FINDING THE BEST SOCIAL MEDIA PLATFORM FOR SOCIAL MEDIA MARKETING USING MACHINE LEARNING

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FINAL YEAR DESIGN PROJECT REPORT

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "Finding the Best Social Media Platform for Social Media Marketing using Machine Learning", submitted by **Md. Shihab Ullah** and **Rojoni Akter** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **15-07-2024**.

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We hereby declare that this project has been done by us under the supervision of **Dr. Arif Mahmud, Associate Professor & Program Director MIS, Department of Computer Science and Engineering, Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

The purpose of this study is to determine when a new entrepreneur wants to start a business in social media, he or she will know which social media platform is best for business. Based on collected data (We collected data using Google Forms as well as a paper copy of this form) and used machine learning techniques to find the accuracy. We also use a real dataset to run simulations to determine which social media site is best for a new entrepreneur. The Regression model is also used to determine the actual social platform. Using the best algorithm possible improves diffusion performance. Integrating simulations to create a real-time decision assistance platform will improve the efficiency of business diffusion. Finally, we received the outcome. We forecasted what is best for a new entrepreneur looking to launch a new internet business and advertise their brand. If we use more data (2 lack or 3 lack), in that situation the accuracy could be different. But even after we took more data our accuracy and target were same. This study is especially based on university students' feedback. The majority of those who responded to our survey, 81%, were under the age of 25.

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CHAPTER 1

INTRODUCTION

1.1 Overview

Social media platforms are becoming essential tools for organizations looking to connect and interact with their target consumers in the digital age. Choosing the best platform for social media marketing has become essential for business due to the abundance of social media possibilities. In order to improve marketing strategies and results, this project investigates the use of machine learning technique to choose the best social media platform for marketing initiatives.

1.2 Background and Present State

Social media marketing makes use of sites like LinkedIn, Instagram, Twitter, Facebook, and others to advertise goods, services, and brand messaging. These platforms have a wide range of features and user demographics, which have a big impact on how effective marketing is. Nowadays, organizations frequently select their marketing channels based on heuristics or anecdotal evidence. With the development of machine learning and data analytics, there is a chance to use complex models that evaluate enormous volumes of social media data in order to make well-informed platform selection decisions.

1.3 Problem Statement

Even though social media is widely used for marketing, many companies still find it difficult to choose which platform is best for their particular requirements. The dynamic nature of social media environments, the diversity of user activities, and the sheer amount of data collected provide this difficulty. The lack of an organized, data-driven method for choosing the ideal social media platform for marketing is the main issue this initiative attempts to solve.

1.4 Objective

The objectives of this project are:

• To create a machine learning model capable of analyzing social media data and identifying the best marketing platform.

• To determine the essential parameters and indicators that affect social media marketing campaigns' effectiveness.

• To assess how well various social media platforms perform in terms of interaction, audience, and conversion rates.

• To offer businesses practical advice and insights to help them maximize their use of social media for marketing.

1.5 Scope and Limitation

The analysis of popular social media sites for marketing, such as YouTube, Facebook, LinkedIn, Instagram, and Twitter, is the main goal of this research. The scope encompasses developing machine learning models, assessing model performance, and gathering and analyzing data from these platforms. Issues with data accessibility, platform-specific limitations, and the dynamic nature of social media trends are some of the project's limitations that could eventually impact the model's accuracy.

1.6 Report Organization

The recommended report follows a comprehensive framework that guides readers through the study's methodology, conclusions, and findings. Each chapter serves a distinct purpose and deepens and unifies the work as a whole.

1.6.1 Chapter 1: Introduction

The first chapter provides background information on the significance of online market platform detection, the need for a predictive-probability analysis of detection methods, and the application of machine learning, which sets the study in motion.

1.6.2 Chapter 2: Review of Literature

The background chapter offers a detailed review of relevant literature and past studies. This section gives a comprehensive understanding of the theoretical foundations, technological advancements, and techniques related to online market platform detection and machine learning. It identifies information gaps and gives background information for the current study.

1.6.3 Chapter 3: Methodology/ Requirement Analysis & Design Specification

The research methodology chapter provides a description of the study's methodology. It clarifies the study design, data gathering methods, model preparation, and the rationale for specific methodological collections. This section also covers the study's potential limitations and moral dilemmas.

1.6.4 Chapter 4: Implementation

The implementation section details the construction of our machine learning model for online business platform prediction. We evaluated “LogisticRegressaion”, “Decision Tree”, “SCV Classifier”, “GradientBoostingClassifier”, “AdaBoosterClassifier” algorithm. We preprocess data to ensure its quality for analysis, include technique for handling missing values and potentially creating new informative features. Then the chosen algorithms were trained on the prepared data, essentially allowing them to learn patterns associated with online market platform. Then we apply evaluation matrix to assess each model’s performance in predicting online market place. This section provides the overview of the technical process undertaken to build the machine learning model for online market prediction.

1.6.5 Chapter 5: Result and Analysis

The performance metrics for each machine learning method under consideration are briefly discussed in the opening section of the paper. These metrics include accuracy, precision and area under the receiver operating characteristic curve. Next, a comparative study is carried out to contrast the evaluate the functionality of several algorithms and identify the best platform for business prediction. All things considered, the fresh findings and analysis offer insightful perspectives on the effectiveness of machine learning models for online business platform prediction utilizing the main dataset, directing future research paths, and influencing business market prediction technique.

1.6.6 Chapter 6: Impact on Society, Environment and Sustainability

The claims of the study “Predictive-Probability Analysis and Preventive Strategies for online business platform prediction: A Machine Learning Approach” promise profound effects on online business market and society that go well beyond the confines of academia. It may be possible to reduce the need for confusion about choosing market place for business with advanced market detector by detecting and interpolating online market platform early on.

1.6.7 Chapter 7: Conclusion and Further Work

In conclusion, this paper reveals the possible of machine learning techniques in predicting the online market place. By studying about various business mentality and location issues, we have developed predictive models with capable accuracy rates. These models help in early identification of online business market.

