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Machine Learning Model to Predict Placement Success

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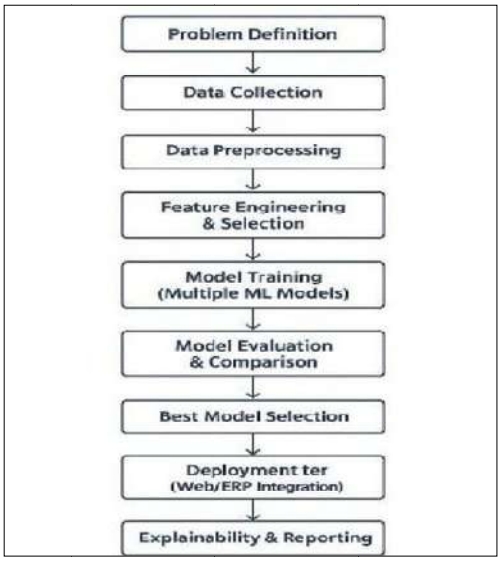
Abstract: Predicting whether a student will succeed in getting a good placement has become a key use of machine learning in education data analysis [8]. The old ways mainly depend on people checking manually, looking at past grades, and using opinions, which aren't always accurate or easy to scale [9]. In this study, a new approach using machine learning is suggested to forecast a student's chance of getting placed [2]. This approach uses different factors like academic results, technical abilities, behavior, and socio-economic. The system uses different machine learning methods like Logistic Regression, Random Forest, Support Vector Machine, and Gradient Boosting to find out which one works best [9]. The model is trained using organized data that includes things like grades, technical skills, projects, internships, communication skills, test scores, and participation in extra activities [2].

1. INTRODUCTION

Higher education has changed a lot in recent years. More schools are now using data to help students do better in their studies and get good jobs after they graduate. With more students' finishing school each year, the job market is getting more competitive. Employers now look for people who are good at their subjects, have strong technical skills, can communicate well, are good at solving problems, and are ready to work professionally. Because of this, it's important for colleges, training teams, and students to understand what really helps in getting a job. In the past, colleges mostly used old methods to try and predict where students might end up working [1].



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They looked at student grades, did practice interviews, and checked test scores. Even though these methods could give some useful hints, they weren't very dependable. They could be influenced by personal feelings, didn't al- ways work the same way every time, and had trouble dealing with a lot of information quickly [5]. Machine Learning (ML) provides a strong solution by allowing computers to automatically predict a student's chance of getting a job based on past data. Different ML methods like Logistic Regression, Decision Trees, Random Forest, Support Vector Machines, and Neural Networks can learn from previous student records and determine if a new student is likely to be placed [3]. These models use various factors such as academic progress, technical skills, internships, personality traits, involvement in extra activities, and performance in placement training to make accurate predictions [10]. As artificial intelligence becomes more common and large amounts of student data are available, creating a Machine Learning model to predict job placement has be- come a practical and meaningful area of study [12]. This research aims to build such a model using real data, check how well it works, and show how using predictions can help in education [21]. The project is focused on building a reliable system. It includes collecting and organizing data in a good way, creating useful features, choosing the best algorithms, trying out different models, and checking how effective they are [17]. The goal is to develop a tool that helps both schools and students get better results during their placements [8].

2. EXISTING SYSTEM

Most current placement-prediction models use a traditional supervised learning approach [15]. The common parts include:

a) Current systems gather data sets that aren't very large [19].

- Academic indicators include things like a student's overall grade point average, their average for each semester, how many courses they've failed, and how regularly they attend classes
- Personal attributes include details like a student's gender and age. Age is usually included in academic data, but it's also a subject of debate when it comes to ethical concerns.
- Skill indicators: scores from coding tests, communication scores, number of projects, and internships.

b) Richer and More Diverse Data

The model can include [6]:

- Internship quality and the company's level, How deep the projects are, how active someone is on GitHub, and whether they've taken part in hack at hons
- Scores from technical assessments and results from skill tests in specific areas
- Evaluations of soft skills from mock interviews
- Information about how in demand certain skills are in the job market

c) Multi-Outcome Prediction

Instead of just guessing whether some- one will get a job or not, a better model can predict [3]:

- The chance of getting placed
- The expected salary range
- How many job offers they might receive
- How long it might take to get a job during the hiring season
- This type of prediction gives a more complete picture of some one's chances of getting a job.

d) Integration into an Institutional Workflow

The improved system can be used in different ways [13]:

- A dashboard for training and placement offices
- A tool for students to get career guidance. An automatic warning system that detects students who might struggle
- A system that checks on students regularly and updates based on changes in job market needs

3. PROPOSED SYSTEM

The proposed system is a smart, data based tool for predicting placement chances. It is designed to fix the problems with cur- rent models and offer accurate, clear, and useful information about a student's job readiness [8].

