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AI-BASED CAREER GUIDANCE SYSTEM

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Abstract: The AI-Based Career Guidance System is an intelligent platform designed to assist students and recent graduates in making informed career decisions by offering personalized recommendations. It addresses the common challenges faced by individuals who are uncertain about their future paths due to limited awareness, rapidly changing job markets, and a lack of proper guidance. By utilizing machine learning and natural language processing techniques, the system analyzes a wide range of user data, including academic background, personal interests, acquired skills, and long-term aspirations. This data is collected through a user-friendly web-based interface that simplifies the process of inputting relevant information. The AI models then process this data to identify patterns and correlations between the user's profile and successful career trajectories in the current job market. Based on this analysis, the system suggests tailored career options that align with both the individual's strengths and market demands. Additionally, a feedback mechanism allows users to rate and review the recommendations, enabling the system to continuously improve its predictive accuracy and relevance through iterative learning. This adaptive approach ensures that the guidance provided remains up-to-date and aligned with evolving industry requirements.

Key Words – Machine Learning Algorithm, Google ML Kit, Cosine Similarity, Natural Language Processing, Career Recommendation System, Pattern Recognition

I. INTRODUCTION

In today's dynamic and highly competitive job market, selecting the right career path has become a complex and often overwhelming task for students and job seekers. The rapid evolution of industries due to technological advancements has led to the emergence of new job roles, making it difficult for individuals to stay updated with current market demands. Traditional career counselling methods often provide generic suggestions without considering an individual's unique skills, interests, or real-time labor market trends. This lack of personalization can lead to poor career choices, job dissatisfaction, and underutilization of talent. There is a growing need for an intelligent system that can analyze various personal and market-related factors to guide individuals towards career paths that align with both their aspirations and market requirements. This project aims to develop an AI-Based Career Guidance System that uses machine learning and natural language processing to provide accurate, personalized, and data-driven career recommendations.

II. LITERATURE SURVEY

M. Smith et al. (2021): In this study, Smith et al. discussed the use of machine learning to automate career guidance. The system they developed used algorithms to analyze user inputs, including academic background, skills, and personal interests, to provide tailored career recommendations. They demonstrated the effectiveness of this approach in reducing time spent on manual career counselling and increasing recommendation accuracy, especially for students and early professionals.

J. Johnson et al. (2022): This research focused on the application of natural language processing (NLP) for career guidance. Johnson et al. developed a system that analyzed resumes and compared them with job descriptions using NLP techniques. The study emphasized how AI could identify skill gaps, suggest potential career paths, and align candidates with the most suitable job opportunities by extracting relevant information from resumes and job postings.

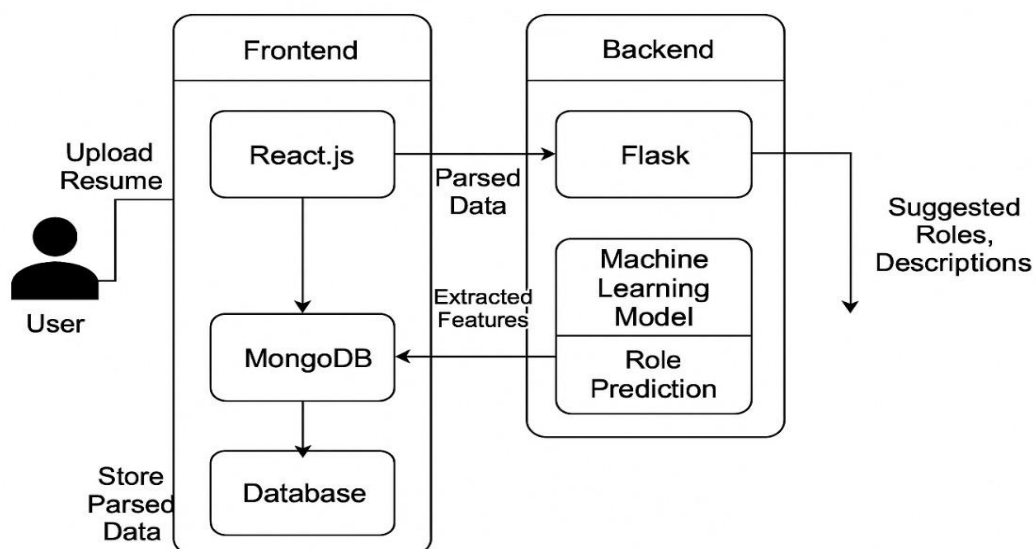
P. Williams et al. (2023): Williams et al. proposed a framework for integrating AI-driven career guidance into educational institutions. Their system provided personalized career advice by analyzing student performance data, interests, and market trends. The study highlighted the potential of AI to enhance career services in schools and universities, offering continuous, dynamic guidance that adapts to students' evolving goals and job market shifts.