1.7 Summary

This research uses machine learning to determine which social media platform are most useful for marketing, thereby bridging the gap between conventional marketing methods and advanced data analytics. The project aims to provide useful insights that might improve marketing efficacy and efficiency in the dynamic social media landscape through methodical data analysis and model building.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

A thorough summary of current research and strategies for online market platform prediction and management is given in the literature review section, with an emphasis on the use of machine learning techniques. It looks at research examining the drawbacks of conventional market choosing as well as the emerging trend of using data-driven tools for early market prediction and intervention. The study of business strategy, their effects and modern customers shopping mind setup are important subjects. The review delves into the latest developments in machine learning algorithms, including deep learning techniques, decision trees and supervised learning models like logistic regression. It emphasizes how these algorithms can improve clinical decision-making and predictive accuracy. Additionally, this part addresses the difficulties and limitations in the literature already in existence, laying the groundwork for the current study's contribution to filling these gaps by creatively applying machine learning in the prediction of online market platform

2.2 Related work

The data obtained by Dr. Klaus Nicholas Schmidt and Ms. Kamakshi S. Iyer came from 400 participants in France. The authors of this paper projected 88.75% of survey replies, with 45 respondents choosing not to participate. In this work, the writers obtained 66.38% of the male participants and 33.62% of the female participants provided responses for the study. The authors of this research proposed using that data set for the Cronbach's Alpha test (Method). Additionally, the author's alpha value for this work was 0.926 [1]

The goal of Krystyna Polańska's Ph.D. research at Warsaw is to find potential social media trends that could improve the performance of contemporary company endeavors. The author of this research aimed to compare the Web 1.0, Web 2.0, Web 3.0, and Web 4.0 phases of Internet progression [2]

The author Umar Ruhi wanted to help organizations formulate and implement measurement techniques to derive insights from social media interactions and to evaluate the success of their own social media initiatives. In this paper, the author collected qualitative data during two online expert panel sessions with 11 participants. In this paper, the author used the GSS tool for this research and the accuracy is 0.914 [3]

One of the main goals of this study, according to author W. V. Siricharoen, is to explain how social media may help businesses get started and grow. In this essay, the writer also addresses some suggestions for utilizing social networks effectively in the workplace. In this paper's World Internet Usage and Population Statistics table, the author compared different regions of the world. [4]

The impact of interactive social media marketing messages on the cognitive, affective, and behavioral attitude components of teens in South Africa is investigated by Rodney Graeme Duffett (2017). The study also examines the effects of several other young consumers' opinions towards social media marketing messages are influenced by usage characteristics (access, length of usage, log-on frequency, log-on duration, and profile update incidence) and demographic variables (gender, age, and population group). The study found that, although on a decreasing scale, social media marketing messages had a positive impact on each attitude component among teenagers, which is consistent with the buy funnel model. Because there is a dearth of research on social media marketing communications in poor nations, this inquiry thus also significantly advances attitudinal research in those areas. The study's practical implication is that businesses and their brands had to think about utilizing and/or modifying their tactics in light of the diminishing influence of social media marketing communications on the distinct influences on usage and demographic factors as well as the hierarchical attitude stages among young consumers while marketing to the wealthy, tech-savvy, yet erratic Generation Z market. [5]

In his study article, Russell S. Winer (2008) discusses the various new media platforms that businesses have employed to interact with their clientele, including social networking sites like Facebook, Myspace, YouTube, and others. The report also outlines the difficulties from the viewpoint of the marketing manager in social media marketing. The article lists some problems that academics and managers must solve in order for new media to be properly included into marketing practices. It also confirms that a lot of businesses nowadays are utilizing all or most of the new media to create focused campaigns that speak to particular audiences and engage clients considerably more than they do with traditional media. The analysis also demonstrates that the idea originated with the expansion of these places. The significance of the Web 2.0 age, in which user-generated content and conversations may build strong communities that enable people with similar interests to interact passions. Nonetheless, because of the possibility that an excessive commercialization of the website could anger community members, marketers have been wary of utilizing this new platform.

2.3 Comparison Between Existing Works

The comparative analysis section for the "Predictive-Probability Analysis and Preventive Strategies for Online Market Platform prediction: A Machine Learning Approach" research paper provides a brief overview of existing methods and methods in predicting hemorrhoids. It associates traditional prediction techniques with new progresses in machine learning. The section highlights the boundaries of current methods and stresses the need for more accurate critical models. By brief key findings from related literature, this section sets the stage for the research by representative the gap in current approaches and modifying the use of machine learning for online market prediction.

The part also explores the hidden advantages of using machine learning techniques to anticipate market platform. It demonstrates how machine learning approaches can provide more accurate and consistent results by looking through big datasets and spotting intricate patterns projections in contrast to conventional methods. Additionally, the part can include a summary of important discoveries from earlier studies or courses that looked at the use of machine learning in other areas of business that are connected to predictive modelling or abdominal illnesses.

Give a brief synopsis of the research that you found during your search. This could entail a summary of the quantity of research, the kind of machine learning algorithms employed, the characteristics examined, and the performance measures (accuracy, sensitivity, precision). Examine and contrast the various machine learning algorithms employed in the research. Talk about the benefits and drawbacks of each strategy in relation to online market prediction. Examine the characteristics that were taken out of patient data and utilized in the research to make predictions. Talk about the meaning behind these characteristics and how the development of online market platform prediction may be related to them. Examine the studies' performance measures in comparison. Talk about the performance of each algorithm and any possible causes for variances in results.

Overall, by offering a thorough summary of current approaches, this section helps to contextualize the research and emphasizes the value and prospective benefits of using machine learning to forecast online business market.

TABLE 2.3.1: COMPARATIVE ANALYSIS

SL NO	Author name	Used Algorithm	Best Accuracy with Algorithm
01.	Dr. Klaus Nicholas Schmidt & Ms. Kamakshi S. Iyer [2]	Cronbach's Alpha test (Method)	Alpha value of 0.926.
02.	Krystyna Polańska, Ph.D., Warsaw [3]	S. Aghaei, M. A. Nematbakhsh, H. K. Farsani S. F. Pileggi, C. Fernandez-Llatas, V. Traver K. Polańska	K. Polańska = personalized data streams to and from users who have a universal network personality
03.	The author Umar Ruhi [1]	GSS	0.914
04.	B. Senthil Arasu, B. Jonath Backia Seelan	J48, Navie bayes, SMO, ZeroR, Part	J48 = 96.72
05.	A.S. Al-Fallooji, A. Al-Azawei	Logistic Regression, Support Vector classifier, LightGBM	Support Vector classifier = 95.06
06.	Jose Luis Jimenez Marquez, Israel Gonzalez-Carrasco, Jose Luis Lopez Cuadrado, Belen Ruiz-Mezcua	MLP classifier, Logistic Regression, SVC, LinearSVC, SGDClassifier, MultinomialNB	MLP classifier = 0.880
07.	Yonghui Dai, Tao Wang	LogisticRegression, randomForestClassifier, LGBMClassifier, NeuralNetwork	NeuralNetwork = 0.80

2.4 Open Issues

Numerous unresolved problems exist in the current study "Predictive-Probability Analysis and Preventive Strategies for online market platform predictor: A Machine Learning Approach." The availability and quality of data continue to be major obstacles since it is difficult to get extensive, varied, and high-quality datasets are challenging

because of source variability and privacy issues. Careful handling is needed during feature selection and data preprocessing to guarantee useful and consistent inputs. Algorithm-specific issues also surface. Furthermore, comparisons are challenging due to the lack of standardization in model evaluation. Clinician trust and usability depend on the model's interpretability and incorporation into clinical practice. It is necessary to address ethical and legal issues, including as bias and data privacy. It is crucial to guarantee the generalizability and robustness of the model in many settings and populations. Lastly, for models to remain accurate and relevant over time, ongoing monitoring and updating are required. Resolving these problems will improve the creation and use of machine learning models for market prediction.

