Final_Report

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CAMPUS PLACEMENT PREDICTION

Rajiv Gandhi University of Knowledge Technologies
Srikakulam – 523402

Under the Guidance of

Mr. N. Sesha Kumar

Asst. Professor, Dept of CSE

IIIT RGUKT, Srikakulam

Project done by:

S180878 -D.Santhosh

S180805-B.Hymavathi

S180516 -Ch.Tanuja

Campus Placement Prediction Using Machine Learning

A PROJECT REPORT

Submitted in partial fulfillment of requirements to

RGUKT-SRIKAKULAM

For the award of the degree

B.Tech in CSE

By

Team-74
D.Santhosh Kumar(S180878)
B.Hymavathi(S180805)
Ch.Tanuja(S180516)

Department of Computer Science and Engineering,
RGUKT-SRIKAKULAM, ETCHERLA.
April 2023

DECLARATION

I certify that

a. The work contained in this report is original and has been done by us under the guidance of my supervisor(s).

b. The work has not been submitted to any other Institute for any degree or diploma.

c. We have followed the guidelines provided by the University in preparing the report.

d. We have confirmed the norms and guidelines given in the Ethical Code of Conduct of the University.

e. Whenever we have used materials (data, theoretical analysis, figures, and text) from other sources, I have given due credit to them by citing them in the text of the report and giving their details in the references.

f. The work was done in the academic semester period i.e., from April 2023 – JULY 2023.

Date: 17-03-2023,

Place: Srikakulam.

CERTIFICATE

This is to certify that the Documentation Report entitled, "**Campus Placement Prediction**" submitted by **Mr. "D.Santhosh (S180878)", Ms. "B.Hymavathi (S180805)" and Ms. "Ch.Tanuja (S180516)"** to Rajiv Gandhi university of Knowledge Technologies, Srikakulam, Andhra Pradesh, is a record of bonafide Project work carried out by him/her under my/our supervision and guidance and is worthy of consideration for the fulfillment of mini project of Bachelor of Technology in Computer Science and Engineering of the University.

Supervisor	Dept of HOD

Date: 17-07-2023

Abstract

The campus placement prediction system that utilizes machine learning (ML) algorithms, including linear regression, support vector machines (SVM), k-nearest neighbors (KNN), decision trees, random forests, and gradient boosting. The existing system incorporates features such as name, age, percentage, and work experience to predict the likelihood of a student getting placed. The proposed system enhances the prediction accuracy by incorporating additional features such as programming skills, communication skills, participation in hackathons etc. Through the implementation of these ML algorithms, the system analyzes the provided features and predicts the probability of campus placement for a student. Experimental results demonstrate the effectiveness of the proposed system, with significantly improved prediction accuracy compared to the existing system. The outcomes of this study highlight the potential of ML algorithms in predicting campus placements and provide valuable insights for educational institutions and students.

Acknowledgment

"We would like to express my sincere appreciation and gratitude to all those who have supported and contributed to the completion of this mini project.

First and foremost, we would like to express our profound gratitude and deep regards to our guide, **Mr. N. Sesha Kumar**, for their valuable guidance and continuous support throughout the project. Their expertise and insights were instrumental in shaping the direction of the project and ensuring its successful execution. We are extremely grateful for the confidence bestowed in us and for entrusting our project entitled "**Campus Placement Prediction**".

We truly grateful to all the individuals and Institution for their contributions and support. Without their involvement, this mini project would not have been possible. Thank you once again for your valuable assistance and encouragement."

D. Santhosh (S180878)

B. Hymavathi (S18080805)

Ch. Tanuja (S180516)

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CHAPTER-1
INTRODUCTION

1.1 Introduction:

Students studying in the final year of an engineering college start feeling the pressure of placement. They feel the need to know where they stand and how they can improve their skills to chances of getting a job. The main objective to build the system can be helpful to increase progress in student performance. So, students can analyze where they need to improve to secure a good placement in the near future. Placement holds the most important part of a student's life. This system will have a major impact on the performance of the students, resulting in good placements.

This Document presents an overview of the machine learning techniques that can be used to predict a student's placement performance. The ability to predicting the performance of a student is a very essential task of all educational institutions. This project can be used to predict the probability of final year students for the placement. This system uses the machine learning classifier- Logistic Regression, Naive Bayes (NB), support vector machine (SVM), Decision Tree, Random Forest and Gradient Boosting. By leveraging the power of ML, this project aims to provide valuable insights and predictions that can assist students in making informed decisions during the campus placement process. The outcomes of this project have the potential to enhance the efficiency of the placement process, improve student employability, and facilitate better matches between students and potential employers.

