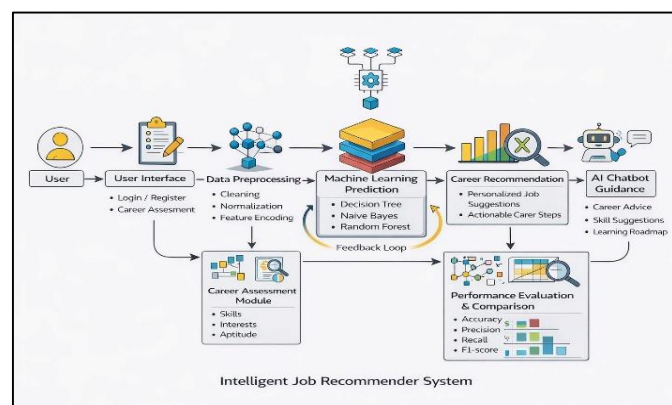


Figure.1. Proposed system

3. 2.1. Data Collection And Preprocessing:

User data is gathered by a career assessment quiz that has several questions pertaining to skills, interests,

aptitude and career preferences. The responses obtained from the users are transformed into a structured format that is suitable for machine learning processing. Data preprocessing involves handling missing values, encoding categorical features and normalising numerical values to give consistency to the dataset. This preprocessing step helps to improve the efficiency and accuracy of the machine learning model by preparing clean and meaningful input data.

2.2. Machine Learning-Based Prediction Of Job

The main component of the proposed system is a supervised machine learning classification model for predicting appropriate job roles, which is based on user responses. The model is trained based on labelled data, which represents the correlation between the user attributes and career outcomes. Once trained, the model takes new inputs from the user, gained from the career assessment quiz and categorises them into suitable job roles. This approach allows for accurate, scalable, and efficient job prediction and adapts to unique user profiles and career preferences.

2.3. AI Chatbot For Career Guidance

To improve the interaction and give users continuous guidance, an AI-driven chatbot is integrated into the system. The chatbot helps users by explaining the recommended job roles and giving them information about skills and learning paths required. The chatbot also provides career roadmap suggestions as well as answers user queries regarding career growth and development. By utilising natural language processing techniques, the chatbot provides personalised and context-aware responses, enhancing user engagement and clarity.

2.4. Voice Assistant Module

The given system includes a Voice Assistant Module in order to make career guidance more user-friendly and engaging. This module allows users to interact with the system by voice command and have the ability to take the career assessment, ask for job recommendations, and access information related to careers by speaking into it. The speech-to-text technology is applied to decode the user's voice utterances into an understandable format that will be processed by the machine. The system responses,

such as job roles and career guidance to users, are given in the form of text-to-speech conversion, and it gives the user real-time spoken feedback. This voice interface is more user-friendly to those who have poor typing skills and more interactive, as it provides a more natural and interactive experience in career guidance

2.5. User Interface Module

To improve the interaction and give users continuous guidance, an AI-driven chatbot is integrated into the system. The chatbot helps users by explaining the recommended job roles and giving them information about skills and learning paths required. The chatbot also provides career roadmap suggestions as well as answers user queries regarding career growth and development. By utilising natural language processing techniques, the chatbot provides personalised and context-aware responses, enhancing user engagement and clarity.

4. Results And Discussion

The proposed Intelligent Job Recommender System was tested on various test cases with different user profiles. The machine learning model was able to show consistent performance in predicting relevant job roles based on user inputs. The integration of the AI chatbot aided in the significant improvement of user engagement and aided them better understand career options and needed skills. The system is very effective in bridging the gap between career prediction and career guidance and provides a complete solution for intelligent career pathing.

Figure 3.1 illustrates the main user interface of the proposed system. It provides a simple and intuitive layout that allows users to navigate through career assessment, prediction results, and AI-based guidance modules easily.

