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AI-Driven Placement Prediction and Recommendation System for College Students

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Abstract -Campus placements are one of the most important milestones in a student's academic journey. However, the process is often uncertain and many students lack the right guidance to meet industry expectations. Companies look for strong technical skills, problem-solving ability, and consistent academic performance, but students are often unaware of these requirements. To bridge this gap, we propose an AI-driven placement prediction and recommendation system that helps students understand their placement chances and improve their preparation. The system predicts both the likelihood of a student being placed and the expected salary package using features such as CGPA, aptitude test scores, coding profiles, and backlog status. In addition to prediction, the system integrates a Generative AI module that provides personalized recommendations, including suitable job roles, skill-gap analysis, and focused preparation strategies. To ensure transparency, explainable AI methods high light the key factors influencing the predictions. A user-friendly dashboard built with Streamlit allows students to view their placement chances in real time and receive actionable suggestions for improvement. This project aims to support students in achieving better placement outcomes while also helping institutions strengthen their overall placement performance.

Key Words: —Campus Placement, Placement Prediction, Ma chine Learning, Regression, Classification, Generative AI, Explainable AI, Recommendation System,

1. INTRODUCTION

Campus placements have become one of the most significant turning points in a student's academic journey. While many engineering graduates enter the workforce each year, only a small percentage are able to meet the expectations of employers. Since the IT sector is continuously evolving, organizations look for students with strong foundational knowledge, problem-solving skills, and relevant technical expertise. However, a gap often exists between academic performance and industry readiness, as many students are unaware of these industry requirements.

Placement statistics also play a crucial role in defining a college's reputation and attracting new admissions. Therefore, it is the responsibility of educational institutions and placement cells to guide students effectively and provide them with better opportunities. Traditional placement preparation methods may not always be sufficient, as they often fail to provide personalized insights into a student's strengths and weaknesses.

To address this issue, we propose an AI-driven placement prediction and recommendation system for PICT students. The system analyzes historical placement records along with student data such as CGPA, AMCAT scores, subject grades, coding profiles, and backlog status to predict both the expected placement package and the likelihood of a student being placed. Students are classified into three categories: Low, Average, and Strong placement chances. In addition to prediction, the system incorporates Generative AI to provide tailored recommendations, helping students enhance their technical and academic skills for improved career outcomes.

This project not only assists students in understanding their placement readiness but also helps institutions strengthen their placement outcomes. By combining data-driven prediction with actionable guidance, the proposed model bridges the gap between student preparation and industry demands, thereby improving both the efficiency and transparency of the placement process.

2. LITERATURE SURVEY

In this section, we review previous research studies that applied supervised machine learning and deep learning techniques for campus placement prediction. These works demonstrate different datasets, features, and algorithms, highlighting their strengths and limitations.

In [1], the authors developed a campus placement prediction system using logistic regression to estimate the probability of a student being placed. The dataset included academic features such as CGPA, attendance, and test results from the placement management system. Historical data from past students were used to train the model. The work emphasizes how logistic regression, with properly selected training tuples, can provide reliable predictions, helping both students and faculty to identify skill gaps and improve academic planning.

In [2], a placement predictor was designed and evaluated using multiple supervised learning algorithms

True Positive, False Positive, True Negative, and False Negative values. Results showed that different algorithms performed differently on the dataset, with some offering higher accuracy than others. The comparative approach provides useful insights into selecting the most suitable classifier for placement prediction tasks.

In [3], the authors proposed a placement prediction model using deep learning. The system was aimed at pre-final year students to help them understand their placement chances and prepare accordingly. By analyzing previous years' datasets and applying a deep learning framework, the model could capture complex relationships among student features. The study high lights how deep learning can go beyond traditional models by identifying hidden patterns in large datasets, although at the cost of higher computational resources.

In [4], placement prediction was performed using KNN, AdaBoost, and Random Forest algorithms. The dataset considered not only academic scores but also aptitude, technical, and communication skills, providing a more holistic evaluation of student readiness. The authors compared the performance of these classifiers and showed how such models can help placement cells identify potential students, improve skill development, and guide admission planning for future years.