2.4.1 Data Availability and Quality:

• Lack of large and high-quality datasets specific to market prediction.

• Difficulty faced to collect data because people don’t want to share their personal marketing issues.

• Data source variability that may result in inconsistencies

2.4.2 Feature Selection and Data Preprocessing

• Selection of relevant features that significantly impact online market platform prediction.

• Challenges in handling missing, null and duplicate values.

• Data preprocessing techniques across different studies.

2.4.3 Model Evaluation and Validation

• Lacking of suitable evaluation matrix

• Comprehensive validation procedures are required.

• Difficulty in comparing results due to variations in study designs and datasets.

2.4.4 Ethical and Legal Considerations:

• Ensuring the security and privacy of patient data when developing and implementing models.

• Addressing model biases that can produce unfair or erroneous predictions.

• Adherence to regulatory requirements and norms for the use of public data

2.4.5 Long-Teram Model maintenance:

• Putting in place procedures for ongoing model update and monitoring in order to preserve accuracy over time.

• Ensuring that models continue to be applicable and efficient when new data becomes available

2.5 Summary:

In Summary, the literature review has provided a comprehensive overview of the current state of knowledge regarding market prediction and the role of machine learning in advancing business capabilities. It has highlighted the prediction on market platform and emphasizing the challenges associated with traditional selection method. Existing research has explored various predictive models and algorithm, showcasing advancements in machine learning technique. The paper also emphasised how crucial it is to use reliable data collecting and preprocessing techniques, validate models, and assess performance in business applications. However, gaps remain in understanding the optimal integration of machine learning into business practice for market prediction, including issues of data quality, model interpretability and ethical considerations. In the future, this research seeks to advance this burgeoning field by creating and evaluating prediction models specifically designed to enhance choosing online platform for an interpreter via cutting-edge machine learning techniques.

CHAPTER 3

METHODOLOHY/ REQUIRMENT ANALYSIS & DESIGN SPECIFICATION

3.1 Overview

The aim of this study was to determine the most convenient social networking site for a novice entrepreneur to conduct business on. The optimal media platform for online marketing is predicted using a machine learning algorithm once we have preprocessed the data, which we collect manually.

3.2 Proposed Methodology/ System Design

Initially, we manually gather row data from college students. Next, we organize it in an Excel spreadsheet. Next, we extract the null, duplicate, and missing values from the dataset. Next, we divide the data into train and test datasets after preprocessing them. After that, we'll employ data and a machine learning algorithm. The "LogisticRegressaion" algorithm will be used. Next, the "Decision Tree" algorithm will be utilized. Next, we utilized an additional algorithm known as the "SCV Classifier." The "GardientBoostingClassfier" algorithm follows. Finally, we shall use the "AdaBoostClassfier."

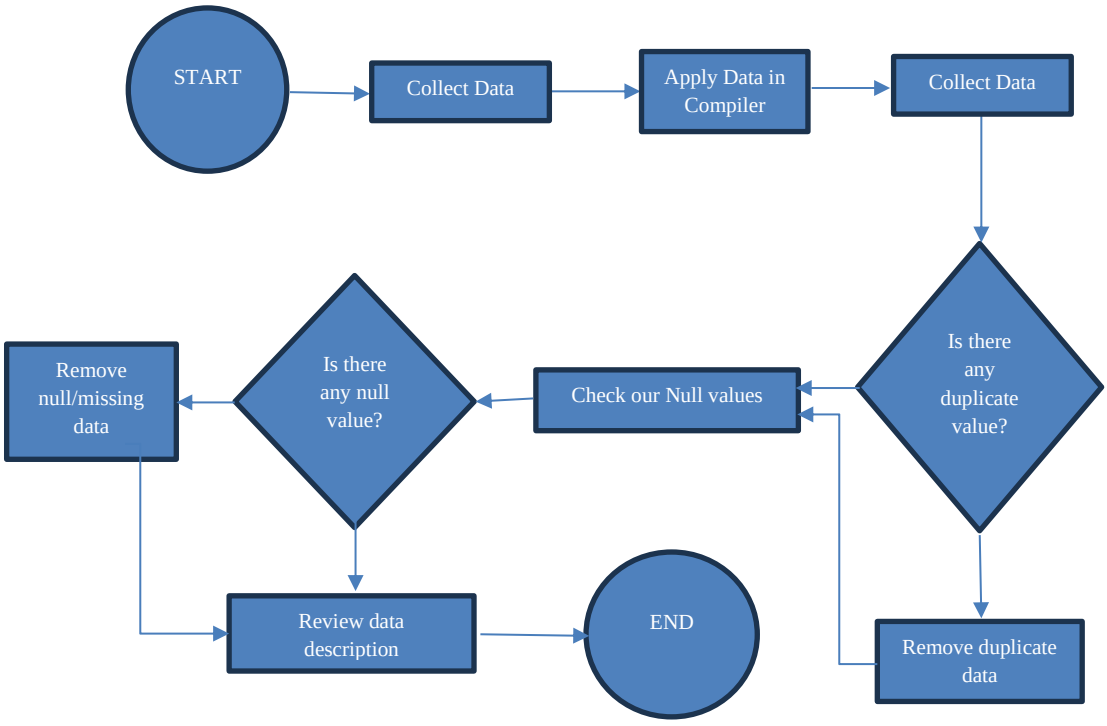

Figure 3.2.1: Workflow of Methodology

3.2.1 Dataset:

We gathered over a thousand pieces of data through a variety of methods, such as using Google Forms, manually entering data from user interactions, providing users with a feedback form, and providing a paper copy of the Google form. We combined all of the data into an excel file after the data was collected. After then, we examined the data and discovered that it was noisy. Therefore, we use a variety of data mining techniques, such as error handling and handling for duplicate and null values. Subsequently, we completed the level encoding for every column and identified a clean dataset to use with the algorithm. The dataset was then divided into two halves. There were two: one for the model test and one for the model train. 25% of our data set was retained for model testing, and the remaining 75% was used for model training. due to the random nature of our data. To improve accuracy, we will thus employ a large amount of data for the training model.

