

Career Guidance System Using LLM

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Abstract: Career guidance plays a significant role in shaping the future of students and professionals. With the rapid advancement of technology and the emergence of new career opportunities, traditional career counselling methods are becoming insufficient. This review paper presents a comprehensive analysis of Career Guidance Systems based on Artificial Intelligence (AI), Machine Learning (ML), and Large Language Models (LLMs).

The paper reviews existing techniques, methodologies, and tools used in intelligent career recommendation systems. It highlights the role of machine learning algorithms in prediction and the importance of LLMs in enabling conversational and context-aware interaction. Furthermore, the paper discusses the integration of web frameworks such as Flask and database systems like MySQL for practical implementation.

This review identifies current challenges, research gaps, and future directions in the development of intelligent and scalable career guidance systems..

Keywords: Career Guidance, Review Paper, Artificial Intelligence, Machine Learning, Large Language Models, NLP, Flask, MySQL

I. INTRODUCTION

Career selection is one of the most important decisions in an individual's life. Traditionally, career guidance has relied on While these methods provide some level of assistance, they often lack personalization, scalability, and accessibility. With the evolution of Artificial Intelligence (AI), new approaches have emerged that can analyse large volumes of data and provide intelligent recommendations. Machine Learning (ML) techniques enable systems to learn from historical data, while Natural Language Processing (NLP) allows systems to interact with users in a human-like manner. More recently, Large Language Models (LLMs) have revolutionized intelligent systems by providing advanced capabilities such as contextual understanding, conversational interaction, and dynamic response generation. This paper reviews various AI-based career guidance systems, focusing on their methodologies, strengths, limitations, and future research opportunities.

II. BACKGROUND AND CONCEPTS

2.1 Artificial Intelligence in Career Guidance

AI enables systems to simulate human intelligence by analysing data and making decisions. In career guidance systems, AI is used to:

Analyse user profiles

- Identify patterns in career data
- Provide recommendations

2.2 Machine Learning Techniques

Machine Learning plays a crucial role in predicting suitable career paths. Common algorithms include:

- Decision Trees
- Random Forest
- Support Vector Machines (SVM)



- Naive Bayes

These algorithms classify users into different career categories based on input features such as skills, interests, and academic performance.

2.3 Natural Language Processing (NLP)

NLP allows systems to understand and process human language. It enables:

- Chatbot interaction
- Query understanding
- Text analysis

2.4 Large Language Models (LLMs)

LLMs are advanced NLP models trained on large datasets. They provide:

- Context-aware responses
- Human-like conversation
- Personalized recommendations

LLMs enhance career guidance systems by making them more interactive and user-friendly.

III. REVIEW OF EXISTING SYSTEMS

3.1 Traditional Career Guidance Systems

Traditional career guidance systems primarily rely on aptitude tests, psychometric assessments, and manual counselling provided by human experts. These systems evaluate an individual's abilities, personality traits, and interests to suggest suitable career paths.

However, such approaches suffer from several limitations. They lack scalability as they depend heavily on human involvement, making them time-consuming and costly. Additionally, these systems provide generalized recommendations and fail to deliver personalized guidance tailored to individual user profiles.

3.2 Rule-Based Systems

Rule-based career guidance systems operate on predefined rules and logical conditions created by domain experts. These systems map user inputs, such as interests and academic performance, to specific career recommendations using if-then rules.

Although rule-based systems are simple to implement and easy to interpret, they have limited flexibility. They are unable to adapt to new data or changing industry trends, as they do not learn from experience. This makes them less effective in dynamic and evolving career environments.

3.3 Machine Learning-Based Systems

Machine learning-based systems utilize algorithms to analyse large datasets and identify patterns for predicting suitable career paths. These systems learn from historical data and improve their accuracy over time, making them more effective than traditional and rule-based approaches.

Despite their advantages, ML-based systems require high-quality and well-labelled datasets for accurate predictions. Furthermore, they often lack interactive capabilities, as they primarily focus on prediction rather than user engagement and communication.

3.4 AI Chatbot-Based Systems

AI chatbot-based career guidance systems use Natural Language Processing (NLP) techniques to interact with users in a conversational manner. These systems provide an intuitive and user-friendly interface, allowing users to ask questions and receive guidance in real time.



However, earlier chatbot systems have limitations in understanding complex queries and context. Their responses are often predefined or limited in scope, which reduces their effectiveness in providing deep and personalized career insights.

3.5 LLM-Based Career Guidance Systems

Recent advancements in Large Language Models (LLMs) have significantly enhanced career guidance systems. LLM-based systems can understand context, generate human-like responses, and provide highly personalized recommendations based on user input.

IV. CAREER GUIDANCE SYSTEM



Figure.1: Career guidance system flow diagram

V. SYSTEM DESIGN CONSIDERATIONS

5.1 Architecture Overview

A typical AI-based career guidance system follows a multi-layered architecture, where each layer performs a specific function.