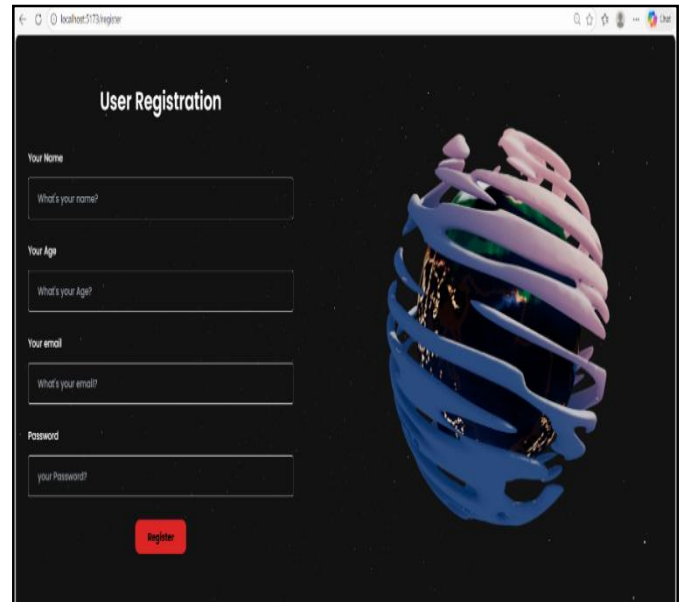


Figure 2 User registration module

Figure 2 shows the user registration module, which allows new users to create an account by providing basic details. This module ensures secure access and enables personalised career recommendations based on individual profiles.

