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AI-Based University Admission Prediction System Using Random Forest Regression

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Abstract: ***Admission prediction plays a crucial role in assisting students to make informed decisions regarding higher education. This paper presents a machine learning–based admission prediction system that estimates the probability of admission for undergraduate (UG) and postgraduate (PG) programs. The proposed system utilizes academic performance, standardized test scores, and university rankings as input features. Separate datasets are maintained for UG and PG admissions, and a Random Forest Regression model is employed to predict admission chances. The system supports year-wise predictions, evaluates admission probability across multiple universities, and categorizes results into reach, match, and safety levels. Additionally, it provides profile improvement recommendations to enhance admission prospects. Experimental results demonstrate that the proposed approach offers an effective and user-friendly solution for admission guidance and decision support.***
Keywords: Admission Prediction, Machine Learning, Random Forest, Educational Data Mining, University Ranking.

I. INTRODUCTION

In recent years, the process of university admission has become increasingly competitive due to the growing number of applicants and limited availability of seats in reputed institutions. Students often face difficulty in identifying suitable universities that match their academic profile and admission prospects. Traditional admission counseling methods are largely experience-based and may not provide accurate or personalized predictions. Hence, there is a growing need for intelligent systems that can assist students in making informed decisions regarding higher education.

With the advancement of Machine Learning (ML) and Data Analytics, predictive models can be effectively utilized to estimate admission probabilities based on historical data and student performance metrics. Machine learning techniques are capable of learning complex patterns from data and generating reliable predictions, thereby reducing uncertainty in the admission process.

This paper presents an AI-based University Admission Prediction System for both Undergraduate (UG) and Postgraduate (PG) programs. The proposed system uses the Random Forest Regression algorithm to predict the probability of admission to various universities by analyzing parameters such as entrance examination scores (JEE/GRE/TOEFL), academic performance (12th percentage/CGPA), Statement of Purpose (SOP), Letter of Recommendation (LOR), research experience, category, state quota, and university ranking. The system supports dynamic admission year selection and integrates university ranking data from external sources such as Google Sheets to ensure flexibility and scalability. Based on the predicted admission probability, universities are classified into Reach, Match, and Safety categories, providing clear guidance to students. Additionally, the system offers profile improvement suggestions, helping applicants understand how minor enhancements in their academic or professional profile can improve their chances of admission. The proposed model aims to serve as a decision-support tool for students and academic counselors by providing accurate, data-driven, and personalized admission predictions. This approach not only simplifies the admission planning process but also enhances transparency and confidence in higher education decision-making

II. LITERATURE SURVEY

Several researchers have explored the application of machine learning techniques in educational analytics. Logistic Regression and Decision Trees have been widely used for student performance and admission prediction; however, they often fail to capture complex non-linear relationships. Support Vector Machines and Neural Networks provide better accuracy but require extensive tuning and larger datasets.

Recent studies emphasize the effectiveness of ensemble learning methods, particularly Random Forest, due to their robustness, high accuracy, and resistance to overfitting. Research also highlights the importance of incorporating qualitative features such as SOP, LOR, and research experience for reliable prediction. Despite these advances, many existing systems lack adaptability, real-time university ranking integration, and personalized recommendation features. The proposed system addresses these limitations.

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III. PROPOSED SYSTEM

A. System Overview

The proposed system predicts admission probability for UG and PG applicants using a machine learning-based approach. It accepts student academic details and university rankings as input and outputs predicted admission chances along with categorized recommendations.

B. System Architecture

The system consists of the following modules:

1) Dataset Creation and Management
2) University Ranking Integration
3) Data Preprocessing
4) Random Forest Regression Model
5) Admission Prediction and Categorization
6) Recommendation Engine
7) Visualization Module

