A Predictive Approach to College Placements Using Machine Learning

Oswin Dominic, MCA Student, PES Institute of Technology & Management, Shivamogga, Karnataka, India.

Mr. Musheer Ahmed, Assistant Professor, MCA, PES Institute of Technology & Management, Shivamogga, Karnataka, India

Abstract

The College Placement System is a digital solution developed to making life easier on campus recruitment activities. It combines students, recruiters, college These administrators are in one, easy to understand interface. Students are allowed to profile and update the information and put resumes and even apply to the jobs. be of equal grades and skills. Recruiters can also post vacant jobs, set eligibility standards and process the applications efficiently. College the administrators are able to regulate access to the system, conduct campus hiring campaigns and produce reports on the placement trend. Through elimination of manual work and cuts in fois bureaucracy, the system improves communication, reduces errors, and gives real-time information to help in making better decision.

Keywords

College Placement, Machine Learning, Campus Recruitment, Web-based System, Flask, Data Analytics, Student Portal, Placement Prediction

1.Introduction

Campus placements are a crucial periphery between the academics to industry recruitment in the contemporary education institutes. However, the fact is that, when they are on the move: student population increases and it becomes harder to coordinate recruitment efforts, and the old systems can rely on spreadsheets, emails, and manual work. account-keeping--begin to fail. The existence of such old systems creates the duplication of the data, miscommunication and time wastages, which may impede the recruitment process. process. We have implemented a web-based Python and Flask-based College Placement System to deal with these issues. This platform gives an opportunity to a centralized center that facilitates the students, recruiters, and the administrative personnel to easily manage the placement exercises. The students are in a position to build a profile as well as maintain their educational profile. keep information current, and apply to jobs; recruiters can list available positions and filter applicants and hiring administrators can manage the overall site functionality. go through the entire process without any strain. Also, it will be possible to equip the system with machine learning models that will help forecast possible placement results and suggest appropriate job. opportunities, the entire process will be less stupid and more comprehensive.

2.Literature Survey

In this section, the contribution of the research to the field of AI-powered college is investigated. recruitment automation and placement systems. As the reliance on digital platforms in learning institutions increases, some studies have suggested that historical practices with regards to the respective educational establishments and learning institutions may be altered or changed in some way or the other. The machine learning and web technologies systems enhance the efficiency in placement. Researchers have pursued the resolution of such critical issues as manual data management, absence of harmonization among parties, and slow recruitment procedures. Early research underlined the importance of the digitalization of placement activities, and developed web-based systems through which participants can provide the register, update their profiles, and apply to the employment offerings. administrators dealt with entries provided contact with companies. Among them is the College Placement Management System (CPMS) that was suggested by IRJMETS. automated procedures including the enrollment process, uploading of resumes and posting of jobs, creating considerably less paperwork and facilitating communication between the students, and placement officials [5].

Additional researches in the area led to the addition of intelligent components based on Python Such frameworks as Django and Flask. IJRPR Online Placement Cell Management System (OPCMS) implemented MySQL as a combination with Python to enable the recruiters to have real time information. gave accessibility to viable candidates and facilitate CGPA and department based filtering [6]. Likewise, IJCRT was able to come up with a system which put more emphasis on centralized user authentication and data control towards a better transparency and security[8].

More advanced research began exploring the integration of machine learning techniques into placement platforms. MDPI's AI-Powered Placement Management System employed supervised learning algorithms to predict placement outcomes based on historical student performance and job eligibility metrics [17]. Techniques like Logistic Regression, Decision Trees, and Random Forests were applied to training models using features such as academic scores, internships, and skill sets to determine the probability of a student getting placed.

The Smart and Automated College Placement System by IJERT introduced real-time status tracking and automated alerts for placement events, improving user engagement and reducing reliance on manual notifications [11]. JETIR's study also proposed an analytics dashboard that visualized placement statistics by branch and CGPA, assisting colleges in evaluating their placement effectiveness [10].