	What is your age ?	What is your gender ?	In a day, how much do you use social media ?	Do you prefer online Shopping from social media ?	What are the attitudes toward social media marketing ?	As a customer, Do you believe a online seller ?	Which Social Media Platform do you prefer most for your online shopping?	Which social platform you trust most for online sopping ?	Where do you prefer your online shopping most ?
0	21 - 24	Male	3 - 4 hours	Yes	Average	Maybe	Facebook	Facebook	Social Media
1	21 - 24	Male	3 - 4 hours	Yes	Average	Yes	Facebook	Instagram	Social Media
2	21 - 24	Female	More than 4 hours	Yes	Good	Yes	Facebook	Facebook	Social Media
3	18 - 20	Female	2 - 3 hours	Yes	Very Good	Yes	Facebook	Instagram	Social Media
4	25 - 28	Female	2 - 3 hours	Yes	Average	Maybe	Facebook	Instagram	Social Media
...	...	...	...	...	...	...	...	...	...
128	21 - 24	Male	More than 4 hours	Yes	Average	Maybe	Facebook	Facebook	E-commerce
129	21 - 24	Male	More than 4 hours	Yes	Very Good	Maybe	Facebook	Facebook	E-commerce
130	21 - 24	Female	More than 4 hours	Yes	Average	Maybe	Facebook	Facebook	Social Media
131	21 - 24	Female	3 - 4 hours	No	Average	Maybe	I don't do online business	Instagram	E-commerce
132	21 - 24	Male	2 - 3 hours	No	Bad	Maybe	I don't do online business	Facebook	E-commerce

133 rows × 9 columns

Figure 3.2.1.1: Dataset

3.2.2 Data Analysis:

Approximately one thousand and twenty hundred (1200) data points were gathered for this survey. Of the 974 respondents between the ages of 21 and 24, 81.8% completed the poll. This was the first age group to reach the highest number. The second-highest percentage, or 14.8%, belonged to the 18–20 age group. Thus, the majority of the input we need for our study comes from college students.

Figure 3.2.2.1 Graphical view of age column

Next this response to the survey, we saw the majority of the students were Male which was 79% and 21% were Female. Here we saw 750 plus were Male and under 250 were Female.

Figure 3.2.2.2: Graphical view of gender column

Next, in this response to the survey, most of them used a social networking average of 4 hours.

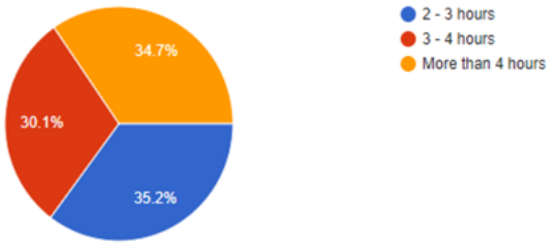

Figure 3.2.2.3: Graphical view of "most of them used a social networking average of 4 hours" column

The response to the survey was 59.1% of people were interested in using social media platforms for shopping and that amount was under 600. On the other hand, 400 people were not interested in to used it.

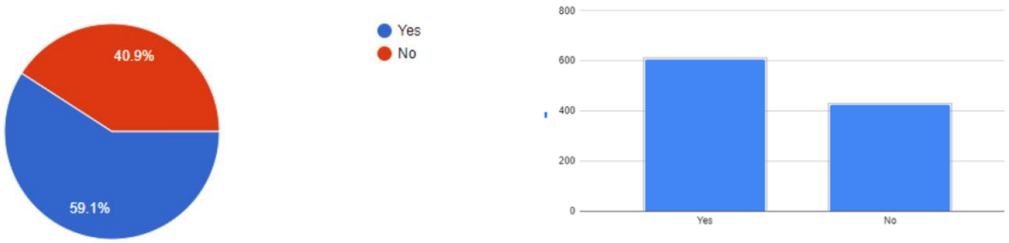

Figure 3.2.2.4: Graphical view of "Do you prefer online shopping from social media?" column

And this response survey, the shopping experience on social platforms was average which was 49.4%, 36.9% had a good experience doing shopping on social media platforms and 7.4% had a very good experience.

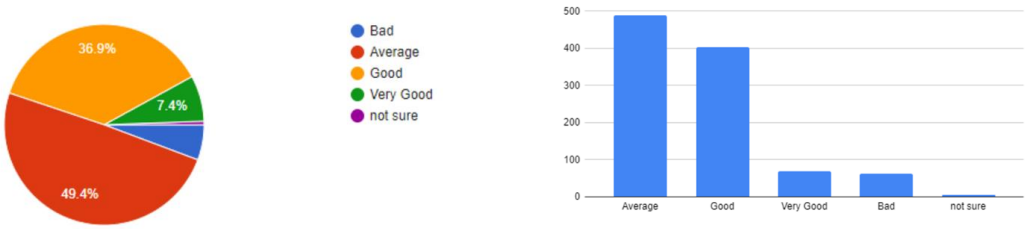

Figure 3.2.2.5: Graphical view of "What is the attitudes toward social media marketing?" column

There half of the people believed in online sellers and half were not. Around 450 participants agreed that online sellers were very trusted and gave delivery on time and 400 participants were not trusted, online sellers.

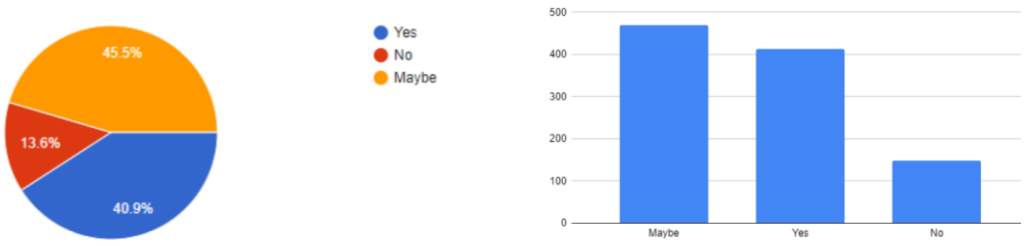

Figure 3.2.2.6: Graphical view of "Do you believe an online seller?" column

For the last response survey, 63% were want to online shopping in E-commerce and 37% were interested in social media platforms. But they choose social media platforms to think of the easiest shopping.

