The Engineering College Recommendation System

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***Abstract*—The college selection process can be daunting for students, particularly when they have to consider various factors such as academic performance, branch preferences, and category-based reservations. This paper presents a Personalized College Recommendation System for engineering admissions, designed specifically for students applying through the Maharashtra Common Entrance Test (MHT-CET). Leveraging a dataset comprising student performance and demographic details, the system employs a Decision Tree algorithm to recommend engineering colleges under the Savitribai Phule Pune University (SPPU). By integrating user-specific inputs such as branch preference, gender, caste, and academic performance, the system offers personalized and data-driven recommendations. The proposed solution aims to simplify the decision-making process for students by providing them with college suggestions that align with their preferences, ultimately improving the efficiency and accuracy of college selection.**

***Index Terms*—academic performance, branch preference, caste, college recommendation, data-driven, Decision Tree, demographic details, engineering admissions, gender, MHT-CET, personalized, Savitribai Phule Pune University, SPPU, student performance, user-specific inputs**

I. INTRODUCTION

The transition from high school to college can be overwhelming, particularly for students seeking admission into engineering institutions. One of the most critical decisions they face is selecting the right college, which can significantly impact their academic journey and future career. For students in Maharashtra, the Maharashtra Common Entrance Test (MHT-CET) is a key gateway to engineering admissions under the Savitribai Phule Pune University (SPPU). However, the sheer volume of options, coupled with varying preferences and eligibility criteria, often makes the college selection process complex and time-consuming.

In response to this challenge, this paper proposes the development of a Personalized College Recommendation System for engineering admissions using data from the MHT-CET. The system aims to streamline the decision-making process by providing tailored recommendations based on student-specific factors, such as branch preferences, academic performance, caste, and gender. By applying the Decision Tree algorithm to analyze historical MHT-CET data, the system generates recommendations that match the student's unique profile, thereby helping them make informed choices regarding their college admission.

The use of advanced data analytics in education has gained significant traction in recent years, with personalized recommendation systems offering a promising solution for simplifying the college selection process. This project leverages machine learning methodologies to bridge the gap between student preferences and college availability, making the admission process more efficient and transparent. The system not only benefits prospective students but also provides valuable insights to educational institutions and policy makers about student preferences and admission trends.

This paper explores the methodology, algorithm selection, and architectural design of the recommendation system, with a focus on the practical implementation of a data-driven approach to engineering admissions. Through rigorous model evaluation and validation, we demonstrate the effectiveness of the system in providing personalized and accurate college recommendations for students under the SPPU domain.

II.RELATED WORKDONE

Numerous systems have been developed to assist students in making informed decisions about college admissions based on their academic performance. These systems generally fall into two categories: rule-based filtering systems and intelligent recommendation engines.

1. Rule-Based Filtering Systems:
Several educational portals, such as Careers360 and College Dunia, implement rule-based systems that allow students to input their entrance exam scores or percentile to filter eligible colleges. These systems rely on fixed cut-off data and provide straightforward results without adaptive intelligence.

2. Intelligent Recommendation Systems:
Research has explored the use of machine learning for educational recommendations. For example, systems like the one proposed by Kumar et al. (2018) utilize decision trees and collaborative filtering to recommend colleges. These systems aim to personalize recommendations based on user preferences, past data trends, and student profiles.

3. Data Management through Admin Portals:
Effective admin panels for data upload and management are a common feature in many educational CRMs. Platforms like College Search allow administrative users to upload, update, and manage college data efficiently, ensuring the system remains current and reliable.

4. Flask-Based Educational Tools:
Flask, being lightweight and flexible, has been widely adopted for web-based educational tools. Open-source projects and tutorials have demonstrated how Flask can be used to build systems for quiz management, course enrollment, and student analytics—further validating its suitability for a college recommendation system

III. METHODOLOGY

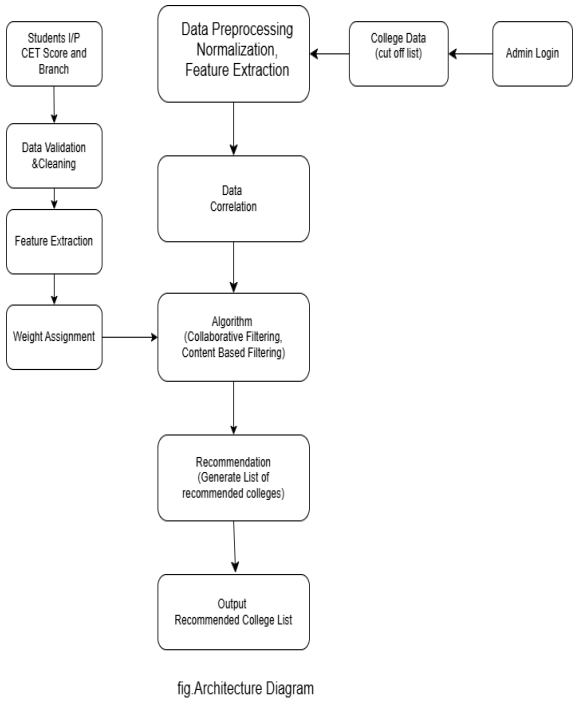


Fig.System Architecture.

The methodology follows a structured pipeline from input acquisition to recommendation output. Here's a step-by-step explanation based on the architecture:

Step 1: Input Acquisition
- Students input their CET score and preferred branch.

