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# Strategic Optimization of Term Deposit Campaigns

## A Predictive Analytics & Segmentation Approach

By Marcela Lizarazo



# Term Deposit Campaign Analysis

A Portuguese banking institution conducted multiple direct phone-based marketing campaigns to promote term deposits. Despite the high number of contacts, overall subscription rates remained low. This project analyzes a synthetic dataset reflecting those campaigns, where each record corresponds to an individual client interaction and includes demographic, economic, and campaign-related information.

## Objectives:

- Estimate the likelihood of term deposit subscription.
- Segment clients into behavioral groups using clustering.
- Provide insights to guide more efficient strategies.

# Model and Dashboard Approach



## Model Overview

In this project, most clients in the dataset did not subscribe to the term deposit (only about 11% said “yes”). That means the data is unbalanced. If we only used accuracy, the model could seem “correct” just by saying “no” all the time — and that would not help the business. To solve this, We used:

- **Random Forest:** A strong model that works well with many features and gives good results.
- **SMOTE:** A method to create more examples of clients who subscribed, to help the model learn better.
- **Threshold adjustment (0.35):** This means the model is more sensitive to possible “yes” answers.

- **Precision:** 39% of predicted “yes” that were correct
- **Recall:** 54% of real “yes” the model found
- **F1-score:** 45% Balance between both



## Client Segmentation

After predicting the likelihood, we grouped clients into **4 clusters** using the K-Means method.

- Clustering was based on variables like: age, job, marital status, education, and contact history.
- **The goal:** find patterns in behavior and group clients by similarity.

**Cluster 1 and Cluster 0** had the highest probability of conversion. These groups include older, married clients, often contacted by telephone. They are ideal for direct contact efforts.

**Cluster 2 and Cluster 3** showed very low conversion rates. These clients received many calls but rarely subscribed. We recommend reducing marketing effort to these segments.



## Dashboard Overview

The dashboard includes two interactive views:

- **Training View:** Focused on understanding client behavior from past campaigns. It shows conversion rates by age, job, education, contact channel, and day of contact. It also includes filters by cluster (1 to 4) to explore how different segments responded.
- **Prediction View:** Displays only clients from the test set. It highlights those with a predicted conversion probability  $\geq 70\%$ , helping the team quickly identify who to prioritize. Filters allow exploration by age, job, contact method, and cluster.

Both views are designed to support smarter marketing decisions by combining model predictions with behavioral patterns.

# How to Use the Dashboard for Smarter Targeting

## The dashboard helps business users:

- Understand which client profiles are more likely to subscribe
- Prioritize future contacts based on predicted probability
- Identify low-response groups to reduce wasted effort

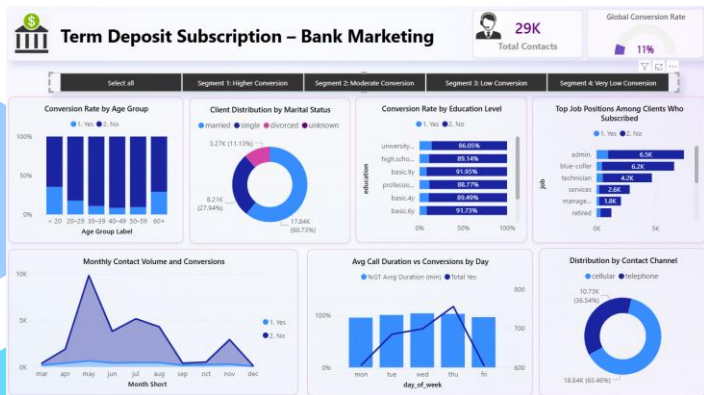
## It combines:

- A prediction model trained on real campaign data
- A segmentation model that groups clients by behavior
- Interactive visuals to explore both past and future trends

## How to Use It?

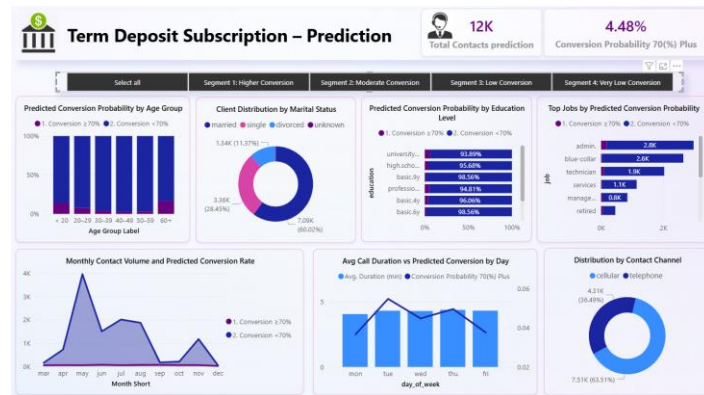
### Training View

- Go to this tab to explore historical results
- Use filters to compare clusters (1–4)
- Analyze conversion rate by age, job, education, and contact method (Helps understand who converted in the past)



### Prediction View

- Focuses on new clients from the test set
- Use the “Conversion  $\geq 70\%$ ” filter to target high-potential leads
- Apply filters by age group, cluster, job, or channel (Helps decide who to contact next)



## Strategic Recommendations

- Use the model's predicted probabilities to score leads and prioritize outreach based on likelihood to convert.
- **Combine prediction and segmentation:** focus first on high-probability clients in Cluster 1, and second on promising cases in Cluster 0.
- **Avoid over-targeting Clusters 2 and 3** unless re-engagement or awareness campaigns are planned.
- **Promote term deposits as a safe investment**, especially to clients with existing loans who may see this as a path to qualify for better credit conditions.
- Explore seasonality in conversion patterns using A/B testing in months like March and December.

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# Thanks!