1.2 Objectives:

The objectives of this project are as follows:

1. To develop a Machine Learning model that can accurately predict the student placement.
2. Trying various classification Algorithms for efficient feature extraction from huge dataset and capturing relevant patterns for the prediction.
3. Using different Machine learning algorithm can improve the classification performance.
4. Evaluate and compare the performance of the proposed model with individual existing model.
5. To assess the accuracy, precision, recall, and other relevant metrics of the ML model.

1.3 Scope and Limitations:

Scope:

The project focuses on predicting the likelihood of students getting placed within the boundaries of a specific educational institution or campus. The scope is limited to the students within that IIIT campus. Here are some key aspects to consider within this defined scope.

Gather and analyze data specific to the students within the campus, including their profiles, academic records, skills, projects, internships, and any other relevant information. Collect historical data related to placements within the campus. Consider the existing resources, facilities, and support services available within the campus that may influence placement outcomes, such as career counseling, training programs, alumni networks, or industry partnerships. Develop a predictive model specifically tailored to the campus, utilizing the relevant features and data available within the campus context. The model should aim to forecast the likelihood of students getting placed based on the specific characteristics and dynamics of the campus. Evaluation and Validation: Assess the performance and accuracy of the prediction model within the specific campus environment. Validate the model's effectiveness by comparing its predictions with the actual placement outcomes within the campus.

Limitations:

1. Data availability and quality: The accuracy and reliability of the prediction model heavily depend on the quality and availability of the data. Incomplete or biased data can lead to inaccurate predictions.

2. Changing market dynamics: The job market is subject to constant change, with new industries emerging and demand for certain skills fluctuating. Historical data may not fully capture these dynamics, limiting the accuracy of the predictions.

3. Individual variations: Each student is unique, and factors beyond the available data, such as personal attributes, networking, and communication skills, can significantly impact placement outcomes. These factors are often difficult to quantify and include in the model.

4. External factors: Economic conditions, company policies, and industry-specific trends can influence placement outcomes. Incorporating these external factors accurately into the model is challenging.

5. Ethical considerations: Handling personal data and making placement predictions can raise ethical concerns related to privacy, fairness, and bias. It's crucial to address these issues appropriately.

1.4 Literature Review:

In [1] the authors used decision tree, Naïve Bayes and random forest to classify the dataset of campus placed and non- placed students. The accuracy obtained by the decision tree was 82.79%, Naïve Bayes was 84.65% and the random forest was 86.04% in this paper. The Author of this paper take the dataset from Kaggle which contains the attribute gender, percentage, work experience and placement status. This model benefits the placement cell within an institute to recognize the potential students and pay consideration to and advance their technical as well as social abilities. In this paper, the authors proposed some supervised machine learning classifiers which can be utilized to foresee the placement of a student in the IT industry centered on their academic performance in class tenth, twelfth, graduation, and work experience till date in graduation. Numerous factors utilized to associate and examine the outcomes of distinctive established classifiers are accuracy score, percentage accuracy score, confusion matrix, heat map, and classification report. Classification report created through advanced classifiers consists of parameters precision, recall, f1-score, and support.

Predicting student placement class manually by Training and placement is a difficult task. To resolve this problem, The author of [2] used data mining to help predict the student placement. This propose system implements a student placement prediction system which predicts particular student place or not with the help of these three algorithms – SVM, Random Forest and Decision Tree. The most common decision tree algorithms such as ID3, CHAID, C4.5 and CART algorithms were applied on the dataset using the Rapid Miner Tool. The analysis is to figure out the most suitable algorithm for the given dataset. From the result analysis and measurements, they found ID3 algorithm as the one with highest accuracy. This prediction can enlighten students to identify their capabilities and improve accordingly. This system also helps in the academic planning of an institution to prepare proper strategies and improve the placement statistics for the future years.. A prediction system could help in the academic planning of an institution for future years. Several factors contribute to the campus placements for a student both academic and non-academic. Of these, academic achievements, both present and past, soft skills, domain knowledge, area of specialization, socio economic attributes are considered here. The proposed work attempts to build a system which can predict the probability that a student who joins in a college with certain features is going to be placed or not.