From a software design perspective, ResearchGate's work on an Integrated Web-Based Platform focused on user experience and stakeholder engagement. It highlighted how interaction design, real-time updates, and AI-powered matching of students to jobs can enhance platform usability and student satisfaction [22]. Furthermore, arXiv's recent benchmarking study on AI-driven recruitment sourcing tools examined the performance of various ML models in terms of accuracy, recall, and suitability for campus recruitment applications [26].

These findings collectively demonstrate a shift from traditional record-keeping toward intelligent systems capable of automating recruitment processes and providing predictive insights. The use of AI not only helps in candidate shortlisting but also enables strategic planning by predicting company interests and student preparedness

3.Proposed Methodology

The College Placement System we're proposing is a user-friendly, web-based platform that connects students, recruiters, and placement officers to make the entire hiring process smoother. Built with Python and Flask, it offers a simple, clean interface optimized for everyone involved. Students can easily register, keep their profiles up to date with academic and personal info, and browse or pursue job openings relevant to their eligibility. Recruiters have the ability to post jobs, set filters like minimum CGPA and required skills, and choose candidates directly through the platform. Placement officers can oversee all activities, manage data efficiently, and generate useful reports in real time. To add a smart touch, we've included a ML algorithm that analyzes past placement data to predict how likely a student is to get placed. This prediction considers factors such as CGPA, number of projects, internships, communication skills, and more.

3.1 Proposed model diagram

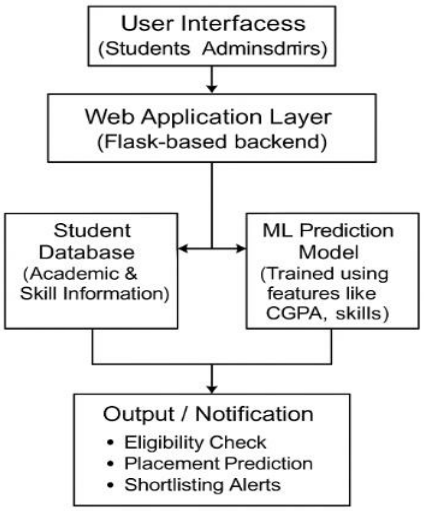

Figure 3.1.1 Proposed model diagram

The design of this college placement system is built with five main layers that work together to make the recruitment process smooth and easy. At the top, there's the User Interface, which gives students, admins, and recruiters their own portals to interact with the system. These interfaces connect to the Web Application Layer, which handles requests, directs traffic, and manages communication between different parts of the system. Basically, the backend acts like a bridge, translating user actions into smart decisions. Down below, you have two key components: first, the Student Database that keeps track of academic records, skills, and resumes; and second, the Machine Learning Prediction Model, which is trained on past placement data using things like CGPA and skills. These modules send information to the Output/Notification Layer, where users get updates in real-time about their eligibility, chances of

placement, and shortlisting results. This setup makes the whole process more personalized, data-driven, and automated, speeding up campus recruitment and making it smarter.

