

# Demo POC-Study Report on Marketing Prediction

## Data Source:

This demo project is based on the publicly available dataset from the UCI machine learning repository:  
<https://archive.ics.uci.edu/ml/datasets/bank+marketing>

## Project Goal:

The goal is to predict future marketing engagement by analyzing the data of historical marketing campaigns.

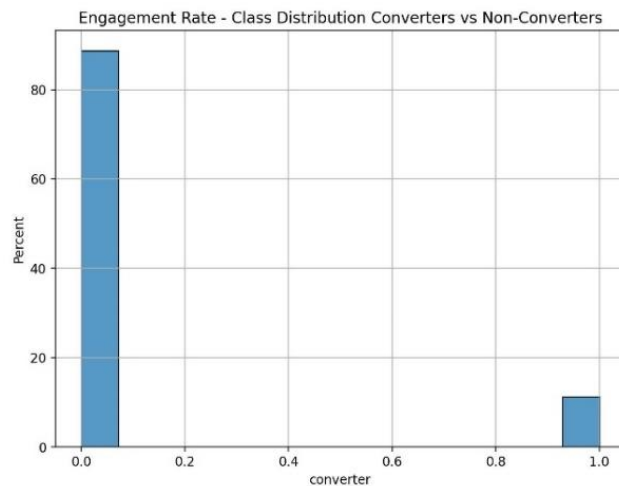
## Solution Approach:

After data preprocessing (e.g. fill missing data, remove outliers, replace rare categorical variables, considering the class imbalance etc), different machine learning models were trained and tuned using cross-validation. The best model, which was by definition the model with the highest area under the precision-recall curve, was the sklearn gradient-boosted tree model. (see the code here: <https://github.com/Sebastian1981/Marketing-Sales-Conversion-Prediction-Webapp>)

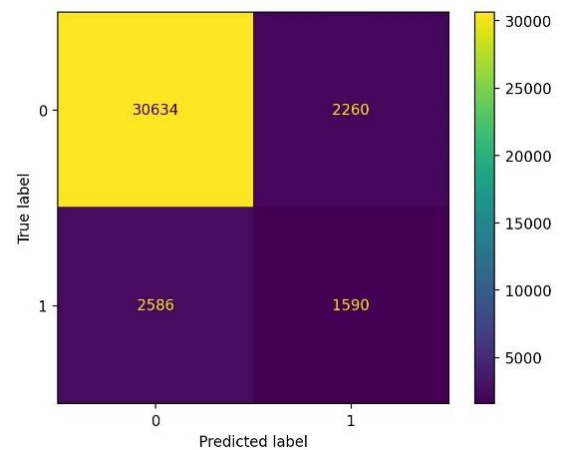
## Tools:

Python, Jupyter, pandas, numpy, sklearn

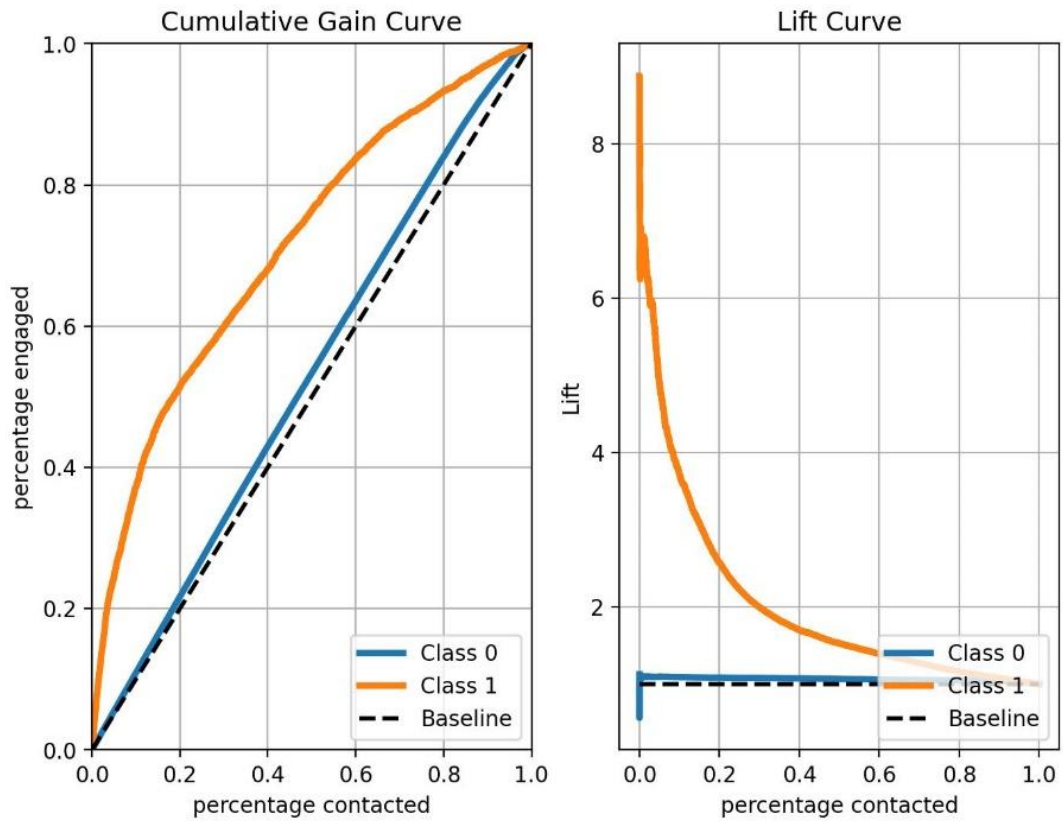
## Key Findings:



**Figure 1. Engagement rate.**



**Figure 2. Confusion matrix.**



**Figure 3. Cumulative gain curve (left) and lift curve (right).**

Figure 1 shows that the engagement rate among all customers is around 10%. Hence, not leveraging the power of AI to focus targeting only the customers with the highest conversion rate is very ineffective. Figure 2 shows the model performance in the form of the confusion matrix of the test dataset (i.e. data the model has not seen during training). It shows that the recall and the precision of the ml-model are both around 40%. But what does the accuracy of the model translate into increasing the effectiveness of the marketing campaign based on the ml-model? The answer is given in the cumulative gain and the lift curves in Fig. 4. It shows that contacting only the top 20% of the customers with the highest conversion probabilities predicted by the model yields around 50% engagement (Fig. 4, left). This corresponds to a lift of around 2.5 compared to randomly picking customers i.e. not using any predictive model (Fig. 4, right).