Overall, these studies illustrate that a variety of machine learning methods can be applied to placement prediction, ranging from classical models like logistic regression and KNN to advanced approaches such as deep learning. However, most works focus mainly on prediction accuracy and do not provide personalized guidance or explainability. Our proposed system extends this line of research by combining regression and classification models with a Generative AI recommendation engine, while also incorporating explainable AI techniques to provide actionable insights for students and institutions.

3. METHODOLOGY

The methodology of this project is designed to build a complete placement prediction and recommendation system by combining machine learning models with Generative AI. The workflow can be divided into the following phases:

A. Data Collection and Preprocessing: -

Historical placement records from PICT were collected, including academic scores (10th, 12th/diploma, and CGPA), backlog status, AMCAT results, and coding profiles from platforms like LeetCode and Codeforces. The data was preprocessed by handling missing values, normalizing numerical features, encoding categorical attributes such as branch, and removing outliers. This step ensured that the dataset was clean and suitable for training machine learning models.

B. Exploratory Data Analysis (EDA): -

Statistical analysis and data visualization were carried out to study relationships between different features, such as CGPA vs. package and coding scores vs. placement status. EDA helped in identifying the most influential attributes and checking for multicollinearity, which improved both model interpretability and performance.

C. Model Development: -

Two categories of models were developed:
• Regression Model: Used to predict the expected placement package (in LPA). Algorithms such as Linear Regression, Random Forest, and Gradient Boosting were trained and compared based on MAE, RMSE, and R2 score. • Classification Model: Used to categorize students into placement-chance groups: Low, Average, and Strong. Models such as Logistic Regression, Random Forest, XGBoost, and SVM were trained and evaluated using accuracy, precision, recall, F1-score, and confusion matrices.

D. Generative AI Recommendation Engine: -

A recommendation system powered by Generative AI was developed to provide personalized feedback. The engine analyzes a student's profile and suggests actionable improvements such as enhancing coding performance, focusing on specific core subjects, or improving AMCAT scores. This helps students bridge skill gaps and align better with industry requirements.

E. User Interface and Deployment:

A web-based interface was designed using Streamlit. The dashboard allows students to enter their details and view predictions in real time, along with AI-generated recommendations. The system is deployed on cloud platforms like Streamlit Cloud or AWS for easy accessibility.

F. Validation and Iteration:

The models were validated using standard performance metrics and tested with unseen data. Pilot testing was also carried out with students and Training & Placement officers. Based on the feedback, models and recommendation prompts were fine-tuned to improve accuracy and relevance. Overall, this methodology combines supervised machine learning with Generative AI to provide a dual solution of prediction and personalized guidance, making the placement process more effective and transparent for both students and institutions

4. PROPOSED SYSTEM

The proposed system focuses on predicting placement chances and recommending personalized improvement strategies for students at PICT. The workflow begins with data collection, where historical placement records and student performance details such as CGPA, AMCAT scores, subject grades, backlog history, and coding profiles are gathered from institutional records. After data collection, preprocessing steps are performed, including handling missing values, normalization of numerical attributes, encoding categorical variables, and removal of outliers. The cleaned dataset is then divided into training and testing subsets.

A. Model Training and Evaluation:
For the prediction tasks, two types of machine learning models are developed: regression and classification. The regression model is used to predict the likely salary package (in LPA), while the classification model categorizes students into placement-chance groups such as Low, Average, and Strong. Algorithms including Logistic Regression, Random Forest, Gradient Boosting, and XGBoost are applied and compared. The best-performing models are selected based on metrics such as MAE, RMSE, accuracy, precision, recall, and F1 score. To ensure transparency in prediction, Explainable AI methods are employed to highlight the most influential features impacting placement outcomes.

B. Recommendation Engine:
In addition to prediction, the system incorporates a Generative AI-based recommendation engine. This engine analyzes the feature vector of each student and generates personalized suggestions such as improving problem-solving skills, strengthening subject knowledge, or enhancing performance on coding platforms like LeetCode. These recommendations help students close their skill gaps and prepare more effectively for campus recruitment drives.