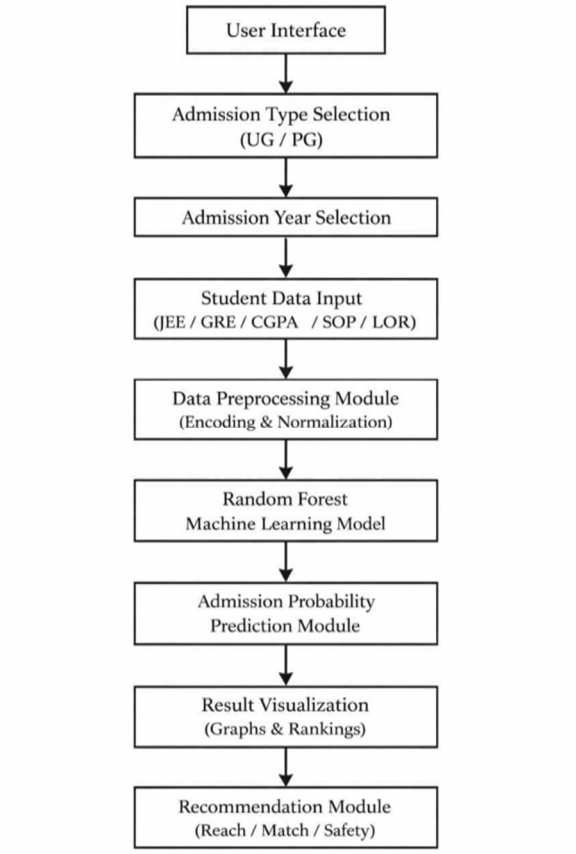


Fig. 1. System architecture of the proposed AI-based university admission prediction system using Random Forest regression.

C. Workflow

1) User selects admission type and year
2) Student profile data is collected
3) University ratings are loaded
4) Model is trained or loaded
5) Admission probability is predicted
6) Results are categorized and visualized

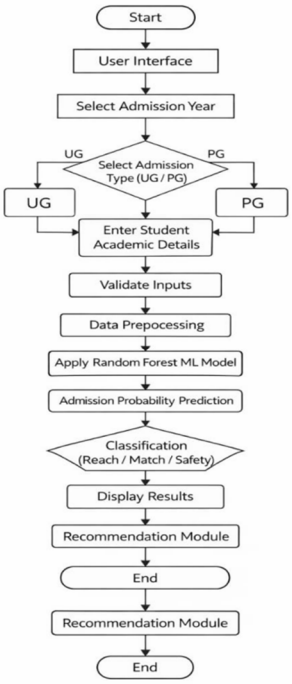


Fig. 2. Workflow diagram illustrating the step-by-step execution of the proposed AI-based university admission prediction system.

IV. METHODOLOGY

A. Dataset Description

The system uses two datasets:

UG Dataset: Contains approximately 300 records with features such as JEE Main score, 12th percentage, PCM percentage, category, state quota, university rating, and admission chance.

PG Dataset: Contains approximately 250 records with features including GRE score, TOEFL score, CGPA, SOP rating, LOR rating, research experience, university rating, and admission chance.

The dataset is partially simulated and normalized for experimental validation due to limited availability of public admission datasets.

B. Feature Set

UG Features:

- JEE Main Score
- 12th Percentage
- PCM Percentage
- Category
- State Quota
- University Rating

PG Features:

- GRE Score
- TOEFL Score
- CGPA
- SOP Rating
- LOR Rating
- Research Experience
- University Rating

C. Machine Learning Algorithm

The Random Forest Regression algorithm is selected due to its ability to handle non-linear relationships, mixed data types, and feature importance evaluation. It combines multiple decision trees to improve prediction accuracy and reduce overfitting.

D. Evaluation

The dataset is split into training and testing sets using an 80:20 ratio. Model performance is evaluated using Root Mean Square Error.

V. RESULTS AND DISCUSSION

A. Sample Prediction Results

University	Predicted Probability (%)	Category
IIT Bombay	82.4	Safety
NIT Trichy	68.9	Match
VIT Vellore	55.3	Match
Average University	43.7	Reach

The model achieved an RMSE of 6.8, indicating good prediction accuracy. Results show that entrance exam scores and university rating significantly influence admission probability.

B. Visualization

Horizontal bar charts are used to visually represent admission probabilities, improving interpretability and decision-making.

VI. CONCLUSION AND FUTURE SCOPE

This paper presented an AI-based University Admission Prediction System using Random Forest Regression. The system accurately predicts admission chances and assists students in selecting suitable universities. Experimental results validate the effectiveness of the proposed approach.