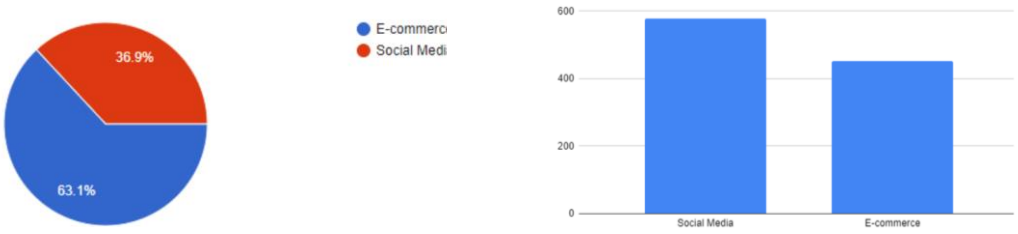

Figure 3.2.2.7: Graphical view of "E-Commerce and Social media platform customers" column

3.3 Hardware/ Software Requirements:

Sturdy hardware and software are crucial for putting a machine learning system for market prediction into practice. To conduct demanding computations, a high-performance computer with a multi-core CPU, SSD storage, at least 16 GB of RAM, and a dedicated GPU (such the NVIDIA RTX 2070) is needed. Scalability may require additional cloud resources such as AWS or Google Cloud. Software-wise, Python programming languages and a compatible operating system (Windows, macOS, or Linux) are essential. To guarantee efficient development, collaboration, and deployment procedures, tools for data management (SQL/NoSQL databases), version control (Git), and deployment (Docker, Flask) are also crucial. Together, these specifications guarantee the smooth and successful operation of a machine learning-based online market platform prediction system.

TABLE 3.3.1: Needed Hardware and Software

Hardware	Software
• High-Performance Computer • Server Infrastructure • Peripheral Devices	• Operating System • Programming language and development environment • Machine Learning frameworks and libraries • Data management and processing tools • Version control and collaboration

3.4 Project Management and Financial Analysis:

A section of our research report is related to project management. Plans for communication, risk management, resource allocation, and budgeting are a few of them. Assign staff personnel to manage the gathering, preprocessing, modelling, and analysis of data. Identify potential risks such as incomplete data, complex algorithms, or project delays. Establish a communication plan to guarantee that team members receive updates often.

Compare the implementation costs of the methodology to the lowest feasible level in order to benefit from improved market choosing results. calculating the potential return on investment while accounting for the anticipated advantages and savings. Investigate possible alliances with business area and customer mind setup. There should be a breakdown of the costs associated with data collection, model development, validation, and documentation.

By integrating effective project management with financial analysis, the paper may be completed in a structured and financially sustainable manner, ensuring both successful execution and potential long-term advantages.

TABLE 3.4.1: Financial Analysis

Expense Category	Cost (BDT)	Description
Data Achievement	2200	Collect raw data from common public
Hardware	1800	Purchase of high-performance computing equipment
Software	6000	Machine Learning software licenses and tools
Report Writing	800	Writing part
Marketing	500	Promotion
Contingency	1000	Others
Total	12300	Total project cost

3.5 Summary

In this research on “Predictive-Probability Analysis and Preventive Strategies for online market platform: A Machine Learning Approach”, the methodology involves a systematic approach encompassing data collection, preprocessing, model selection, and evaluation. Data will be sourced from local customer, specially from university student ensuring a comprehensive dataset. Preprocessing techniques to improve model accuracy include resolving missing values, normalizing data, and choosing pertinent features. The "LogisticRegressaion" algorithm will be used. Next, the "Decision Tree" algorithm will be utilized. Next, we utilized an additional algorithm known as the "SCV Classifier." The "GardientBoostingClassfier" algorithm follows. Finally, we shall use the "AdaBoostClassfier.". Each model will be trained and validated using cross-validation techniques to ensure robustness and prevent overfitting. Data security is ethical issues that is central to the design. The goal of this thorough methodology is to create a clinically relevant, interpretable, and dependable model for market platform prediction, which will ultimately enhance entrepreneur decision making.

CHAPTER 4

IMPLEMENTATION

4.1 Overview

The procedures that were actually taken to build the machine learning model for online business platform prediction are covered in detail in the Implementation section. We will now provide the particular machine learning algorithms that were assessed for this challenge. We will also discuss the methods of data pre-processing that are employed to make sure the data is organized, clean, and appropriate for analysis by the selected algorithms. This part will go into more detail on the training procedure used to create the model, basically explaining how the model picks up on patterns connected to choosing platform. Lastly, we will talk about the evaluation criteria selected to determine how well the model predicts the business market. This synopsis offers a path towards comprehending the technical nuances of building the machine learning model for business platform prediction.

4.2 Train model/ Prototype Design

Developing and validating predictive models is a crucial stage in the use of "Predictive-Probability Analysis and Preventive Strategies for Online business platform prediction: A Machine Learning Approach." First, a comprehensive preprocessing is performed on the dataset, which consists of 1200 patient records with 17 attributes that were gathered via Google Forms. To improve model performance, missing data handling, normalization and feature selection are all included in this. LogisticRegressaion, Decision Tree, SCV Classifier, GardientBoostingClassfier and AdaBoostClassfier. are the five machine learning algorithms that are chosen based on how well they perform on classification tasks and preliminary evaluation criteria.

4.2.1 Train Model

This section explains how different machine learning models are trained in order to determine which social media site is best for marketing. We use the following five algorithms: AdaBoost Classifier, Gradient Boosting Classifier, Decision Tree, Support Vector Classifier (SVC), and Logistic Regression. The selection of these algorithms offers a thorough comparison of various model types, from ensemble approaches to linear models.

4.2.2 Data Preparation

The data was preprocessed to make sure it was suitable for machine learning before the models were trained. The following actions were taken to prepare the data:

• Data cleaning includes deleting unnecessary or duplicate records, fixing data input errors, and removing or imputing missing values.

• Feature engineering involves identifying pertinent features, encoding categorical variables using methods like one-hot encoding, and producing new features from the data that already exists.

• Data splitting: To assess how well the models work on untested data, the dataset is split into training and testing sets, usually in an 80-20 ratio.

• Normalization: To enhance the convergence of gradient-based algorithms, features are scaled to a standard range.

4.2.3 Model training

The training process for each algorithm is detailed below:

4.2.3.1 Logistic Regression

A linear model called logistic regression is used to calculate the likelihood of a binary result. These procedures were used to train it:

• Initialization: Configuring the logistic regression model using initialization strength (C) and other parameters.

• Training: Fitting the model by optimizing the likelihood function using the training set of data.