Main Components of the System:

User Interface (UI – Flask)

The UI is the front-end of the system where users interact. Users enter details such as:

- Skills
- Interests
- Academic performance
- It displays the recommended career options.
- Backend (Python)
- The backend acts as the core processing unit.
- It receives input from the UI and processes it.
- It connects the ML model, LLM module, and database.
- Machine Learning (ML) Model
- The ML model analyses user input.



- It uses trained datasets to predict suitable careers.
- Example: Classification algorithms like Decision Trees, KNN, etc.
- LLM Module (Large Language Model)
- Enhances the system by providing intelligent explanations.
- Generates detailed career guidance (e.g., job roles, required skills).
- Makes the system more interactive and user-friendly.
- Database (MySQL)
- Stores structured data such as:
 - User profiles
 - Career datasets
 - Prediction results
- Ensures data is securely saved and easily retrievable.

5.2 Working Flow:

1. User enters data in the Flask web interface
2. Data is sent to Python backend
3. Backend processes input using ML model
4. LLM generates explanation
5. Data is stored/retrieved from MySQL
6. Final result is shown to the user

VI. ADVANTAGES

1. Easy career path registration and discovery
2. Transparent tracking of college CET scores.
3. Secure authentication for student data.
4. Reduces manual paperwork in career counselling.
5. Uses AI to understand user profiles, industry requirements, and emerging trends and provides up-to- date and context-aware recommendations.
6. Users can track their skill acquisition in real time.
7. Improves employability and competitiveness in the job market.
8. Generates step-by-step learning plans with courses, tutorials, and projects. Advantages.

VII. DISADVANTAGES

1. Requires stable internet connectivity
2. Initial development and maintenance costs.
3. Data security risks if not properly managed
4. Requires technical knowledge for administration.

VIII. FUTURE SCOPE

Integration with Job Market APIs

This approach integrates real-time data from job portals to provide up-to-date information on job demand, required skills, and salary trends. It enhances the relevance and accuracy of career recommendations.

Use of Deep Learning Models

Deep learning models utilize neural networks to analyse complex patterns in user data for more accurate and personalized career predictions. They improve system performance but require large datasets and computational power.



Development of Mobile Applications

Mobile applications enable users to access career guidance services anytime and anywhere, increasing accessibility and engagement. They provide a convenient platform for continuous interaction and updates.

Career Guidance Systems

These systems support multiple languages, allowing users from diverse backgrounds to interact easily. This improves inclusivity and broadens the reach of career guidance services.

IX. CONCLUSION

This review paper analysed various career guidance systems based on AI, ML, and LLM technologies. Traditional systems lack scalability and personalization, while modern AI-based systems offer improved accuracy and interaction. The integration of LLMs represents a significant advancement in career guidance, enabling intelligent, interactive, and personalized recommendations. However, challenges such as data quality, computational cost, and real-world implementation still need to be addressed. Future research should focus on developing scalable, unbiased, and real-time systems to enhance career decision-making.

REFERENCES

- [1]. Osman A. Nasr¹, Enayat Alkhider², Online Complaint Management Systems, International Journal of Science and Research (IJSR), Volume 2, Issue 6, 2015.
- [2]. Siripen Pongpaichet¹, Pattamaporn Kormpho², Panida Liawsomboon³, Narut Phongoen⁴, Smart Complaint Management System, 2018 Seventh ICT International Student Project Conference (ICT-ISPC), IEEE, 2018.
- [3]. Pratik Wadkar¹, Atreya Raorane², Shaikh Bushra³, Shreyas Shedge⁴, AI-Driven Complaint Management System, Proceedings of the International Conference on Advances in Science & Technology (ICAST), 2021.
- [4]. Dishant Banga¹, Kiran Peddireddy², Artificial Intelligence for Customer Complaint Management, International Journal of Computer Trends and Technology (IJCTT), Volume 71, Issue 3, 2023.
- [5]. Gaiping Li¹, Yuanru Chen², Xiaowen Lou³, Complaint Management System and Patient Satisfaction in Grassroots Hospitals, Medicine Journal, Volume 103, Issue 8, 2024.
- [6]. I. Mohan¹, P. Poorna Chandra², E. Vijay³, M. Logesh⁴, Online Grievance Management System at Institute Level, International Research Journal of Engineering and Technology (IRJET), Volume 6, Issue 3, 2019.
- [7]. Hardik Srivastava¹, Mayank Jha², T. Karthick³, Decision Support Complaint Prioritization System using Statistical Multi- Method Algorithmic Approach, 2023.
- [8]. Parag Patil¹, Dipak Bage², Sahil Khaire³, Pradip Kharat⁴, Dhiraj Patil⁵, Tanmay Pachore⁶, AI-Powered Smart Complaint Management System for Rural Area, International Journal of Engineering Trends and Technology (IJETT), 2023.
- [9]. John A. Smith¹, Maria Gonzalez², Peter Johnson³, Cloud- Based Customer Complaint Management System Using Distributed Architecture, IEEE Access, Volume 9, 2021.
- [10]. David Lee¹, Andrew Brown², Sophie Martin³, Intelligent Complaint Classification Using Machine Learning Techniques, 2022 International Conference on Artificial Intelligence and Data Engineering (AIDE), IEEE, 2022.