CHAPTER-2
FEASIBILITY STUDY

2.1 Existing System:

- Traditional algorithms: The existing system may rely on traditional statistical and machine learning algorithms like logistic regression, decision trees, or support vector machines for prediction.
- Limited data analysis: The existing system might not utilize a wide range of data sources or advanced data analysis techniques, potentially limiting the accuracy of predictions.
- Feature selection: The existing system might not have an automated process for feature selection, leading to the inclusion of irrelevant or redundant features that can impact prediction accuracy.
- Scalability: Depending on the scale of data and complexity, the existing system might face challenges in handling large datasets efficiently.
- Lack of adaptability: The existing system may struggle to adapt to changes in data patterns or new features that become important for prediction.

2.2 Proposed System:

- Advanced machine learning techniques: The proposed system could leverage state-of-the-art machine learning algorithms, such as deep learning models or ensemble methods, to improve prediction accuracy.
- Big data analysis: The proposed system might integrate big data analysis techniques, allowing for the inclusion of a broader range of data sources, leading to more accurate predictions.
- Feature engineering and selection: The proposed system could employ advanced feature engineering and automated feature selection methods to identify the most relevant features, enhancing prediction accuracy and reducing overfitting.
- Scalability and performance: The proposed system might be designed to handle large-scale data efficiently, ensuring it can process a high volume of student and company information during peak placement seasons.
- Real-time updates: The proposed system may offer real-time updates and continuous learning capabilities, allowing it to adapt to changing patterns and provide up-to-date predictions.

Incorporation of new data sources: The proposed system could integrate emerging data sources or trends, such as industry-specific requirements, new job profiles, or evolving job market conditions.

2.3 Functional Requirements:

Functional requirements for campus placement prediction describe the specific features and capabilities that the system should possess to effectively perform the prediction task. Here are some key functional requirements for a campus placement prediction system:

1.Data Collection and Integration
2. Data Preprocessing
3. Feature Selection and Engineering
4. Machine Learning Models
5. Model Training and Evaluation
6. Real-time Prediction
7. Prediction Visualization
8. Scalability
9. Integration with Existing Systems
10. Robust Error Handling

2.4 Non-Functional Requirements:

Non-functional requirements for campus placement prediction are the criteria that specify how the system should perform and the constraints it must adhere to. These requirements focus on aspects such as system performance, reliability, security, and usability. Here are some non-functional requirements for campus placement prediction:

1. Performance
2. Scalability
3. Reliability
4. Security
5. Usability
6. Accuracy and Confidence
7. Privacy and Data Protection
8. Compatibility
9. Integration
10. Ethical Considerations

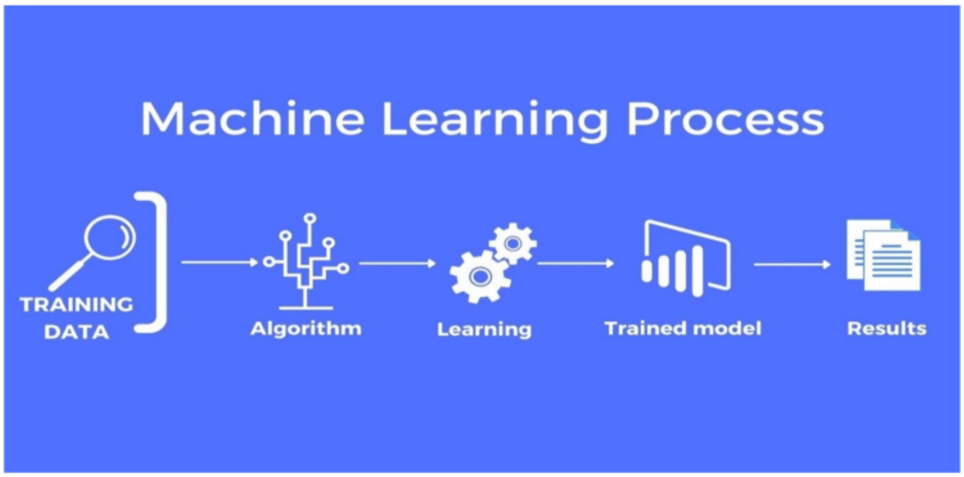
By fulfilling these functional requirements and Non Functional Requiremenra, a campus placement prediction system can effectively assist educational institutions, students, and recruiters in making informed decisions, optimizing the placement process, and achieving successful matches between candidates and job opportunities.

CHAPTER-3
DESCRIPTION

3.1 About Machine Learning:

Machine Learning is the field of study that gives computers the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that makes it more similar to humans: The ability to learn. Machine learning is actively being used today, perhaps in many more places than one would expect.