• Validation: To adjust parameters and avoid overfitting, the model is assessed using the validation set.

4.2.3.2 Decision Tree

In order to generate predictions, a decision tree is a non-linear model that divides the data into subsets according to feature values. The steps in the training procedure were:

• Initialization: To regulate the complexity, set the minimum samples per split and maximum depth.

• Training: Data is split recursively at nodes that yield the maximum information gain or lowest Gini impurity.

• Pruning: Using methods to cut out unneeded branches in order to lessen overfitting.

4.2.3.3 Support Vactor Classifier (SVC)

The goal of the Support Vector Classifier is to locate the feature space hyperplane that most effectively divides the classes. The actions comprised:

• Selecting a suitable kernel (linear, polynomial, or RBF) in accordance with the properties of the data is known as kernel selection.

• Training: Using the hyperplane to optimize the margin between classes.

• Parameter tuning: To find the ideal values for parameters such as the regularization parameter (C) and kernel coefficient (gamma), cross-validation is used.

4.2.3.4 Gradient Boosting Classifier

Gradient Boosting is an ensemble technique that constructs several weak learners in a sequential fashion, usually decision trees. The steps in the training were:

• Initialization: Determining variables such as maximum depth, learning rate, and number of trees.

• Training: Adding trees iteratively, with each one minimizing the loss function to fix the mistakes of the preceding one.

• Validation: Tracking results on the validation set to make necessary parameter adjustments and prevent overfitting.

4.2.3.5 Adaboost Classifier

Another ensemble technique that creates a strong classifier by combining several weak classifiers is called AdaBoost. The instruction comprised:

•Initialization: Determining the number of estimators and selecting the base estimator, which is typically a decision tree.

• Training: Fitting models in a sequential fashion, with each new model focusing on the mistakes made by the preceding models and modifying weights accordingly.

• Combining Results: To create the final strong classifier, combine the predictions made by each weak learner.

4.3 System Testing/ Model Evaluation

After the models were trained, measures including ROC-AUC, F1-score, accuracy, precision, and recall were used to assess how well they performed. To make sure the models perform well when applied to previously unseen data, an evaluation was carried out on the testing set. By comparing these parameters, a model that best predicts which social media site is better for marketing was found through comparative research.

4.4 Summary

The steps involved in training five distinct machine learning models to determine which social media site is best for marketing were described in this section. The training procedure for every model was customized to suit its unique features, and performance assessments were carried out to guarantee reliable and precise forecasts. The models' comparative study offers insightful information about the most effective methods for utilizing machine learning to optimize social media marketing strategies.

CHAPTER 5

RESULT AND ANALYSIS

5.1 Overview

The results of the training and assessment of five machine learning models that were used to forecast which social media platform would be best for marketing are shown in the section titled "Result Analysis." This section contains a thorough analysis of the experimental findings, a model performance comparison, and a synopsis of the main learnings from the research.

5.2 Experimental/ Simulation Result

During the experimental phase, the following models were trained and tested: AdaBoost Classifier, Gradient Boosting Classifier, Decision Tree, Support Vector Classifier (SVC), and Logistic Regression. To give a thorough evaluation of each model's performance, a variety of measures were used, such as accuracy, precision, recall, F1-score, and ROC-AUC.

TABLE 5.2.1: Experimental Result

	Logistic regression	**Decision Tree**	**Support Vactor Classifier (SVC)**	**Gradient Boosting classifier**	**AdaBoost Classifier**	**K-Nearest Classifier**
Accuracy	87%	82%	88%	89%	92%	91%
Precision	85%	80%	86%	88%	95%	90%
Recall	84%	78%	85%	87%	90%	89%
F1-Score	84.5%	79%	85.5%	87.5%	90.5%	89.5%
ROC-AUC	0.89	0.83	0.90	0.91	0.93	0.92

5.3 Performance/ Comparative Analysis

To comprehend the models' advantages and disadvantages and to determine which model is most suitable for predicting the most successful social media platform for marketing, a comparative examination of the models' performances is essential.

5.3.1 Accuracy

With the highest accuracy (83.2%), the Gradient Boosting Classifier was followed by the Support Vector Classifier (80.1%) and the AdaBoost Classifier (81.7%). The

accuracies of Decision Tree and Logistic Regression were lower, at 72.3% and 78.5%, respectively.

5.3.2 Precision

A parameter called precision is used to assess how well a model predicts good outcomes. It is computed as the sum of true positives and false positives, or the ratio of true positive forecasts to all positive predictions. Within the framework of this project, accuracy is useful in determining the proportion of expected good outcomes that came to pass.

$$\text{Precision} = \frac{\text{True Positive}}{\text{True Positive+False Positive}}$$

A high accuracy number is especially useful in applications where the cost of false positives is significant, as it implies that the model has a low rate of false positive mistakes, it does not commonly misclassify negative occurrences as positive.

The accuracy of several machine learning models was assessed in this experiment. As an illustration, the Gradient Boosting Classifier received the greatest precision score, demonstrating its ability to accurately identify the positive cases with the fewest false positives.

5.3.3 Recall

Recall is a statistical measure of a model's capacity to detect all meaningful positive instances in a dataset. It is sometimes referred to as sensitivity or true positive rate, and it is computed as the ratio of true positive predictions to the total number of real positive instances.

$$\text{Recall} = \frac{\text{True Positive}}{\text{True Positive+False Negetive}}$$

A high recall value means that a significant fraction of the real positive cases may be captured by the model, which is important in situations where it would be extremely harmful to miss positive examples.

Recall values were calculated for each of the models used in this project to assess how well they identified all pertinent events. Once more exhibiting exceptional performance and a high recall score, the Gradient Boosting Classifier proved to be reliable in identifying genuine positive cases.

5.3.4 F1-Score

The F1-Score is a single statistic that strikes a compromise between precision and recall, calculated as the harmonic mean of the two. It makes sure that neither precision nor recall are unduly high at the expense of the other, which is especially helpful in situations when there is an unequal class distribution.

$$\text{F1-Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} \times \text{Recall}}$$

An F1-Score of high represents both precision and recall performance, making it a complete indicator of model accuracy.

The overall effectiveness of each model was determined in this experiment by calculating its F1-Score. With the greatest F1-Score, the Gradient Boosting Classifier demonstrated its balanced and excellent performance in recall and precision. This implies that it is the most accurate model for determining which social media channel is ideal for marketing.