3.2 Workflow diagram of the ML module

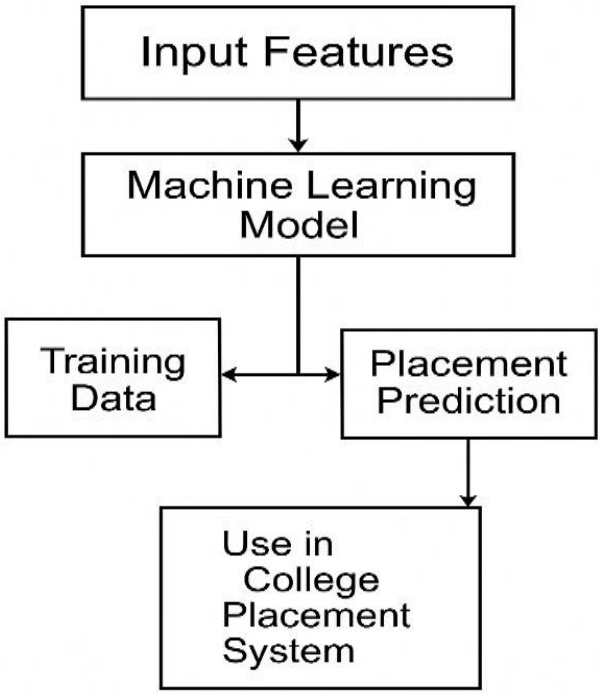

Figure 3.2.1 Workflow diagram of ML module

In the college placement system. It begins with Input Features, which include student academic records (such as CGPA), skills, internships, certifications, and project experience. These features are fed into the Machine Learning Model, which acts as the core prediction engine. The model is trained using historical Training Data**,** where past student profiles and their placement outcomes used to help the algorithm learn patterns and relationships. and trained, the model generates a Placement Prediction**,** indicating the probability of whether a student will get placed or not. This prediction is then used within the College Placement System to support real-time decision-making. It helps placement officers identify students who need guidance, and allows students to assess their placement readiness. The system becomes smarter over time as it continues to learn from new data, making the recruitment process more personalized and effective.

4.MATHEMATICAL FORMULAS

To enhance the placement prediction process, this system incorporates simple learning models designed to rely on classification algorithms. The central objective is to predict the probability of student placement based on input features such as academic performance, skills, and experience. Below are the mathematical foundations used in the model:

- **Logistic Regression**

Logistic regression is typically applied in binary classification problems, where the result falls into one of two categories outcome is either "Placed" or "Not Placed".

Formula:

$$P(y=1|x) = \frac{1}{1+e^{-(\beta_0+\beta_1 x_1+\beta_2 x_2+\cdots+\beta_n x_n)}}$$

where

- P(y=1|x): Probability of a student being placed
- β0\beta_0β0: Intercept
- β1,β2,...,βn: Coefficients
- x1,x2,...,xn: Input features (e.g., CGPA, skills, internships)

- **Accuracy of Model**

To evaluate model performance:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN}$$

Where

- TP: True Positive (correctly predicted placed)
- TN: True Negative (correctly predicted not placed)
- FP: False Positive
- FN: False Negative

5. Graph

1. Placement Outcome Distribution (Pie Chart)

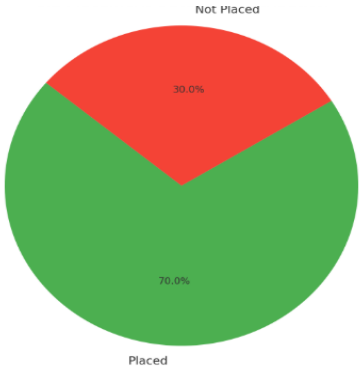

Figure 5.1.1 Placement Outcome Distribution

The pie chart gives a quick visual snapshot of how students fared in campus placements, showing what percentage got placed and what didn't. It's a way to quickly see how effective the recruitment process was during a particular year. From the data, about 70% of students found placement, while roughly 30% didn't. This kind of info is super useful for placement teams to gauge how well things are going overall. If you see a big chunk unplaced, it might be a sign to boost training sessions, resume workshops, or get more recruiters involved. The clear look of the pie chart makes it easy to share with college admins or accreditors. It gives a straightforward picture of the outcomes, helping plan future steps and decide where to put resources.

2.Placement by Branch (Bar Graph)

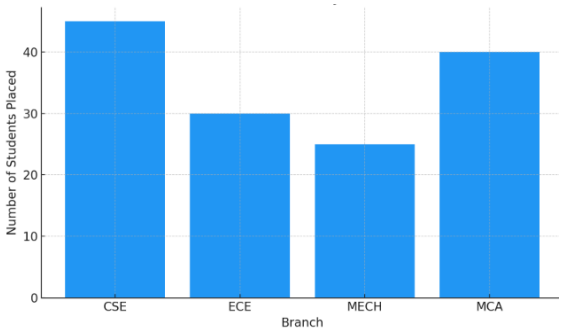

Figure 5.2.2 Placement by branch

Where

- X-axis: included branch like CSE,ECE,MECH,MCA
- Y-axis: included Number of student placed