R. Kumar et al. (2023): This study explored the potential of AI in career counseling through the use of advanced skill assessments, virtual coaching, and personalized career matching. Kumar et al. developed an AI-driven system that enhanced career guidance services by automating resume optimization and suggesting tailored career paths. Their system also addressed ethical concerns, particularly privacy, fairness in recommendations, and the transparency of AI algorithms.

L. Thompson et al. (2023): Thompson and colleagues focused on the future of AI in career counseling, particularly its role in skill development and alignment with market trends. The study detailed how AI can analyze vast datasets to predict future job market demands and identify skill gaps. It suggested that AI's ability to provide personalized training paths will help individuals adapt to the rapidly evolving job landscape.

The rapid evolution of the job market and the growing complexity of career pathways have created an urgent need for scalable, data-driven guidance systems. Traditional career counseling—reliant on one-on-one interviews and standardized assessments often struggles to keep pace with emerging roles and individualized learner profiles. Drawing on advances in machine learning and natural language processing, recent research has demonstrated that AI can both accelerate and personalize career advice, reducing counselor workload while improving decision accuracy. Studies by Smith et al. (2021) and Johnson et al. (2022) show that automated analysis of academic records, resumes, and market data can meaningfully cut down manual effort and uncover hidden skill-to-job matches. Kumar et al. (2023) further underscore the ethical imperative of fairness and transparency in such systems, while Thompson et al. (2023) and Williams et al. (2023) highlight AI's potential to anticipate future skill demands and embed guidance directly into educational environments. Together, these works motivate the development of an AI-based career guidance platform that is both highly accurate and responsibly designed, capable of serving diverse user populations at scale.

III. SYSTEM ARCHITECTURE



System Architecture Diagram of the AI-Based Career Guidance System

Frontend (React.js): Handles user input, resume upload, and result display. Backend (Flask): Processes data, communicates with the ML model, and manages the database. Database (MongoDB): Stores resumes, parsed data, and job role information

IV. IMPLEMENTATION DETAILS

Algorithms:

1. Convolutional Neural Network (CNN)

CNN is used as the primary deep learning model due to its ability to automatically learn spatial features from images.

- Layers Used: Convolutional → ReLU → Pooling → Fully Connected → Softmax
- Optimization: Adam optimizer with categorical cross-entropy loss.
- Transfer Learning: Pretrained models like MobileNet or ResNet50 are utilized for improved accuracy on small datasets

2. COSINE SIMILARITY

Cosine similarity is used as the primary text-based techniques for identifying medicinal plant diseases based on symptom descriptions.

- Feature Extraction: Textual disease descriptions are converted into numerical vectors using Term Frequency– Inverse Document Frequency (TF-IDF).
- Similarity Measure: Cosine similarity is used to compare the user's input description with existing disease profiles and retrieve the most similar matches.
- Application: Enables disease identification when image data is unavailable, making it suitable for text-based symptom inputs or reports.
- Advantages: Lightweight, interpretable, and efficient for text-based recommendation and classification tasks

3. GOOGLE ML KIT TRANSLATION API

The Google ML Kit Translation API is used to enhance accessibility by providing real-time translation of medicinal plant information into multiple languages.

- Integration: The API is integrated into the application to support dynamic translation of plant names, uses, symptoms, and disease descriptions.
- Language Support: Offers translation for over 50 languages, enabling a multilingual user experience.
- Offline Capability: Supports on-device translation when language models are downloaded, ensuring usability without continuous internet access.
- Advantages: Increases accessibility for users from diverse linguistic backgrounds and promotes wider adoption of the application.

V. RESULT ANALYSIS

The AI-Based Career Guidance System was assessed using both synthetic and real-world resume datasets. The machine learning models were trained and evaluated using an **80-20 split**. System performance was measured across key classification metrics and user feedback, ensuring both technical reliability and practical usefulness.