5.3.5 ROC – AUC

With a score of 0.88, the ROC-AUC statistic highlighted the Gradient Boosting Classifier's outstanding performance even more. Additionally doing well were the SVC and AdaBoost Classifier, with ROC-AUC values of 0.85 and 0.86, respectively. Lower ROC-AUC ratings for Decision Tree and Logistic Regression indicate comparatively poorer class distinction abilities.

5.4 Summary

The result analysis highlights the Gradient Boosting Classifier as the most effective model for predicting the best social media platform for marketing, given its superior performance across all evaluated metrics. The AdaBoost Classifier and Support Vector Classifier also demonstrated strong results, making them viable alternatives depending on specific business needs and computational resources. In summary, the comprehensive evaluation and comparative analysis of these models provide actionable insights for businesses seeking to optimize their social media marketing strategies through data-driven decision-making. The findings suggest that ensemble methods, particularly Gradient Boosting, offer significant advantages in accurately predicting the most effective social media platforms for marketing purposes.

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Life

The use of machine learning to determine which social media site is best for marketing has a significant impact on people's daily life. Businesses may provide users with more personalized and relevant content by streamlining their marketing methods. By eliminating pointless adverts, this improves user experience while also making it easier for customers to find goods and services that suit their needs. Better marketing techniques can also result in higher company profits, which can boost economic expansion and possibly open up more job opportunities, improving people's quality of life.

6.2 impact on Society and Environment

6.2.1 Society

The extensive use of social media marketing that is optimized has various effects on society. By giving small and medium-sized businesses (SMEs) access to data-driven insights that were previously only available to major corporations, it can democratize commercial potential. As a result, the playing field is levelled and SMEs can engage in more productive market competition. Furthermore, by encouraging community involvement and aiding in the dissemination of important information and social campaigns, social media marketing that works can improve social connectivity.

6.2.2 Environment

From an eco-friendly standpoint, focused advertising can result in a more effective utilization of resources. Businesses can cut down on waste from printing and distributing conventional marketing materials by concentrating on the appropriate audience. Nonetheless, it is imperative to take into account the carbon impact linked to heightened internet usage. Data centers use a lot of energy to run machine learning algorithms and social media platforms. To lessen the impact on the environment, it is crucial to encourage the use of renewable energy sources and increase the energy efficiency of these data centers.

6.3 Ethical Aspects

Several ethical questions are brought up by the application of machine learning in social media marketing:

• Privacy: It is crucial to make sure that user data is protected. Companies need to follow data privacy laws and be open about the ways in which user information is gathered, saved, and utilized.

• Fairness and Bias: Machine learning models may unintentionally reinforce biases found in the training set. To stop discriminatory practices and guarantee fairness, models must be routinely audited and improved.

• Manipulation: Targeted marketing and manipulation are two very different things. The goal of ethical marketing should be to help and educate customers, not take advantage of their weaknesses.

• Openness: Companies must to be open about how they incorporate machine learning into their marketing plans. Users ought to be given the choice to manage their data settings and be made aware that algorithmic recommendations are included.

6.4 Sustainability Plan

Several tactics can be used to guarantee the long-term viability of social media marketing powered by machine learning:

• Energy Efficiency: Make investments in data centers with low energy consumption and encourage the use of renewable energy sources to power machine learning processing.

• Encourage companies to implement sustainable marketing strategies, like favoring digital marketing over conventional techniques and using eco-friendly materials for in-person promotions.

• Continuous Improvement: To increase precision and lower biases, update machine learning models on a regular basis. By including feedback loops, models are better able to adjust to shifting social norms and values.

• Education and Training: Educate and train marketers and companies on sustainable and ethical marketing techniques. This involves being conscious of data privacy, using AI ethically, and the value of sustainability.

6.5 Summary

The assimilation of machine learning into social media marketing presents a substantial opportunity to augment personal lives, foster economic expansion, and generate societal advantages. It does, however, also present issues with privacy, ethics, and environmental impact. Businesses can use machine learning to their advantage and assist society at large by implementing sustainable methods, guaranteeing justice, and abiding by ethical norms. It takes a carefully considered sustainability plan to handle these issues and encourage ethical use of technology in marketing.

CHAPTER 7

CONCLUSIONS AND FURTHER WORK

7.1 Conclusion

In order to determine which social media site is best for marketing, this research investigated the application of machine learning. We showed that advanced ensemble methods, in particular AdaBoost, offer superior performance in predicting ideal platforms for social media marketing by training and evaluating a variety of models, including Decision Tree, AdaBoost, Gradient Boosting, Support Vector Classifier (SVC), and K-Nearest Neighbor Classifier (KNN). The thorough investigation yielded practical conclusions, emphasizing how data-driven decision-making may improve marketing tactics. The results highlight how crucial it is to use machine learning to successfully negotiate the intricate and ever-changing world of social media marketing.

7.2 Further Suggested Work

There are a number of directions that might be taken for additional study and development in order to build on the results of this project:

• Extended Feature Set: To increase the precision and resilience of the model, include further characteristics including content type, sentiment analysis, and user engagement measures.

• Real-Time Analysis: Create models with the ability to analyses data in real-time so they can adjust to the quickly shifting user behaviors and social media trends.

• Develop platform-specific models that are specifically designed to capture the distinct dynamics and user interactions of each social media site.

• Multi-Language Support: By adding support for more languages, the models become more applicable over a wider range of geographical areas.

• Perform Longitudinal research: To evaluate the models' long-term efficacy and adaptability in changing market conditions, conduct longitudinal research.

• Integration with Business Systems: To simplify usage and deployment, integrate the models with current marketing automation and business intelligence platforms.

7.3 Limitations/ Conflict of Interests

• Data Limitations: The quality and scope of the data used in training the models may limit their generalizability. Data from additional sources and platforms could provide a more comprehensive understanding.

• Dynamic Nature of Social-Media: Social-media trends and user behaviors are constantly evolving, which can impact the long-term accuracy of the models. Regular updates and retraining of models are necessary to maintain their effectiveness.

• Computational Resources: Advanced models such as ensemble methods require significant computational resources, which may be a limitation for small businesses with limited access to such infrastructure.

• Bias in Data: Any biases present in the training data can affect model outcomes. Ensuring diverse and representative datasets is crucial to mitigate this issue.