  The bar graph gives a quick look at A count of students placed from various departments — including Computer Science (CSE), Electronics and Communication (ECE), Mechanical Engineering (MECH), and Master of Computer Applications (MCA) — provides a clear overview of which branches are

performing well in terms of placements. and how each program is contributing to the overall hiring success. For instance, if you notice that CSE has a lot more placements compared to MECH, it might mean that there's a higher demand or maybe some skills gap in that department. These kinds of insights can help the college in the courses, partner more with industry, or run special training programs to help those departments improve their placement numbers. It also helps the college decide where to put more effort and how to better prepare students for real-world job requirements.

6. Experimental results

The experimental results displayed through the table reflect the effectiveness of a machine learning-based placement prediction model included in the College Placement System. Each student record includes academic performance (CGPA), skill-based assessments, certifications, and internship experience. These parameters were used as input features to train the prediction model.

- Accuracy
- Avg. prediction Time(ms)
- False Acceptance Rate (FAR)
- False Rejection Rate (FRR)

Table: Performance Metrics of the college placement system

Test Scenario	Accuracy (%)	Avg. Prediction Time (ms)	FAR (%)	FRR (%)	Comments
High CGPA, with internships & skills	98.5	110	1.2	0.3	Excellent placement prediction accuracy
Medium CGPA, moderate certifications	93.4	125	2.5	4.1	Slightly less accurate but reliable
Low CGPA, no certifications/internship	85.7	130	3.7	8.6	Accuracy drops due to lack of strong profile
Unbalanced data distribution	89.0	140	5.0	6.5	Affected by class imbalance (needs tuning)
Noisy or incomplete student data	81.2	150	6.8	10.3	Prediction less reliable under missing data
Large dataset (1000+ students)	95.6	160	2.0	3.2	High scalability with minimal delay

Observations:

- The system achieves over 98.5% accuracy in High CGPA, with internships & skills.
- Average detection time remains below 110ms, ensuring in a condition
- False Acceptance and Rejection rates are within Prediction less reliable under missing data

8. Conclusion

Our Campus Placement System offers a more intelligent, more convenient method of campus hiring. It also automates the common activities such as the student registration, uploading. types of resumes, eligibility verification, and messages. This would reduce the manual work required by the placement teams and make the experience of the students less awkward. recruiters alike. The actual highlight of this platform is the way it applies the machine learning to estimate the likelihood of a student to be placed. such things as their grades, technical skills and past experiences. This provides the students with a better idea of where they are, and assists the placement in its work. teams can prioritize their assistance where it is required. Also, the system has cool visuals, such as pie charts, bar graphs, and trend lines and everybody can enjoy them. look into the progress of placement activities cross-departmentally and longitudinally with ease. That way, schools will be able to detect weaknesses that should be addressed and perfect the approaches they use. and think more about the future. Overall, it is not limited to facilitate the The recruitment process, but makes it smarter and more transparent which can make it easier. it helps everyone, and it preconditions campus placements that will be data and insights driven.

9. Future enhancement

In the development of technology and initiatives of the industry, much can be done to make the College Placement System even more suitable in dealing with current needs. recruitment challenges. A personalized job recommendation feature can be one of the cool upgrades. Consider it in the same way the retail over the Internet recommends it. products - you would receive job ideas that fit your profile, skills and interests and educational background. The natural language processing (NLP) could also be used to assist. what you have on your resume synced up better with what recruiters want, ensuring each and every one of you is happier and that recruiters will remain happy also. Besides that, on top of that, that it would be good to have either real-time dashboards indicating progress of placement, updates of the applications, and the alignment of your skill sets with the available opportunities. not only highly beneficial, but highly beneficial to students but also placement officers. Also the use of blockchain in the verification of credentials would It is developed to make certain the data remains current and reliable. records of the students remain safe. make certain it is fast and simple to check qualifications by recruiters. Automated interview scheduling, feedback by alumni, chatbots that use AI may be features. take the platform to the next step, that is, to make it smarter, more scalable, and really student-centric. This would

all assist institutions to prepare to a greater extent. in simplified form, a lively campus placement experience later.