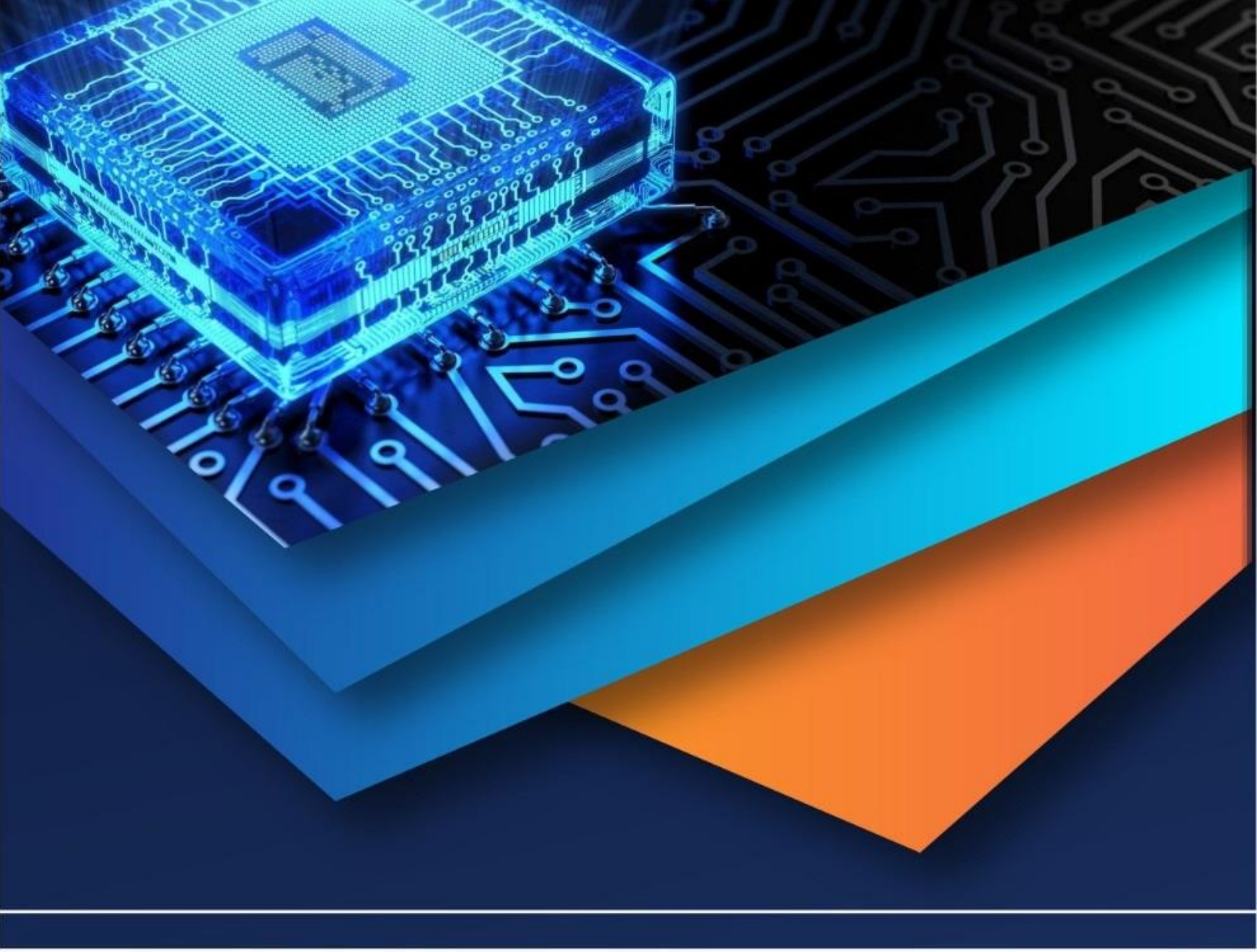
A. Future Work

1) Integration of deep learning models
2) Web-based application deployment
3) Fairness-aware prediction models
4) Real-time admission data integration

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