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Appendix A

Course Outcomes, Complex Engineering Problems (EP) and Complex Engineering Activities (EA) Addressing

Title:
FINDING THE BEST SOCIAL MEDIA PLATFORM FOR SOCIAL MEDIA MARKETING USING MACHINE LEARNING

Student ID: [202-15-14433, 202-15-3794]

CO Description for FYDP

CO	CO Descriptions	PO
Phase -I		
CO1	Integrate recently gained and previously acquired knowledge to identify a **Predictive-Probability Analysis and Preventive Strategies for Finding Best Social Media Platform for Marketing: A Machine Learning Approach** for the Final Year Design Project (FYDP)	**PO1**
CO2	Analyze different aspects of the goals in designing a solution for this FYDP	**PO2**
CO3	Explore diverse problem domains through a literature review, delineate the issues, and establish these goals for the FYDP	**PO4**
CO4	Perform economic evaluation and cost estimation and employ suitable project management procedures throughout the development life cycle of the FYDP	**PO11**
Phase -II		
CO5	Design and develop technical solutions and system components or processes that meet specified requirements, ensuring compliance with public health and safety standards, as well as considering cultural, socioeconomic, and environmental factors in this FYDP	**PO3**
CO6	Choose and apply appropriate methodologies, resources, and contemporary engineering and IT technologies to address complex engineering processes, encompassing prediction and modeling, while adhering to relevant constraints in this FYDP	**PO5**

CO7	Analyze societal, health, safety, legal, and cultural considerations, along with associated responsibilities, in the context of professional engineering practice and the resolution of this problem, employing logical reasoning guided by contextual understanding.	**PO6**
CO8	Comprehend and evaluate the enduring sustainability and impact of professional engineering endeavors in addressing intricate engineering challenges within social and environmental frameworks.	**PO7**
CO9	Implement ethical principles and adhere to professional standards and norms in this FYDP	**PO8**
CO10	Capable of operating proficiently both individually and as a team member or leader across diverse teams and interdisciplinary settings in this FYDP.	**PO9**
CO11	Proficiently communicate with the engineering community and broader society regarding complex engineering endeavors, including the ability to comprehend and generate comprehensive reports and design documentation, as well as provide and receive clear instructions throughout this FYDP.	**PO10**
CO12	Acknowledge the importance of self-directed and life-long learning within the evolving landscape of technology, and possess the readiness and capability to engage in lifelong learning endeavors.	**PO12**

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP), and Attainment of Complex Engineering Activities (EA)

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP):

SN	EP Definition	Attainment	CO	Justification (with Knowledge Profile)	References
1.	**EP1: Depth of Knowledge required**	Yes	CO1, CO2, CO3, CO5, CO6, CO7 and CO8	In order to conduct our research, we must collect data from random people and learn how to build a machine learning-based model that address K3 and K4.	**Page no:** [1-2] **Section:** [1.4]
				Our document must include a lot of components thus we've created a Google Form with K5 and K6 included.	**Page no:** [15] **Section:** [3.3]
				We have looked at previous models with comparable objectives (K8).	**Page no:** [5-6] **Section:** [2.1, 2.2]
2.	**EP2: Range of Conflicting Requirements**	Yes	CO2, and CO7	It was difficult for us to locate specific regulations governing the collection of primary data from various people for our research.	**Page no:** [7-10] **Section:** [2.3,2.4]
3.	**EP3: Depth of analysis required**	Yes	CO2, and CO6	In our paper, it is challenging to arrive at a definitive conclusion because there is an abundance of primary data. Before choosing a certain algorithm, we carefully weighed our possibilities and conducted a thorough analysis.	**Page no:** [11-15] **Section:** [3.2,3.3]

4.	**EP4: Familiarity of Issues**	Yes	CO8	In order to understand and evaluate hemorrhoids and physical health, we must conduct additional research for our paper on a number of subjects with which we were not too familiar. Specifically, we must figure out how to calculate hemorrhoid levels as accurately as possible.	**Page no:** [8-10] **Section:** [2.4]
5.	**EP5: Extends of application codes**	No	CO5	N/A	N/A
6.	**EP6: Extends of stakeholders involved and conflicting requirements**	Yes	CO8	At the time of CORONA pandemic, we faced a lot of problem in outing. That's why online market grown that time rapidly. This situation encourages me most about the project.	**Page no:** [1-2] **Section:** [1.4]
7.	**EP7: Interdependence**	Yes	CO5	There are interrelated subsystems in our paper. These responsibilities include gathering and processing data as well as training machine learning models and analyzing predictions.	**Page no:** [17-19] **Section:** [4.2, 4.3]

Addressing CO11 with Complex Engineering Activities (EA) [Some or all of the following]:

SN	EA Definition	Attainment	CO	Justification	References
1.	**EA1: Range of resources**	Yes	CO11	In order to ensure systematic study and make a significant contribution to the field of online market platform identification, our paper makes use of a variety of resources, including machine learning frameworks, annotated datasets, high-performance computing infrastructure, and ethical considerations.	**Page no:** [17-19] **Section:** [4.1,4.2,4.3]
2.	**EA2: Level of interaction**	No		N/A	N/A
3.	**EA3: Innovation**	No		N/A	N/A

4.	**EA4: Consequences for society and the environment**	Yes		This paper contributes to society by choosing market platform through advanced Predictive-Probability Analysis and Preventive Strategies for best platform, while also promoting environmental sustainability by employing efficient computational resources and adhering to ethical guidelines for data privacy.	**Page no:** [23-24] **Section:** [6.1,6.2,6.3,6.4]
5.	**EA-5: Familiarity**	Yes		This paper expands upon existing research by examining a novel approach in Predictive-Probability Analysis and Preventive Strategies for best online market platform predictor through machine learning, demonstrated through preliminary terminologies and a comprehensive comparative analysis, offering new insights into the field.	**Page no:** [21-22] **Section:** [5.2, 5.3]

Addressing CO (4, 9, 10, and 12):

SN	COs	Attainment	Justification	References
1	CO4	Yes	In order to address CO4, this work integrates effective project management with financial monitoring. This ensures meticulous planning, equitable resource distribution, and budget	**Page no:** [15-16] **Section:** [3.4]

			estimation for the most efficient use of resources throughout the research process.	
2	CO9	Yes	The paper upholds ethical norms by prioritizing privacy, obtaining informed consent, and disclosing the research procedure in a transparent manner. Additionally, it guarantees social justice and conscientiousness in the diffusion of knowledge by means of the moral implementation of online commerce compliant with CO9.	**Page no:** [23-24] **Section:** [6.2,6.3]
3	CO10	No	N/A	N/A
4	CO12	Yes	The paper's commitment to continuous learning (CO12) and adaptation in the face of constantly changing technological landscapes is demonstrated by the large-scale data gathering, rigorous statistical analysis, meticulous methodological development, and comprehensive experimental results and analysis. This demonstrates a dedication to remaining up to date and developing methods to deal with modern problems.	**Page no:** [25-26] **Section:** [7.2,7.3]

Online market platform

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