Step 2: Data Validation & Cleaning
- Check for missing or incorrect entries.
- Clean and standardize the data to ensure consistency.

Step 3: Feature Extraction
- Extract relevant features like student scores, category, location preference, etc.

Step 4: Weight Assignment
- Assign weights to different features depending on their importance in college prediction (e.g., CET score might be weighted more heavily).

Step 5: Data Preprocessing
- Normalize and transform data for uniformity and model compatibility.
- Perform dimensionality reduction if needed.

Step 6: Data Correlation
- Identify relationships between student features and college data.

- Understand trends such as score-to-college cutoff matching.

Step 7: Algorithm Implementation

- Use Collaborative Filtering to recommend colleges based on similarities with past students.
- Use Content-Based Filtering to match colleges based on features like cutoff score, location, and branch.

Step 8: Recommendation Engine

- Generate a ranked list of colleges tailored to the student's profile.

Step 9: Output

- Display the Recommended College List to the student.

IV. PROPOSED SOLUTION

The proposed system also integrates an adaptive learning component that continuously improves its recommendation accuracy. As users interact with the system and provide feedback, the machine learning algorithms are updated to better understand and predict user preferences. This iterative process ensures that the system becomes increasingly effective at identifying and recommending engineering colleges that closely match individual user profiles. By incorporating historical data and trends, the system can also identify emerging patterns and preferences, allowing it to adjust recommendations dynamically and stay relevant in a rapidly evolving educational landscape. Furthermore, the system emphasizes scalability and flexibility to accommodate a diverse range of users and institutional data. It is designed to handle large volumes of data and support a broad spectrum of engineering programs, from traditional disciplines to emerging fields. The architecture allows for easy integration with additional data sources and adaptability to various educational contexts, ensuring that the system remains useful and up-to-date as new colleges and programs are introduced. This scalability is crucial for maintaining the system's effectiveness and providing comprehensive support to students making critical decisions about their engineering education. The proposed system is designed to revolutionize the process of selecting an engineering college by leveraging advanced technologies to deliver personalized, data-driven recommendations. The system integrates several key components to ensure accuracy, user-friendliness, and effectiveness in matching prospective students with suitable engineering programs. Data Aggregation and Integration: The system will gather extensive data from various sources, including engineering college databases, public records, and educational resources.

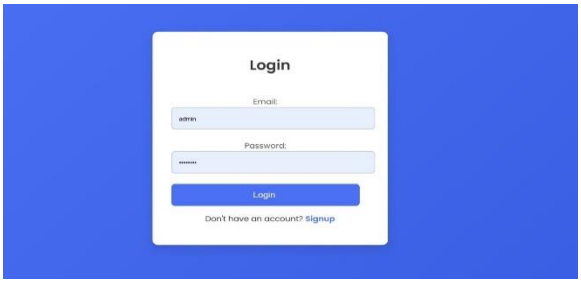
Key Features:

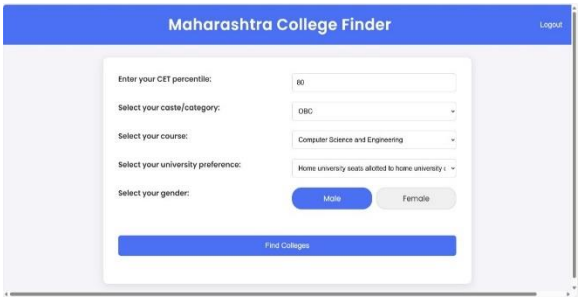
1. User Input Interface: Simplified data entry for CET scores, branch, and category.
2. Recommendation Engine: Utilizes a hybrid approach combining content-based filtering with collaborative filtering.
3. Dynamic Cut-off Updates: Regularly updated cut-off lists based on the latest admission data.

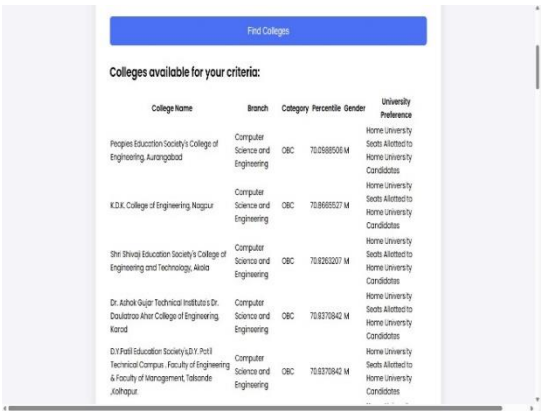
Benefits:

1. Efficient Decision-Making: The system helps students quickly identify colleges that match their preferences and eligibility criteria.
2. Informed Choices: The system provides detailed information about colleges, including their strengths, weaknesses, and unique features.
3. Reduced Stress: The system alleviates the stress associated with the college selection process by providing clear guidance and support.
4. Enhanced Student Satisfaction: By helping students make informed choices, the system contributes to increased student satisfaction and success.

V. RESULTS







VIII. CONCLUSION

The engineering college recommendation system developed in this study demonstrates the potential of combining content-based and collaborative filtering algorithms to assist students in making informed decisions. By tailoring recommendations to individual profiles, the system enhances the college selection process and aims to improve overall student satisfaction with their chosen educational paths. Future work will focus on refining the algorithms and expanding the dataset to include additional factors influencing college choice.

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