C. User Interface and Deployment:
Finally, a user-friendly dashboard is developed using Streamlit. Through this interface, students can input their aca demic and skill-related details, view their predicted placement category and package, and receive actionable guidance in real time. The system is deployed on cloud platforms for easy access and is continuously refined based on feedback from students and placement officers.

Overall, this combination of machine learning prediction and AI-driven recommendations makes the system an effective tool for improving both student readiness and institutional placement outcomes.

5. SYSTEM ARCHITECTURE

The system architecture of the proposed model integrates multiple modules to achieve both placement prediction and personalized recommendation. The workflow begins with data collection from academic and placement records, followed by preprocessing and feature engineering. Machine learning models are then trained for regression and classification tasks, while a Generative AI engine is used to provide skill-gap analysis and personalized suggestions. Finally, a user-friendly dashboard built with Streamlit presents the predictions and recommendations to students in real time.

As shown in Fig. 1, the architecture is divided into five layers:

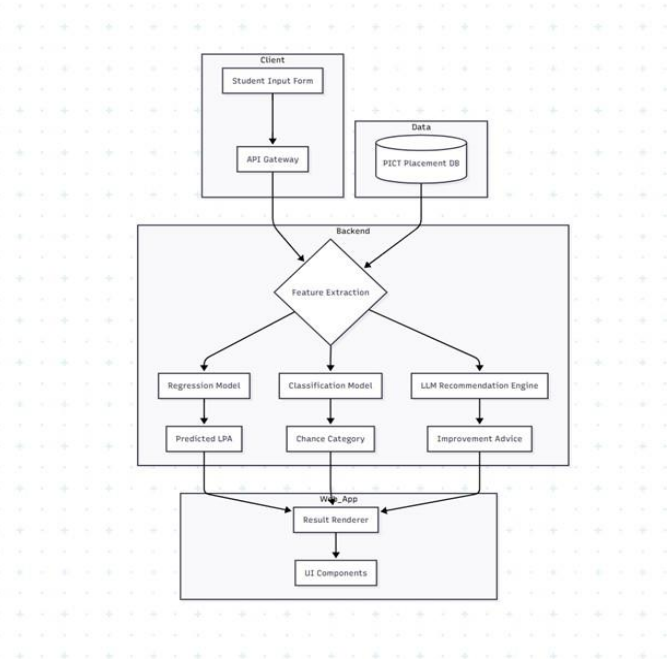

Fig -1: System Architecture of AI-Driven Placement Prediction & Recommendation System

1) Data Collection Layer: Historical academic records, placement statistics, aptitude scores, and coding profiles
2) Preprocessing Layer: Cleaning, normalization, encoding, and outlier handling.
3) Modeling Layer: Regression model for package prediction and classification model for placement category.
4) Recommendation Layer: Generative AI module pro viding personalized guidance and skill-gap feedback.
5) Interface Layer: Streamlit dashboard for students and institutions to view predictions and recommendations.

6. CONCLUSIONS

This project, AI-Driven Placement Prediction & Recommendation System for PICT Students, successfully demonstrates how machine learning and GenAI can be used to guide students in their placement journey. By analyzing historical placement data, academic records, and coding profiles, the system predicts both the likely salary package and the chances of placement. More importantly, the recommendation engine provides personalized advice that helps students identify and work on their skill gaps. The developed models, tested with various regression and classification techniques, show that data-driven approaches can bring more clarity and confidence to students preparing for placements. The web interface ensures accessibility, making it simple for students to enter their details and instantly receive predictions along with meaningful suggestions for improvement.

Overall, this work not only supports students in setting realistic expectations but also encourages continuous self-improvement, aligning with global goals of quality education, decent work, and innovation. With further refinement and feedback, this system can evolve into a reliable placement support tool for institutions, ultimately bridging the gap between students' skills and industry requirements

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