System Objective

The main goal of this system is to accurately predict how ready a student is for placement and how likely they are to get a job [4].

It also aims to:

- Find out which skills are important for getting a job
- Give clear and explainable predictions
- Help schools offer personalized training to students
- Keep up dating based on what the job market needs

i. Architecture of the Proposed System

The system is built using a clear set of connected parts [7]:

a) Data Acquisition Layer

This part gathers detailed information from many sources, including [9]:

How well a student does in school, such as their grade point average, grades from each term, and if they had to repeat any classes.

- How they perform in tests related to their skills, like coding exams and exams for specific subjects.

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- Project portfolio quality (including project difficulty, activity on GitHub, and the technologies used)
- Soft skills such as communication abilities and performance in practice inter- views
- Internship details like the company's standing, the duration of the intern- ship, and the position the person was in
- Achievements outside of regular studies, like taking part in hack athons or contests
- Current job market information such as
- what skills are in high demand and the typical pay in various fields

4. MATERIALS AND METHODOLOGY

This section provides a clear description of all the materials, data sets, tools, parts, and steps that were used to create, develop, and evaluate the pro- posed machine learning-based Placement Success Prediction System [3].

i. Materials:

Dataset Description The system needs a complete set of data that covers many areas of a student's performance, behavior, and job readiness [9].

ii. Academic Attributes

- GPA for each semester
- Overall Cumulative Grade Point Aver- age (CGPA)
- History of backlogs and whether they have been cleared
- Performance in different types of courses (main subjects vs. optional ones)
- Attendance records

ii. Technical Skill Indicators

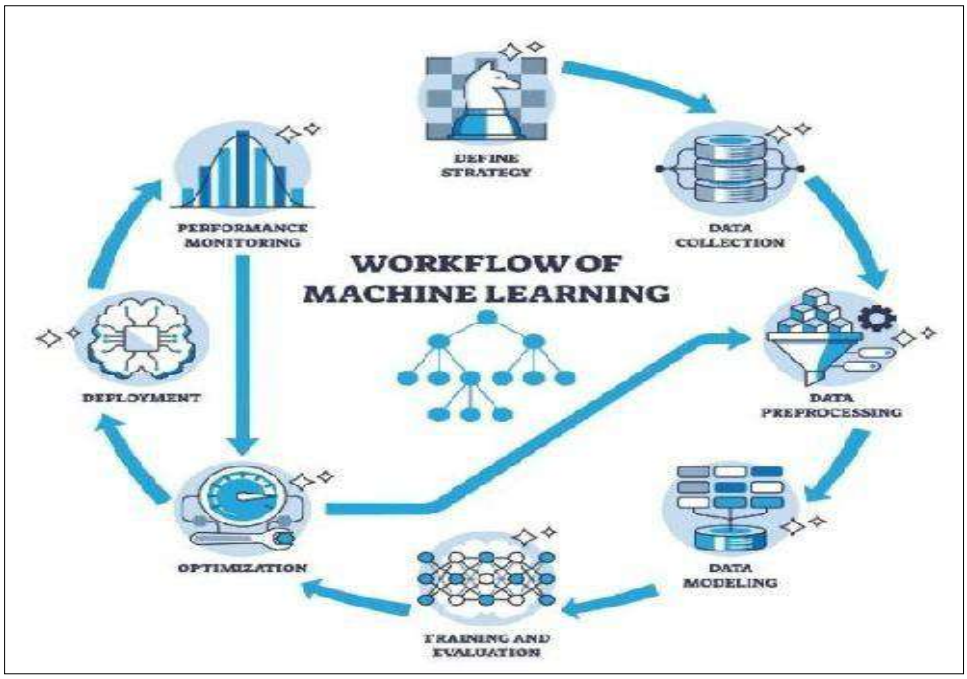
- Scores from coding tests
- Results from exams that focus on particular subjects such as AI/ML, Web Development, and Embedded Systems.
- Metrics from online coding profiles, including the number of problems solved and the level of difficulty of those problems.
- Major academic and personal projects
- Statistics from GitHub, like the number of commits, the technologies used, and how com- plex the projects are

iii. Soft-Skill & Behavioural Features

- Ratings on communication skills
- Mock interview performance
- Group discussion scores
- Leadership and participation in clubs and societies
- Behavioral assessment questionnaires (like how a person deals with problem- solving)

iv. Experiential Learning Indicators

- Number of internships and how long they lasted
- The place or position inside the company where the internship happened.
- Experience from working as a freelancer or in a part-time job.
- Industrial training records



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v. Placement Outcome Labels

Binary label: Placed or Not Placed
Number of job offers received

- Salary package range
- What tier the company is in, such as Tier 1, Tier 2, or Tier 3
- How many days have gone by since the placement season started

a) Software and Tools Used to build the proposed model Python [8]

- Pandas and NumPy for handling and preparing data
- Sci kit-learn is good for simple machine
- For more advanced gradient boosting methods, XG Boost, Light GBM, and Cat Boost are better choices.
- You can use Tensor Flow or PyTorch to create deep-learning models for tabular
- SHAP is a tool that helps explain and understand how our model makes pre- dictions.
- Matplot lib or Plotly are good for making charts and graphs to show results.
- Jupyter Notebook or VS Code is great for running and testing your experiments.
- Fast API or Flask can be used to turn your model into an API for others to use
- My SQL or Postgre SQL is databases where you can say a student information and model results.

