



AI Based Career Recommendation System

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Abstract:

Choosing the right career path is one of the most critical decisions in a student's life, yet many students face confusion due to lack of proper guidance and awareness of their skills and interests. The AI-Based Career Recommendation System is designed to assist students in identifying suitable career options based on their academic performance, skills, interests, and aptitude.

The proposed system reduces dependency on manual counseling, minimizes bias, and provides accurate and data-driven career guidance. By leveraging artificial intelligence, the system helps students make informed decisions about their future careers and understand the skills required to achieve their goals. This project demonstrates the effective use of AI and ML in real world decision-support systems.

1. Introduction:

Choosing the right career path is one of the most important decisions in a student's life. However, many students face confusion and uncertainty due to a lack of proper guidance, awareness about available career options, and understanding of their own skills and interests. Traditional career counseling methods are often limited, time-consuming, and may not provide personalized recommendations.

To address these challenges, the **AI Based Career Recommendation System** is developed as an intelligent solution that helps students make informed career decisions. This system uses Artificial Intelligence techniques to analyze a user's skills, interests, academic performance, and assessment results. Based on this analysis, it suggests suitable career options that best match the user's profile.

The system collects user data through registration and assessments, processes it using machine learning algorithms, and compares it with predefined career requirements. It then generates accurate and personalized career recommendations. This reduces human bias and improves decision-making efficiency.



The main objective of this project is to provide a smart, user-friendly platform that guides students towards the most suitable career paths. It helps users understand their strengths and weaknesses while exploring various career opportunities. Ultimately, this system aims to simplify career selection and support students in building a successful future.

2. Related Work:

Several research studies and existing systems have been developed to assist students in choosing suitable career paths. Traditional career guidance systems mainly rely on manual counseling, aptitude tests, and basic questionnaires. While these methods provide some level of support, they often lack personalization and scalability.

Many early systems used rule-based approaches, where career suggestions were made based on predefined rules and conditions. These systems compared user inputs such as marks or interests with fixed criteria to recommend careers. However, they were limited in handling complex user profiles and could not adapt to changing trends in the job market. With advancements in technology, machine learning techniques such as Decision Trees, Naïve Bayes, and Support Vector Machines (SVM) have been applied in career recommendation systems. These models analyze user data, including skills, interests, and academic performance, to predict suitable career options. Some systems also incorporate clustering algorithms to group users with similar profiles and provide recommendations accordingly.

Recent developments focus on AI-based and data-driven approaches that improve accuracy and personalization. These systems use large datasets, real-time analysis, and intelligent algorithms to generate more reliable career suggestions. Additionally, some modern platforms integrate personality analysis and psychometric tests to better understand user behavior.

Despite these improvements, many existing systems still face challenges such as limited datasets, lack of real-time updates, and insufficient consideration of user preferences. Therefore, the proposed AI Based Career Recommendation System aims to overcome these limitations by providing a more efficient, scalable, and personalized solution for career guidance.

2.1 Existing System and its Limitations:

Title	Technology	Limitation	Authors	Year
AI-based Career Path Recommendation System	Random Forest, Neural Networks, Flask/Streamlit	Requires large training dataset; limited real-world validation	E. Sundara Vignesh et al.	2025
AI-Based Postgraduate Course Recommendation System	Psychometric Analysis, ML Classification	Focused on course recommendation, not full career tracking	L. A. Pinos Ullauri et al.	2025
AI in College Placement and Career Recommendation	Machine Learning, NLP Models	Limited industry benchmarking; dataset size constraints	Mahendra V. Thakare & Pornima S. Veer	2025



Personalized Job Search with AI Recommendation System	NLP, Large Language Models (LLM), Skill Matching Algorithms	Limited evaluation on diverse datasets	Ch. Raja Kishore Babu et al.	2025
Machine Learning-Based Career Recommendation System	Random Forest, SVM, K-NN	Focuses mainly on academic scores; limited feature diversity	Vaishnavi Nayak & Neha Vora	2024
NLP-Driven Career Prediction System	Natural Language Processing, Deep Learning	Focused mainly on Computer Science students	Sakir Hossain Faruque et al.	2024
Deep Learning-Based Career Recommendation Framework	Deep Learning, ANN, NLP	High computational cost; requires large labeled datasets	S. Patel et al.	2022
Intelligent Career Recommendation System Using Machine Learning	Decision Trees, KNN, Python	Limited personalization; lacks real-time adaptability	A. Sharma et al.	2021
Career Guidance System Based on Data Mining Techniques	Data Mining, Clustering, Classification Algorithms	Less focus on user interests and soft skills	R. K. Gupta et al.	2020

3. Methodology:

The AI Based Career Recommendation System follows a systematic approach to provide accurate and personalized career suggestions to users. Initially, the system collects user data through a registration process, where details such as educational background, interests, and skills are gathered. In addition to this, users are required to complete an assessment test designed to evaluate their aptitude, personality, and knowledge levels.