1.Fig: Description of Machine learning



Types of Machine Learning Algorithms:

Machine learning algorithms can be broadly categorized into several types based on their learning approach and functionality. Here are some common types of machine learning algorithms:

Supervised Learning Algorithms:

- ✓ Linear Regression
- ✓ Logistic Regression
- ✓ Decision Trees
- ✓ Random Forests
- ✓ Support Vector Machines (SVM)
- ✓ Naive Bayes Classifier
- ✓ K-Nearest Neighbors (KNN)
- ✓ Gradient Boosting (including Ensemble Learning)

Unsupervised Learning Algorithms:

- ✓ K-Means Clustering
- ✓ Hierarchical Clustering
- ✓ Principal Component Analysis (PCA)
- ✓ Gaussian Mixture Models (GMM)
- ✓ Apriori Algorithm (Association Rule Learning)
- ✓ Self-Organizing Maps (SOM)

Reinforcement Learning Algorithms:

- ✓ Q-Learning
- ✓ Deep Q-Networks (DQN)
- ✓ Policy Gradient Methods
- ✓ Proximal Policy Optimization (PPO)
- ✓ Monte Carlo Tree Search (MCTS)

3.2 Various Classification Algorithms:

Classification algorithms are widely used in machine learning to categorize or predict the class or category of a given input. Here are some popular types of classification algorithms:

1. **Logistic Regression:** A linear algorithm that models the relationship between the input features and the probability of belonging to a particular class.

2. **Decision Trees:** These algorithms create a tree-like model of decisions and their possible consequences. They split the data based on different features and create a hierarchical structure to classify instances.

3. **Random Forest:** A collection of decision trees where each tree predicts the class, and the final class is determined by voting or averaging the predictions of all trees. It helps to reduce over fitting and improve accuracy.

4. **Support Vector Machines (SVM):** SVM constructs a hyperplane or set of hyperplanes in a high-dimensional space, which can be used for classification. It aims to find the best separating line or surface that maximally separates the data into different classes.

5. **Naive Bayes:** A probabilistic algorithm based on Bayes' theorem, assuming independence among the features. It calculates the probability of each class and assigns the class with the highest probability.

6. **K-Nearest Neighbors (KNN):** KNN classifies a new instance based on the majority vote of its k nearest neighbors in the feature space. It measures the similarity between instances using distance metrics.

7. **Gradient Boosting Algorithms:** Boosting algorithms such as AdaBoost, Gradient Boosting, and XGBoost sequentially combine weak learners (often decision trees) to create a strong predictive model. Each subsequent model corrects the mistakes made by the previous models.

CHAPTER-4
METHODOLOGY

4.1 Problem Statement:

Aim:

The objective of this project is to develop a machine learning model that can predict the likelihood of a student getting placed in a campus placement drive based on various factors such as their academic performance, work experience, and other personal attributes.

Background:

Campus placements are a crucial part of a student's academic journey, especially in the field of engineering. However, getting placed in a good company is not an easy task, as there are various factors that determine a student's chances of success in a campus placement drive. In recent years, there has been a growing interest in using machine learning algorithms to predict the outcome of campus placement drives, based on the data collected from past placement drives.

Objectives:

The main objectives of this project are:

- To collect and analyze data
- To develop a machine learning model
- To evaluate the performance of the machine learning model
- Identify ways to improve its accuracy and reliability

Methodology:

The project will involve the following steps:

- Data Collection
- Data Preprocessing
- Feature Selection
- Model Development
- Model Evaluation
- Deployment

Expected Outcome:

The expected outcome of this project is a machine learning model that can accurately predict the likelihood of a student getting placed in a campus placement drive.