5. HARDWARE RESOURCES

Model training and testing were carried out on a system that had at least [2]:

- Processor: An Intel i5 or i7, or a similar type
- RAM: At least 8 to 16 gigabytes
- GPU (not required but helpful): An NVIDIA graphics card for working with transformer models
- Storage: Enough space to store datasets and logs (about 10 to 20 gigabytes)

a) Methodology

The method uses a seven-step process to make sure the system works well and is built on good science [9].

i) Phase1—Collecting Information

Details is collected from different official places, such as:

- Academic Management Systems (AMS)
- Learning Management Systems (LMS)
- Training and Placement Cell databases
- Coding platforms and online test web- sites
- Student resumes and GitHub profile links
- Soft skills assessment tools and practice interview plat- forms

ii) Phase 2 — Cleaning and Preparing the Data

To ensure the model functions properly, the data goes through several key steps [6]:

a) Handling Missing Values

- Filling in missing numbers with average or middle value
- Filling in missing categories with the most common one
- Removing records that have too many missing details

b) Outlier Detection

- Using Z-score and IQR methods to find unusual values
- Detecting outliers with special models
- Checking any strange or incorrect numbers by hand

c) Data Normalization and Scaling

- Using Standard Scaler for numbers that follow a normal pattern
- Using Min Max Scaler for numbers that are not evenly spread out

d) Encoding Categorical Variables

- Using one-hot encoding for things like college branch, internship job title, and company type
- Using label encoding for ordered categories like salary ranges and tech skill levels

6. RESULTS

This section shows the results from testing and using the proposed Machine- based Placement Success Prediction Sytem [8]. The results were checked in several areas like model accuracy, how much each feature contributes, how well the system performs for each group, how easy it is to understand, and how effective the whole system is [9].

a) Dataset Summary and Distribution

After cleaning the data, the final dataset had 1,500 student records. Each record had 45 refined features covering academic, technical, behavioral, and experimental aspects.

- The placement distribution was:
- Placed: 61.7%
- Not Placed: 38.3%

b) Feature Importance and SHAP Analysis

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A key part of the proposed system is its ability to explain predictions using SHAP (Shapley Additive Explanations).

- Technical Assessment Scores
- Project Complexity Index
- CGPA/Academic Stability
- Internship Quality and Duration
- Communication Skill Rating
- Coding Profile Strength

07. DISCUSSION

Discussion goes into detail about these findings, their importance, and how they connect to current research and how institutions operate [9].

c) Understanding Model Performance

When we compare how well different models work, it's clear that more advanced group models, especially XGBoost, do a much better job than older types of models like Logistic Regression, Decision Trees, and Support Vector Machines [20-23].

d) Importance of Features.

The SHAP analysis found that although academic performance (CGPA) is important it isn't the main or strongest factor in predicting placement outcomes.

- Technical assessment scores
- Project complexity and relevance
- Internship quality
- Communication and interview skills are more important.

They care more about skills that can be used right away, real experience from real projects, and how a person acts at work, rather than focusing on exam scores.

Practical Benefits for Institutions

Using the proposed system in real educational environments brings several useful advantages:
It can identify these students well before the placement season begins, which helps in providing support earlier

- Personalized training
- Mentoring
- Mock interviews
- Extra practice materials

8. CONCLUSION

The creation of a machine learning model that predicts placement success shows how using data to make decisions can change education today. This study proves that it's not only possible to predict if a student will find a job with high accuracy, but it's also very useful for schools, students, and training teams. By using in- formation about a student's academic performance, skills, behavior, and experience, the model gives a complete picture of how ready a student is for a job something traditional grades alone can't do. The results show that newer methods like XG Boost work better than older models, giving very accurate and reliable predictions. Also, using SHAP to explain how the model works makes it simpler to understand, which is important when using AI in schools. The model shows that factors like technical tests, project difficulty, in- tern- ship quality, communication skills, and steady academic performance are the most important these are the same things companies look for, proving the model is helpful in real-life situations. From the school's perspective, the model is a helpful way to find risks early on and help students develop particular skills. Students who might not get much attention can get personalized support, which makes them perform better during their placements. Also, school leaders can learn more about typical skill gaps, how prepared students are for real jobs, and how effective the courses are. The system works well, but it also shows areas that need more focus, like needing bigger datasets from many institutions, updating the model often to keep up with changing job markets, and having clear ways to evaluate soft skills. Taking care of these things in future projects will help make the model more scalable and applicable in different situations. In conclusion, the machine learning based placement prediction system shows a big improvement in using artificial intelligence to help with academic and career growth. It proves that by combining detailed data, advanced modeling methods, and clear analysis, schools can greatly improve student success, increase job opportunities, and make their training programs better match what employers need. This study adds value to the field of educational data mining and sets the stage for smarter, more active, and fairer placement systems.