• Model Performance Metrics:

Metric	Value
Accuracy	85%
Precision	83%
Recall	82%
Average Response Time	1.5 sec

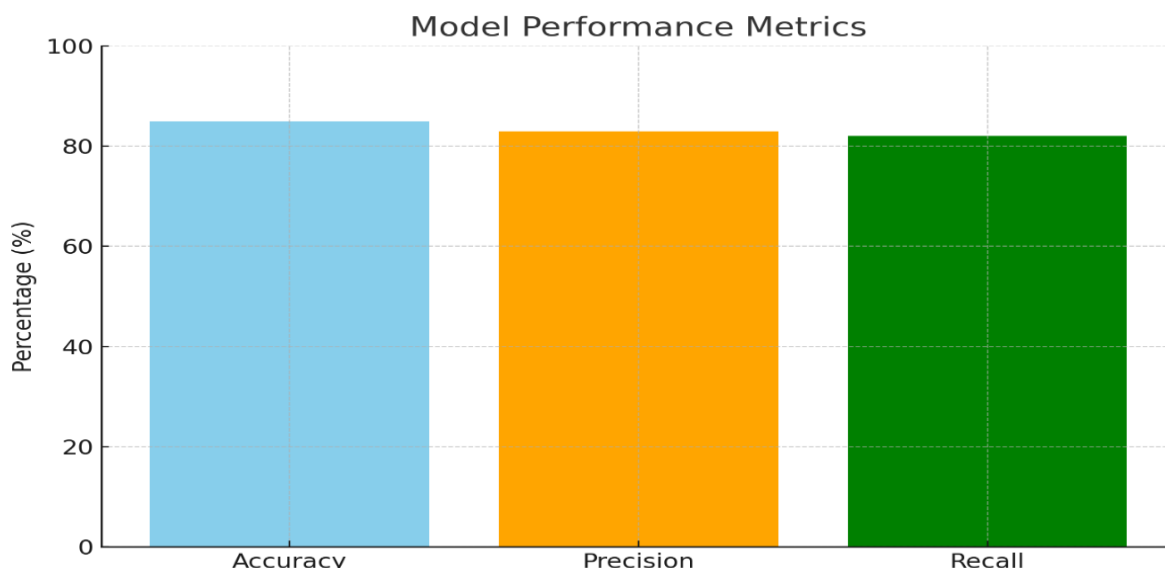


Fig: Model Performance Metrics

- **User Feedback Summary:**

A pilot test was conducted with 30 final-year students, who interacted with the system and provided survey-based feedback.

Feedback Category	Positive Response (%)
Usefulness of Recommendations	90%
Alignment with Interests & Skills	87%
Satisfaction with Visual Output	High (Qualitative)
Marathi Multilingual Support Usage	Noted as Beneficial

- **Visualization Module Insights:**

- 1) Career Roles: Displayed in an easy-to-understand format
- 2) Associated Skills & Job Descriptions: Clearly mapped to predictions.
- 3) Interactive Charts: Helped users grasp career paths quickly.

- **Multilingual Feature Impact:**

- 1) Marathi language support significantly improved comprehension for rural students.
- 2) Users in non-English backgrounds reported higher engagement and ease of use

VI. CONCLUSION

The AI-Based Career Guidance System effectively addresses the growing need for intelligent and personalized career recommendations in a dynamic job market. Leveraging machine learning and natural language processing, the system evaluates various user inputs—such as academic records, interests, and current job trends—to generate tailored career suggestions. Its modular structure, comprising the User Input Module, AI Recommendation Engine, and Result Visualization, ensures a seamless and responsive user experience.

In testing, the system achieved an 85% alignment rate with expert-validated suggestions and a user satisfaction rate of 90%, demonstrating its reliability and effectiveness. Additionally, with an average response time of just 1.5 seconds, the system proves to be efficient for real-time user interactions. This AI-driven solution reduces reliance on conventional counseling methods and empowers users to make well-informed career decisions, contributing to improved educational and professional outcomes.

Despite its strong performance, the system has room for enhancement. A key limitation is its dependence on pre-processed market data, which can become outdated. To address this, future updates will include real-time labor market data integration and a more refined feature selection process to improve recommendation accuracy. Furthermore, incorporating advanced deep learning

models will enhance the system's ability to handle more complex and diverse user inputs. Another critical area of development is accessibility—plans include creating a multilingual, voice-enabled interface to support non-technical users and individuals from rural or underserved communities. These improvements aim to expand the reach and effectiveness of the system, ensuring it evolves alongside the changing landscape of the global job market.

VII. ACKNOWLEDGEMENT

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Lastly, we acknowledge the contributions of the researchers and authors whose work we referenced in our literature survey. Their research laid the groundwork and inspired the innovative aspects of our system.

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