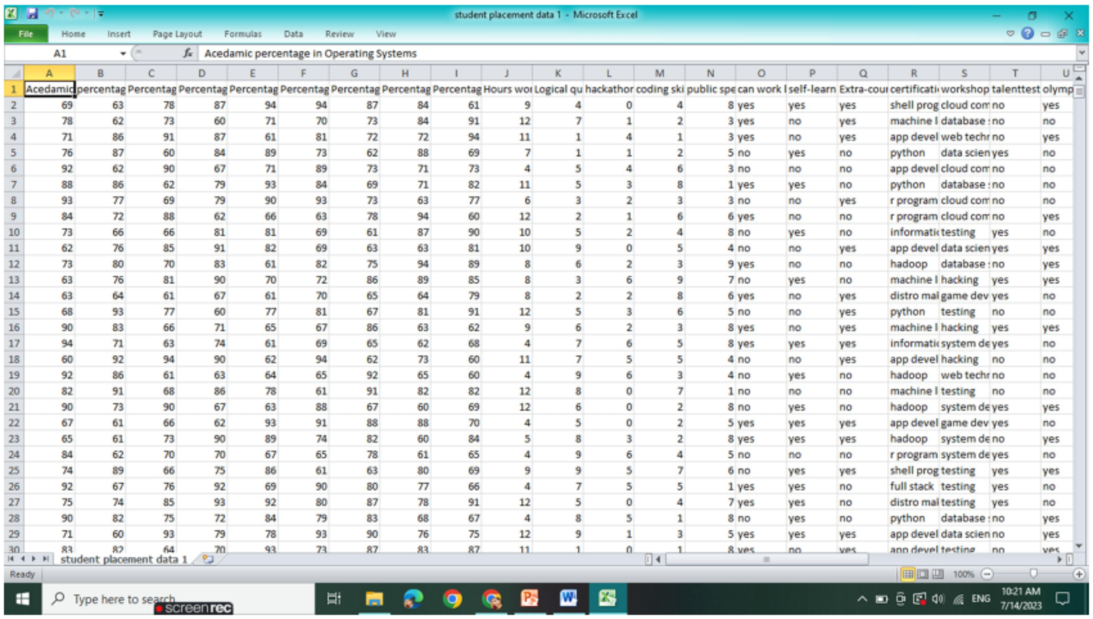
4.2 Implementation:

Methodology for Campus Placement Prediction using Machine Learning:

I. Data Collection:

Gather comprehensive data on students, including academic records, skills, internships, projects, and other relevant attributes. Include placement outcomes i.e., Placement Status.

2.Fig: Student Dataset



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3	78	62	73	60	71	70	73	84	91	12	7	1	2	3	yes	no	yes	machine l	database :	no	no
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6	92	62	90	67	71	89	73	71	73	4	5	4	6	3	no	no	no	app devel	cloud com	no	no
7	88	86	62	79	93	84	69	71	82	11	5	3	8	1	yes	yes	no	python	database :	no	no
8	93	77	69	79	90	93	73	63	77	6	3	2	3	3	no	no	yes	r program	cloud com	no	no
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10	73	66	66	81	81	69	61	87	90	10	5	2	4	8	no	yes	no	informati	testing	yes	no
11	62	76	85	91	82	69	63	63	81	10	9	0	5	4	no	no	yes	app devel	data scien	yes	yes
12	73	80	70	83	61	82	75	94	89	8	6	2	3	9	yes	no	no	hadoop	database :	no	yes
13	63	76	81	90	70	72	86	89	85	8	3	6	9	7	no	yes	no	machine l	hacking	yes	yes
14	63	64	61	67	61	70	65	64	79	8	2	2	8	6	yes	no	yes	distro mal	game dev	yes	no
15	68	93	77	60	77	81	67	81	91	12	5	3	6	5	no	no	yes	python	testing	no	no
16	90	83	66	71	65	67	86	63	62	9	6	2	3	8	yes	no	yes	machine l	hacking	yes	yes
17	94	71	63	74	61	69	65	62	68	4	7	6	5	8	yes	yes	yes	informati	system de	yes	no
18	60	92	94	90	62	94	62	73	60	11	7	5	5	4	no	no	yes	app devel	hacking	no	no
19	92	86	61	63	64	65	92	65	60	4	9	6	3	4	no	yes	no	hadoop	web techr	no	no
20	82	91	68	86	78	61	91	82	82	12	8	0	7	1	no	no	no	machine l	testing	no	no
21	90	73	90	67	63	88	67	60	69	12	6	0	2	8	no	yes	no	hadoop	system de	yes	yes
22	67	61	66	62	93	91	88	88	70	4	5	0	2	5	yes	yes	yes	app devel	game dev	yes	no
23	65	61	73	90	89	74	82	60	84	5	8	3	2	8	yes	yes	yes	hadoop	system de	no	yes
24	84	62	70	70	67	65	78	61	65	4	9	6	4	5	no	no	no	r program	system de	yes	no
25	74	89	66	75	86	61	63	80	69	9	9	5	7	6	no	yes	yes	shell prog	testing	yes	yes
26	92	67	76	92	69	90	80	77	66	4	7	5	5	1	yes	yes	no	full stack	testing	yes	no
27	75	74	85	93	92	80	87	78	91	12	5	0	4	7	yes	yes	no	distro mal	testing	yes	no
28	90	82	75	72	84	79	83	68	67	4	8	5	1	8	no	yes	no	python	database :	no	yes
29	71	60	93	79	78	93	90	76	75	12	9	1	3	5	yes	yes	yes	app devel	data scien	no	yes
30	83	82	64	70	93	73	87	83	87	11	1	0	1	8	yes	no	yes	app devel	testing	no	yes

