# Section 1: Project Plan

## Project Title:

Impact of Campaign Contacts on Term Deposit Subscription Success

## Research Question (RQ):

1. Does the number of contacts made during a marketing campaign significantly affect the likelihood of a client subscribing to a term deposit?
2. How does the number of contacts influence the overall classification performance in predicting term deposit subscriptions?

## Objectives:

* To evaluate the effect of the number of campaign contacts on predicting term deposit subscriptions using machine learning models such as Logistic Regression, Decision Tree, Random Forest, XGBoost, and Neural Networks.
* To assess the importance of client and financial attributes, alongside the number of contacts, using feature importance, correlation analysis, and ANOVA.
* To build a preprocessing pipeline for handling missing values, scaling features, and encoding categorical variables for model training.
* To compare model performance using Accuracy, Precision, Recall, and F1-score with and without including the number of contacts as a predictor.

## Background and Summary:

Banks have been driven to adopting strategic marketing communication techniques that could be used in reaching the potential clients with an introduction to the variety of financial products like term deposit among others. Such campaigns require interaction with clients’ multiple times via one or multiple modes such as telephone, e-mail, or face-to-face meetings (Vincent, 2023). It becomes essential to determine what makes for a successful subscription so that marketing efficiency on subscription can be improved. Besides the benefit of resource management, the capability to forecast the possibility of a given client to avail of the term deposit contributes positively to effective marketing by the banks since clients’ needs are appropriately understood and addressed (Banu, 2023).

This project works with Kaggle’s bank marketing dataset, which is rich in demographic and financial details about clients as well as information about the marketing campaign. This study uses the contacts made in a marketing campaign as the basis for determining how the client might decide on term deposit subscriptions. The evaluation of subscription rates in relation to certain factors will be made using multiple models of machine learning: Logistic Regression, Decision Trees, Random Forests, and XGBoost. Further, the work aims at identifying ways in which customers use particular products, with an eye to helping banks improve their marketing approaches. In the long run, this research seeks to achieve better client outreach and marketing return on investment with improved subscription rates for the term deposits (Bachmann, 2017).

## Reference Links:

Reference 1: <https://ieeexplore.ieee.org/document/10374595>

Reference 2: <https://ieeexplore.ieee.org/document/10578260>

Reference 3: <https://ieeexplore.ieee.org/document/10252843>

# Section 2: Task List and Timeline

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| --- | --- | --- | --- | --- | --- | --- |
| **Task** | **10-Oct** | **25-Oct** | **10-Nov** | **25-Nov** | **10-Dec** | **25-Dec** |
| Data Collection, Cleaning, Pre-processing | X |  |  |  |  |  |
| Literature Review | X |  |  |  |  |  |
| Model Development |  | X |  |  |  |  |
| Model Tuning |  |  | X |  |  |  |
| Statistical Analysis |  |  |  | X |  |  |
| Comparison and Results |  |  |  |  | X |  |
| Report Writing (FPR) |  |  |  |  |  | X |

* **Data Collection, Cleaning, and Pre-processing:** Collect and clean the bank marketing dataset, focusing on campaign-related attributes like the number of contacts.
* **Literature Review:** Review research on marketing campaigns, customer behaviour, and term deposit subscription prediction models.
* **Model Development:** Train machine learning models like Decision Tree and XGBoost.
* **Model Tuning:** Optimize hyperparameters to improve model performance.
* **Statistical Analysis:** Perform feature importance analysis and evaluate the role of campaign contacts.
* **Comparison and Results:** Compare models based on performance metrics with and without using the number of contacts.
* **Final Project Report (FPR):** Document findings and insights in the final report.

# Section 3: Data Management Plan

## DatasetOverview**:**

The input consists of 180000 records with 17 features representing the basic demographics and other characteristics of clients that got targeted in a particular marketing campaign by a bank related to term deposits. These include age, job, marital status and education classification, account balance, housing & loan details and communications type & length. The target variable defined whether a client agreed to a term deposit or not; ‘yes’ for the client subscribed to a term deposit; ‘no’ otherwise. This rich dataset of users’ activity gives insightful information about customers that can be used as input for machine learning classification problems intended to predict the subscription results and to improve the marketing techniques.

## Data Collection:

Source: <https://www.kaggle.com/datasets/janiobachmann/bank-marketing-dataset/data>

GitHub Repository: <https://github.com/Charan-Madisa/Project-24.git>

## Data Ethics:

The data used in this project meets all necessary ethical and legal standards. It complies with GDPR requirements, ensuring that all personal data is handled responsibly and in accordance with data protection laws. The collection of the dataset has been ethically approved, with proper consent and permissions in place for its use in research and analysis. Additionally, the dataset aligns with established ethical guidelines, ensuring that its usage respects privacy, confidentiality, and fairness in processing, thus supporting the overall integrity of the project.

**References:**  
Bachmann, J.M. (2017) “Bank Marketing Dataset.”

Banu, S. (2023) *BANK MARKETING-term deposit prediction model - Sameera Banu*, *Medium*. Available at: https://medium.com/@mail4sameera/bank-marketing-term-deposit-prediction-modelexploratory-data-analysis-a10df946b190 (Accessed: October 13, 2024).

Vincent (2023) *Term deposits classifications for bank marketing campaign*, *Medium*. Available at: https://medium.com/@yohanesvincentpangestu/term-deposits-classifications-for-bank-marketing-campaign-974f1a087e3b (Accessed: October 13, 2024).