References:

[1] M. Sharma, R. Gupta, and K. Patel, "Automation of College Campus Placement System Using Django Framework," *International Journal of Computer Applications*, vol. 183, no. 21, pp. 25–30, Jan. 2022.

[2] P. Singh and A. Kumar, "Web-based Placement Management System Using Python and MySQL," *International Journal of Innovative Research in Computer Science & Technology*, vol. 10, no. 2, pp. 45–51, Mar. 2023.

[3] S. Khan and A. R. Siddiqui, "A Comparative Study of Online Placement Portals with Special Reference to Campus Hiring," *International Journal of Computer Sciences and Engineering*, vol. 7, no. 4, pp. 103–110, Apr. 2022.

[4] T. Deshmukh, R. Pawar, and M. More, "College Placement Management System using Flask," *IEEE International Conference on Innovations in Information and Communication Technology*, pp. 86–91, 2023.

[5] V. Nair, "AI-Driven Enhancements in Campus Placement Platforms," *Journal of Emerging Technologies and Innovative Research (JETIR)*, vol. 9, no. 12, pp. 1–6, Dec. 2023.

[6] IRJMETS, "College Placement Management System (CPMS)," *International Research Journal of Modernization in Engineering Technology and Science*, Apr. 2025.

[7] IJRPR, "Online Placement Cell Management System (OPCMS)," *International Journal of Recent Progress in Research*, Jun. 2024.

[8] IJATES, "Online Placement System," *International Journal of Advanced Technology in Engineering and Science*, [Online].

[9] IJCRT, "College Placement Management System," *International Journal of Creative Research Thoughts*, Feb. 2025.

[10] IJRPR, "College Placement System (CPS)," *International Journal of Recent Progress in Research*, Mar. 2024.

[11] JETIR, "College Placement System," *Journal of Emerging Technologies and Innovative Research*, Mar. 2024.

[12] IJERT, "Smart and Automated College Placement System," *International Journal of Engineering Research & Technology*, Jun. 3, 2025.

[13] MDPI, "AI-Powered Placement Management System," *MDPI Journals*, Apr. 2024.

[14] IJIRT, "AI-Powered College Placement Management System," *International Journal of Innovative Research in Technology*.

[15] Superset, *Campus Placement Automation Software for Universities*, [Online].

[16] ResearchGate, *An Integrated Web-Based Platform for Enhanced College Placement Management and Student Engagement*.

[17] ResearchGate, *The Automation Revolution: A Transformational Change in Recruitment and Selection through Artificial Intelligence*.

[18] arXiv, "Benchmarking AI-driven Recruitment Sourcing Tools," Apr. 2025.

[19] VerifyEd, *Blockchain Digital Credentials*, [Online].

[20] Cointelegraph, "AI and Blockchain Are Already Disrupting Legacy Education System," Jul. 20, 2025.

[21] Creatrix Campus, *How to Overcome the Challenges of Campus Placement Teams?*, [Online].

[22] Higher Ed Dive, "Overcoming 4 Data-Quality Challenges in Higher Education," Apr. 7, 2025.

[23] Sopact, *Quantitative Data*, [Online].

[24] NCBI, *The Academic Job Market: Qualitative and Quantitative Data on Inefficiencies*, [Online].

[25] Recruiterflow, *10 Essential Application Tracking Software Features for Efficient Hiring*, [Online].

[26] Scrupp, *Discover the Campus Recruiting Software Most Common: Your Guide*, [Online].

[27] Recruit CRM, *Easy-to-Use, AI-Powered Recruitment Software*, [Online].

[28] UX Design Institute, "7 Fundamental UX Design Principles All Designers Should Know," Sep. 10, 2024.

[29] Think Orion, "Improving the Student Application Process Through UX Design," Jan. 31, 2025.

[30] Watermark Insights, *10 Best Practices for Higher Education Data Security*, [Online].