REFERENCES

1. Nutipalli, P., Priyanka, D., Yuktha, L., & Prasanth, P. (2021). Model Construction Using Machine Learning for Prediction of Student Placement. International Journal for Research in Applied Science & Engineering Technology
2. Ruparel, M., & Swaminarayan, P.(2020). Student Placement Prediction Using Various Machine Learning Techniques. International Journal of Innovative Science Kumar,
3. R.S.,Dilsha, F.,Shilpa,A.N., & Sumayya,A.A.(2021).Student Placement Prediction Using Support Vector Machine Algorithm. International Journal of Innovative Research in Electrical, Electronics, Instrumentation.
4. Agrawal, V.S., & Kadam, S. S. (2020). Predictive Analysis of Campus Placement of Students Using Machine Learning Algorithms. Journal of Intelligent Technology and Machine Learning.

ISSN: 2393-9842
https://www.irjcs.com/archives
https://doi.org/10.26562/irjcs.2025.v1212.01

5. Rao, V.N., & Dhanalakshmi, P. (2021). Campus Placement Prediction Using Machine Learning. International Journal of Innovative Science and Advanced Engineering.
6. Kumar, G.,& Cengiz, K. (2021). Predicting College Students' Placements Based on Academic Performance Using Machine Learning. Science Up Journal of Computer Science.
7. Singla, P., & Verma, V. (2020). An Improved Prediction Model for the Placement of Students Considering Various Job Aspects. Journal of Information Science and Engineering Management.
8. Shukla, R.,& Sharma, P. (2019). A Machine Learning Framework for Predicting Student Placement Outcomes. International Journal of Information Engineering.
9. Sharma,A., & Patel, S. (2020). Predicting Student Placement Success Using Random Forest and Logistic Regression Models.
10. International Journal of Advanced Research in Computer Science.
11. Thakur,R.,&Gupta,A.(2021). Stu- dent Placement Prediction Using Ensemble Learning Techniques. Journal of Emerging Technologies in Computer Science.
12. Singh, H.,&Kaur, R.(2020). Feature Selection and Machine Learning for Student Placement Prediction. International Journal of Computer Applications.
13. Reddy,S.,&Kumar,N.(2019).A Comparative Study of Machine Learning Algorithms for Predicting Campus Placement. International Journal of Innovative Research in Technology.
14. V.A.,Patil, A.V.,& Bhalkikar, N.(2025). Predicting Student Placement Using Machine Learning. International Journal of Science & Innovation Engineering.
15. Archana, P., Pravallika, D.,s Sindhu Priya, P., Sushmitha, S., & Amitha, S. (2023). Student Placement Prediction Using Machine Learning. Journal of Survey in Fisheries Sciences.
16. Anusha, P. (2024). Machine Learning for Student Placement Fore- casting: An Empirical Study with ANN and Classical Classifiers.
17. Magray,I.A.,&Sodhi,G.K.(2024). Predicting Student Placement in College Using Machine Learning.
18. G.,K.,Pranitha, Y.,Sanjana, A., Sirisha, D. G., & Mamatha, A. (2021). Smart System for Student Placement Prediction. International Journal of Advance Re- search, Ideas and Innovations in Technology.
19. Rai, K. (2024). Students Placement Prediction Using Machine Learning Algorithms. South Asia Journal of Multidisciplinary Studies.
20. Khamkar, P., Lagad, R., Shinde, P., Londhe, S., & Bhosale, S. S. (2022). Students Placement Prediction System.
21. Agrawal, V. S., & Kadam, S. S. (2023). Predicting Student's Campus Placement Chance Using Machine Learning Algorithms. Inter- national Journal of Advanced Net- working and Applications.
22. Thakar, P., Mehta, A., &Manisha. (2017). Role of Secondary Attributes to Boost the Prediction Accuracy of Stu- dents Employability via Data Mining.
23. Thakar, P., Mehta, A., & Manisha. (2024). Cluster Model for Parsimonious Selection of Variables and Enhancing Students Employability Prediction.
24. Kehinde, A.J.,Adeniyi, A.E.,Ogun dokun,R.O.,Gupta,H.,& Misra,S.(2021). Prediction of Students' Performance with Artificial Neural Network Using Demographic Traits.