II. Data Preprocessing:

Data preprocessing is a critical step in the data analysis process that involves transforming raw data into a clean and structured format suitable for further analysis. It encompasses various techniques such as data cleaning, data integration, data transformation, and data reduction. Data cleaning involves removing or correcting any errors, missing values, or inconsistencies in the dataset. Data integration involves combining data from multiple sources into a unified dataset. Data transformation involves converting data into a suitable format, scaling variables, or encoding categorical variables. Data reduction techniques aim to reduce the dimensionality of the dataset while preserving important information. Overall, data preprocessing ensures that the data is reliable, consistent, and ready for analysis, enabling more accurate and meaningful insights to be extracted.

III. Feature Selection:

Feature selection plays a crucial role in campus placement prediction, aiding in the identification of the most relevant and informative variables that significantly contribute to the outcome. It involves the process of selecting a subset of features from the dataset that are highly correlated with the placement status of students. By eliminating irrelevant or redundant features, feature selection helps improve the model's performance, reduces over fitting, and enhances interpretability. Various techniques such as correlation analysis, chi-square test, information gain, and recursive feature elimination can be employed to identify the most influential features. This allows decision-makers to focus on the key factors that impact campus placements, facilitating better resource allocation, targeted interventions, and informed decision-making to enhance overall placement outcomes.

IV. Model Selection:

Model selection is a crucial step in campus placement prediction, as it involves choosing the most appropriate algorithm or model that can effectively analyze the data and make accurate predictions. The goal is to select a model that balances performance, interpretability, and computational efficiency. Commonly used models for campus placement prediction include logistic regression, decision trees, random forests, support vector machines (SVM), and Gradient Boosting. The selection process involves evaluating various models based on metrics such as accuracy, precision, recall, and F1-score, using techniques like cross-validation and train-test splits. The chosen model should have good generalization capabilities, robustness to handle different scenarios, and the ability to capture complex patterns in the placement data. Effective model selection ensures that the campus placement prediction system delivers reliable and meaningful insights, helping institutions make informed decisions to optimize student placements.

V. Model Training and Testing:

The training and validation of a campus placement prediction model involve two key steps to ensure its accuracy and reliability. During the training phase, the model is trained using a labelled dataset containing historical campus placement data. This involves feeding the data into the chosen algorithm or model and allowing it to learn the underlying patterns and relationships between the input features (such as student academic performance, internships, skills, etc.) and the placement outcome (whether a student was placed or not). The model optimizes its internal parameters to minimize the prediction errors and maximize its performance on the training data.

Following the training phase, the model's performance needs to be evaluated on unseen data to assess its ability to generalize and make accurate predictions on new instances. This is done during the test phase. Typically, a separate Test dataset is prepared by splitting the available data into training and testing sets, ensuring that the model hasn't seen the testing data during training. The testing set is then used to assess the model's performance using appropriate evaluation metrics, such as accuracy, precision, recall, or F1-score. This step helps gauge how well the model performs on new data and provides insights into its reliability and potential limitations.

VI. Model Evaluation:

Evaluate the models using appropriate evaluation metrics such as accuracy, precision, recall and F1-score. In addition to overall performance metrics, it is important to analyse the model's performance across different subsets of data, such as different departments, gender, or academic performance levels. This allows for a more granular assessment of the model's effectiveness and the identification of any biases or limitations. **C**ompare the performance of different models to select the best-performing one.

VII. Prediction and Interpretation:

Use the trained model to predict the probability or likelihood of placement for new student profiles. Interpret the model's predictions and identify the key factors that contribute to successful campus placements.

VIII. Model Deployment:

Develop a user-friendly interface where students or placement coordinators can input their profiles and receive placement predictions. Deploy the model in a production environment, ensuring scalability, efficiency, and security.

4.3 Features of new System:

The proposed system is designed in accordance with user requirements to fulfill almost allof them.

- **User Friendly:** The GUI provided in the proposed system is clean and can beaccessed easily.
- **Results can be viewed instantly:** In the proposed system, the user can predict their placement after they enter their details.
- **More accuracy:** The proposed system classifies the Placement status more accurately i.e., it hasapproximately 83%.

CHAPTER-5
RESULT AND ANALYSIS

5.1 Interpretation of Results:

Gradient Boosting is a machine learning technique that builds a predictive model by combining an ensemble of weak learners, typically decision trees, in a sequential manner. It is known for its ability to handle both regression and classification tasks and has achieved great success in various domains, including data analysis and predictive modeling.