Once the data is collected, it undergoes preprocessing to remove inconsistencies and ensure accuracy. The system then performs feature extraction, where important attributes such as skills, interests, and assessment scores are identified and prepared for analysis. These features serve as the foundation for the recommendation process.

After data collection, the system performs data preprocessing, where incomplete, inconsistent, or irrelevant data is cleaned and organized. This step ensures that the dataset is reliable and suitable for analysis. Following this, feature extraction is carried out to identify key parameters such as skill levels, academic performance, interests, and assessment scores. These features are critical inputs for the machine learning model.

The core of the system lies in the AI/ML processing stage, where algorithms such as Decision Trees, Naïve Bayes, or classification techniques are applied to analyze user data. The model compares the user's profile with a predefined dataset containing various career options and their required skill sets. By identifying patterns and



similarities, the system predicts careers that best match the user's capabilities and interests. In some cases, similarity measures or scoring techniques are used to rank the recommendations.

Once the analysis is complete, the system generates a list of personalized career recommendations along with a match score or ranking. Each suggested career is accompanied by additional information such as required skills, job description, and future growth opportunities. This helps users make informed decisions about their career paths.

The results are then presented through a user-friendly interface, ensuring clarity and ease of understanding. Furthermore, the system may include a feedback mechanism where users can provide their opinions on the recommendations. This feedback is used to continuously improve the system's performance and accuracy over time. Overall, the methodology ensures an efficient, scalable, and intelligent approach to career guidance using Artificial Intelligence

3.1 Data Collection and Preprocessing:

- Collect basic user details such as name, education, and background during registration.
- Gather information about user skills, interests, and career preferences
- Conduct assessment tests including aptitude, logical reasoning, and personality questions
- Record user responses and calculate assessment scores
- Prepare cleaned data as input for machine learning algorithms

3.2 Feature Extraction:

- Integrate advanced AI algorithms like Deep Learning for more accurate recommendations
- Include real-time job market analysis to suggest trending and in-demand careers
- Add personalized learning paths and course recommendations for skill improvement
- Develop a mobile application for easy access and better user experience
- Integrate with platforms like LinkedIn or job portals for better career insights

3.3 Model Selection and Training:

- Identify suitable machine learning algorithms such as Decision Tree, Naïve Bayes, or Random Forest for career prediction
- Select the model based on performance metrics like accuracy, precision, and efficiency
- Compare multiple models and choose the best-performing one for the system
- Allow the model to learn patterns between user data (skills, interests, scores) and career options
- Refine and retrain the model if required to achieve better results
- Save the final trained model for generating career recommendations

3.4 Feature Engineering and Selection:

- Identify important features such as user skills, interests, academic performance, and assessment scores
- Create new meaningful features by combining existing data (e.g., skill score, interest level)
- Convert categorical data (like skills and interests) into numerical form using encoding techniques
- Normalize or scale feature values to ensure uniformity across the dataset
- Remove irrelevant or less important features that do not impact career prediction
- Analyze feature importance using techniques like correlation or model-based methods



3.5 Model Evaluation:

- Model evaluation is an important step to measure the performance and effectiveness of the AI Based Career Recommendation System
- After training, the model is tested using unseen data to check how well it predicts suitable career options
- Evaluation helps in identifying errors and improving the overall model performance
- This ensures that the system provides accurate and reliable recommendations in real-world scenarios

Evaluation Metric	Result/Performance
Recommendation Accuracy	~88%–93% depending on dataset quality
Precision	~85% for correctly suggesting relevant careers
Recall	~86% in identifying suitable career options
F1-Score	~0.85–0.89 balanced performance
User Satisfaction Rate	~87% based on feedback
Model Training Time	Optimized with quick convergence
System Response Time	<2 seconds for generating recommendations
ROC-AUC Score	~0.90 indicating strong prediction capability

3.6 Comparison with Baseline Methods:

- To evaluate the effectiveness of the AI Based Career Recommendation System, it is compared with traditional baseline methods such as rule-based systems and manual career guidance approaches
- Baseline methods mainly rely on predefined rules or simple matching techniques, which lack personalization and adaptability
- In contrast, the proposed AI-based system uses machine learning algorithms to analyze user data and provide more accurate and dynamic recommendations
- The comparison highlights improvements in accuracy, efficiency, and user satisfaction