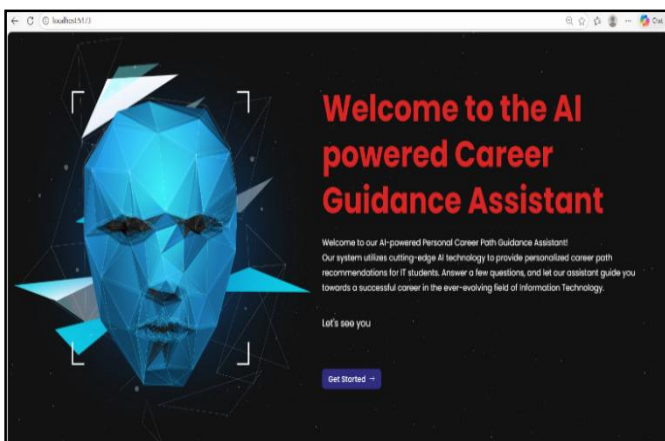


Figure 1 User interface

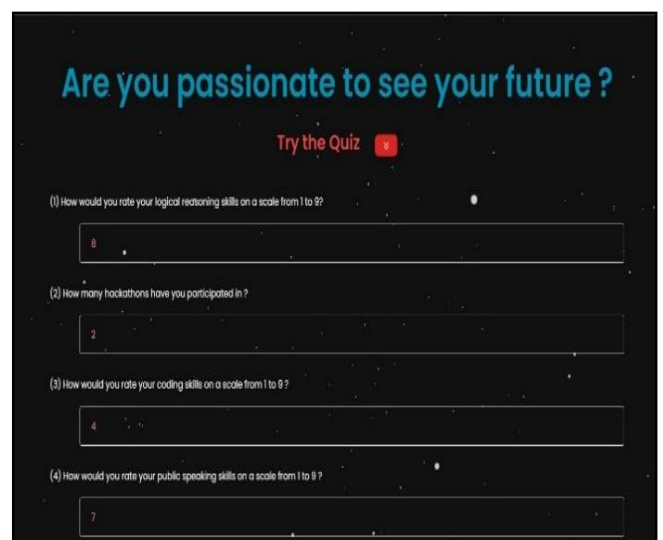


Figure 3 Career assessment module

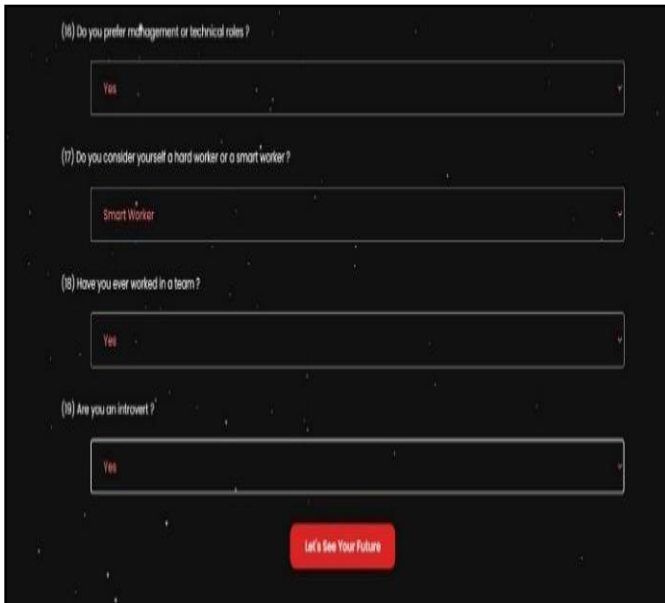


Figure 3 represents different stages of the career assessment module. These screens collect user responses related to skills, interests, and aptitude, which serve as input features for the machine learning model. The structured assessment ensures accurate and relevant job role prediction.



Figure 4 Output of career prediction model

Figure 4 shows the output generated by the machine learning career prediction model. Based on the user's assessment responses, the system predicts the most suitable job role. This result demonstrates the effectiveness of the supervised learning model in providing personalised career recommendations.

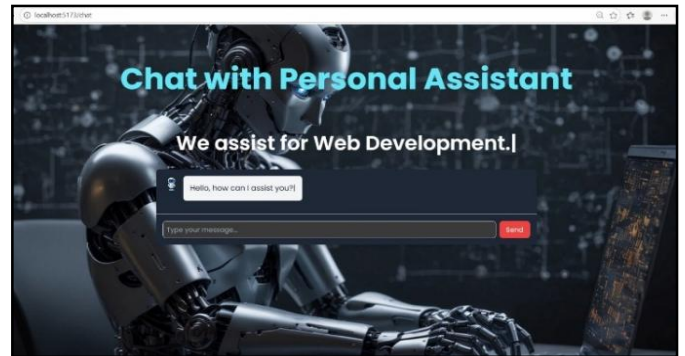


Figure 5 AI chatbot guidance module

Figure 5 illustrates the AI chatbot guidance module. The chatbot provides interactive career guidance by answering user queries, explaining predicted job roles, and suggesting skill improvement paths, thereby enhancing user engagement and clarity.

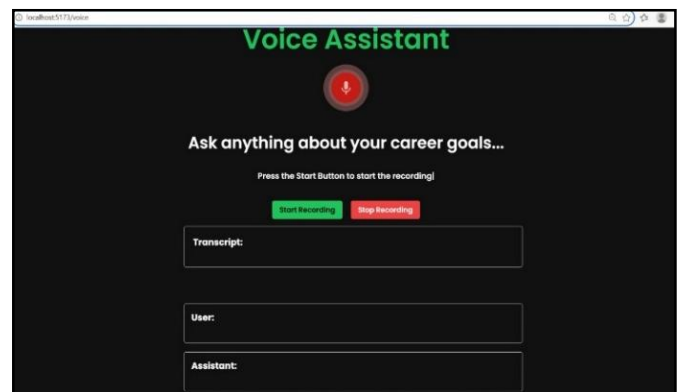


Figure 6 Voice assistant module

Figure 6 shows the voice assistant module, which allows users to interact with the system using voice commands. This feature improves accessibility and enables hands-free career guidance, making the system more user-friendly.

Conclusion

The present paper introduces an Intelligent Job Recommender System that will assist in the efficient career pathing of students and job seekers. The suggested solution will overcome the drawbacks of the conventional career advising strategies as it will utilise machine learning algorithms to process user skills, interests, and levels of aptitude to provide precise job role predictions. The system provides targeted and data-driven career advice grounded on

a structured guide to evaluation and monitored classification models, which increase the accuracy and accessibility of decision-making. Moreover, a chatbot with AI implementation ensures interactive career advice, skill improvement recommendations, and roadmap assistance, enhancing the engagement and usability of users. The experimental analysis has shown that the system is useful in creating significant and trustworthy job recommendations, thus helping users to make quality career choices. All in all, the developed framework proves the potential of intelligent automation in career guidance, which can be extended further with the incorporation of real-time labour market information and adaptive learning systems in favour of long-term career growth.

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