This project is a classification problem using inbuilt gradient classifier with 100 estimators, 0.1 learning rate and 42 random states. Finally we got 0.83125 as accuracy.

Figure 3 Visualize Outliers

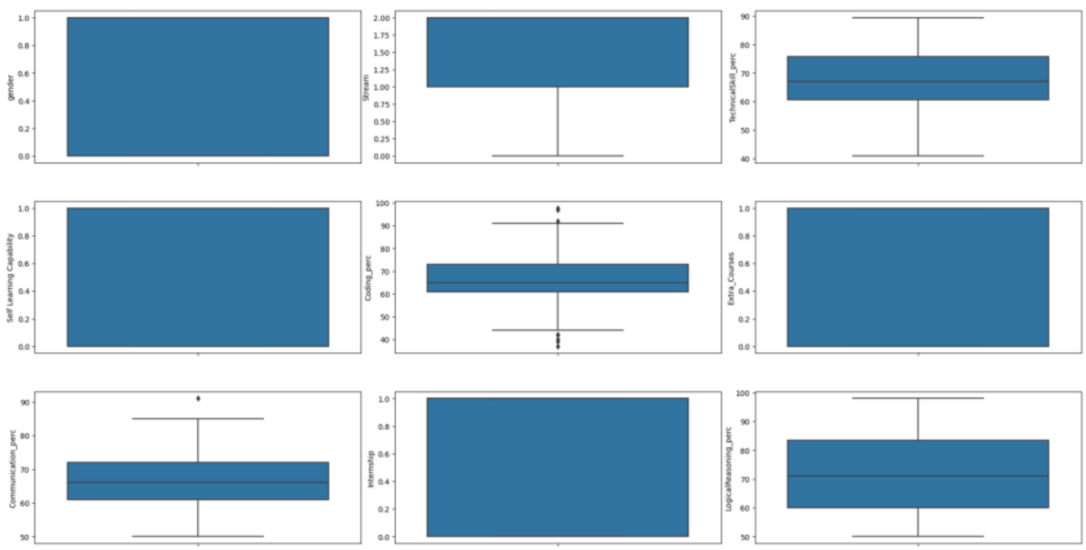


Figure 4 checking distributions of all features

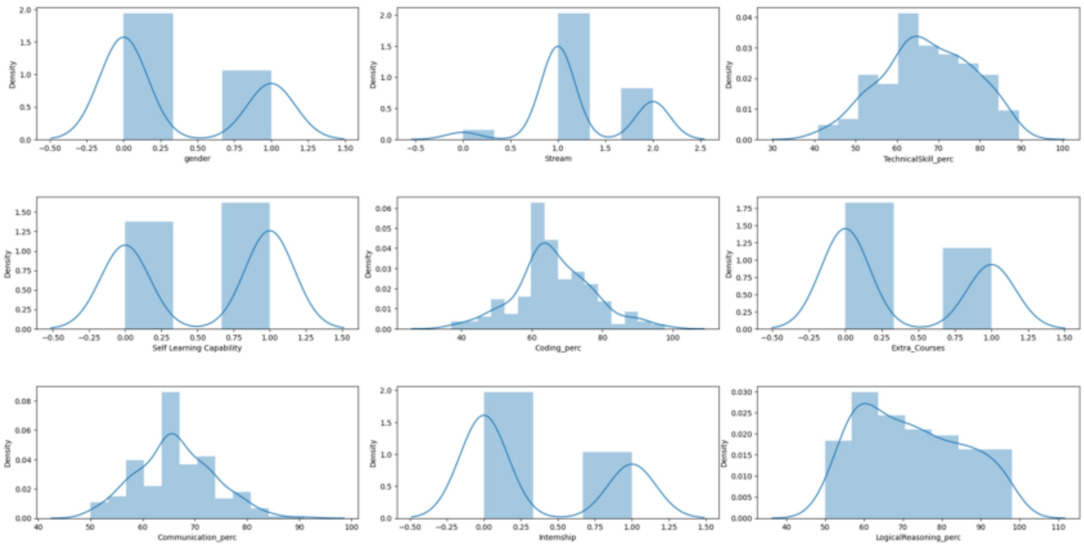


Figure 5 Results

\+ Code + Text

```
[21] gb=GradientBoostingClassifier(n_estimators=100, learning_rate=0.1, max_depth=3)
     gb.fit(X,y)

     ▾ GradientBoostingClassifier
     GradientBoostingClassifier()
```

```
[22] p=gb.predict(new_data)
     prob=gb.predict_proba(new_data)
     if p==1:
         print('Placed')
         print(f"You will be placed with probability of {prob[0][1]:.2f}")
     else:
         print("Not-placed")

     Placed
     You will be placed with probability of 0.79
```

```
from sklearn.metrics import accuracy_score
y_pred = gb.predict(X_test)
score=accuracy_score(y_test,y_pred)
print(score)

0.83125
```