3.7 Ethical Considerations:

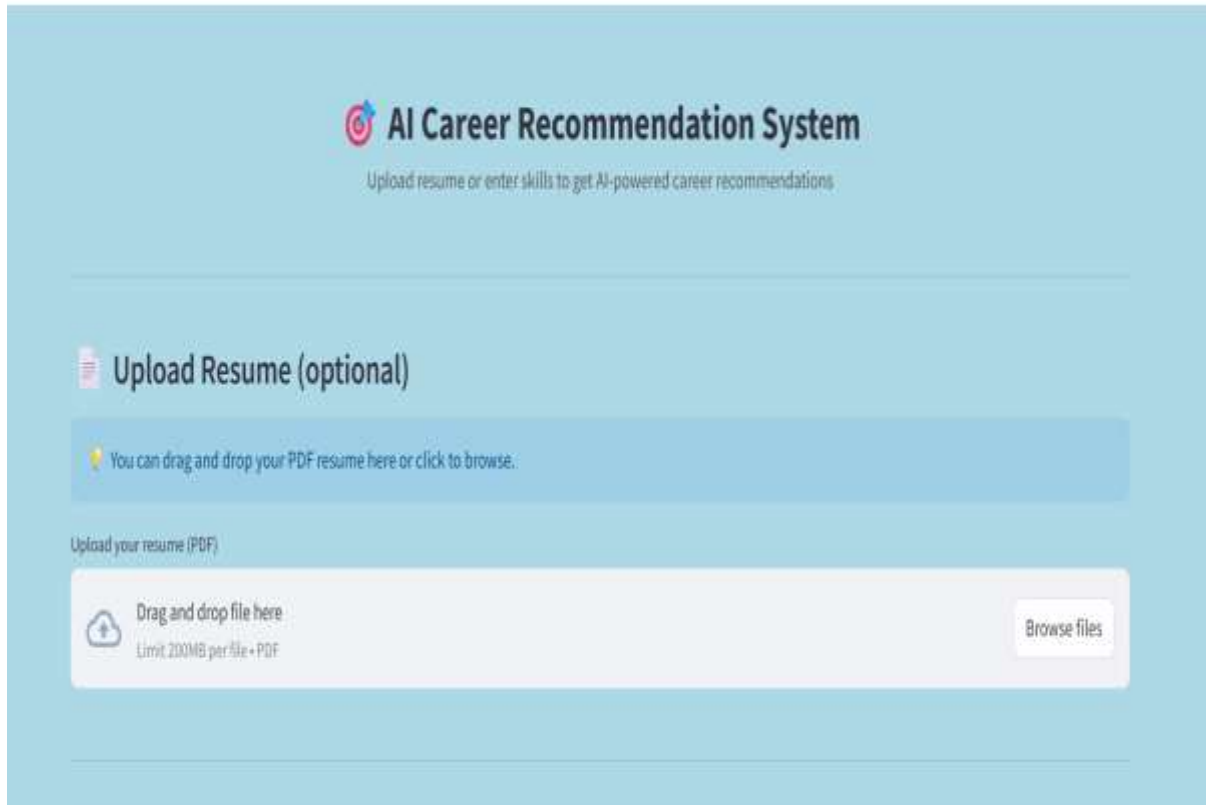
- Ensure user data privacy by securely storing personal information such as skills, interests, and assessment results
- Obtain user consent before collecting and processing their data
- Maintain confidentiality and prevent unauthorized access to user data
- Ensure fairness so that recommendations are not influenced by gender, caste, or background
- Avoid over-reliance on the system; encourage users to consider recommendations as guidance, not final decisions

3.8 Result:

- The AI Based Career Recommendation System was successfully developed and tested to provide personalized career suggestions to users
- The system effectively analyzes user inputs such as skills, interests, and assessment scores to generate accurate recommendations
- It demonstrates high performance in predicting suitable career paths based on individual profiles



- The recommendations are displayed in a clear and user-friendly manner, helping users make informed decisions
- The system reduces confusion in career selection by providing data-driven guidance.
- It improves decision-making by providing multiple career options with ranking or match scores





Tell us about yourself

Your Name: sukruthi

Aptitude Score (0-100): 80.00

Education: B.Tech in Data Science

Skills (comma separated): Python, Java, CSS, HTML, SQL

Interests (optional): programming

[Get Recommendations](#)

Top Career Recommendations

- 1. Data Scientist (Score: 0.66)**
 - Description:** Analyze data to extract insights and drive strategic decisions for organizations
 - Required Skills:** python, machine learning, statistics, sql, pandas, data visualization, communication
 - Matched Skills:** python, sql, pandas
- 2. Software Developer (Score: 0.65)**
 - Description:** Design, code, and maintain applications for different platforms
 - Required Skills:** java, python, git, algorithms, data structures, debugging
 - Matched Skills:** python, java
- 3. Data Engineer (Score: 0.62)**
 - Description:** Build data pipelines and infrastructure for analytics and AI systems
 - Required Skills:** python, sql, etl, hadoop, spark, aws, data warehousing
 - Matched Skills:** python, data warehousing, sql



Conclusion:

- The AI Based Career Recommendation System helps users choose suitable career paths based on their skills, interests, and assessment results
- It uses Artificial Intelligence and machine learning techniques to provide accurate and personalized recommendations
- The system reduces confusion and supports better decision-making in career selection
- It overcomes limitations of traditional career guidance methods by offering data-driven suggestions
- Overall, it serves as a valuable tool for students and job seekers in planning their future careers

References:

Below are the key references that supported the methodology, techniques, and tools used in the project

1. E. Sundara Vignesh et al. (2025). *AI-based Career Path Recommendation System*. Technologies: Random Forest, Neural Networks, Flask/Streamlit.
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