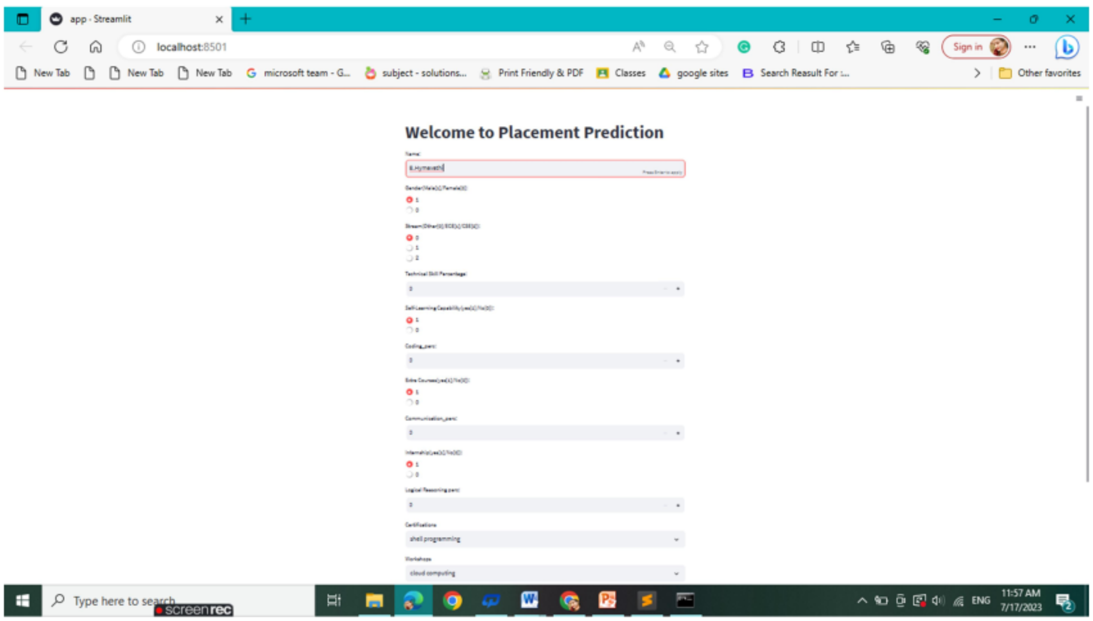
5.2 Metric:

We figured out the confusion matrix for the model. The confusion matrix is a matrix that uses to measure the performance of the machine learning classification techniques. After the training dataset, we measure the model performance with the help of the test dataset. For measuring the performance of the model, we have calculated the accuracy. To evaluate the performance of our model in terms of the metric shown in the following equation.

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+F} \times 100\%$$

5.3 GUI Interface:

Figure 6 GUI Interface



CHAPTER-6
CONCLUSION AND FUTURE WORK

6.1 Conclusion:

In conclusion, predicting campus placements is a challenging task that requires a thorough understanding of various factors such as academic performance, technical skills, aptitude, and interpersonal abilities. While there is no fool proof method to accurately predict individual outcomes, analysing historical data, conducting comprehensive assessments, and considering industry trends can significantly enhance the accuracy of predictions. It is important to recognize that individual success in campus placements depends on a combination of factors, including personal motivation, preparation, and the ability to effectively showcase one's skills and potential during the recruitment process. Therefore, while prediction models can provide valuable insights, they should be used as a tool to guide decision-making rather than as absolute determinants of individual outcomes. Ultimately, students should focus on continuous improvement, networking, and honing their skills to maximize their chances of success in campus placements.

6.2 Future Work:

This model can be further improvised based on the growing competition and can also be proposed in such a way that it can be modified based on particular company's criteria. Later it can further added to the institute website for the students to check their eligibility for the placement preparation.

Reference:

1) Shejwal, P. N., et al. "A Survey on Student Placement Prediction using Supervised Learning Algorithms." *International Journal of Research in Engineering, Science and Management* 2.11 (2019): 2581-5792.

2) Archana, P., et al. "Student Placement Prediction Using Machine Learning." *Journal of Survey in Fisheries Sciences* (2023): 2734-2741.

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