Demo Report on Key-Drivers to Marketing Engagement

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 find the key drivers to marketing engagement by analyzing the data of historical marketing campaigns.

Solution Approach:

Our solution consists of two steps: 1.) exploratory data analysis to find trends and correlations relevant for engagement 2.) apply a state-of-the-art explainable artificial intelligence methods to gain deep insight to what drives marketing success (see the code here: https://github.com/Sebastian1981/Marketing-Sales-Conversion-Prediction-Webapp)

Tools:

Python, Jupyter, pandas, numpy, sklearn, shap
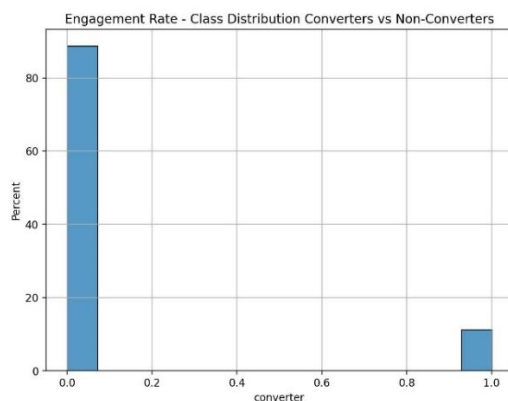
Key Findings:
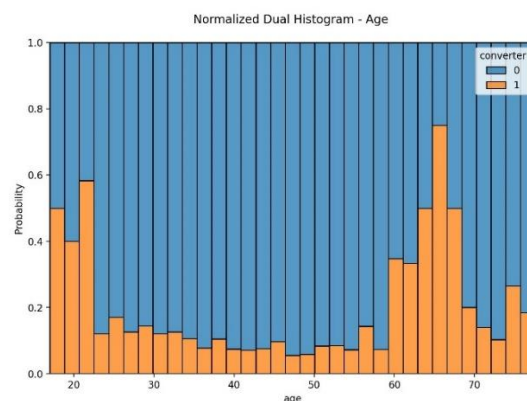

Figure 1. Engagement Rate.

Figure 2. Stacked Age Distribution for Non-Converters (blue) and Converters (orange).

Figure 1 shows that the engagement rate among all customers is 12%. Figure 2 shows a clear effect of age on engagement rate. The age groups around 20 years and between 60-70 years are more likely to engage than the mid-agers.
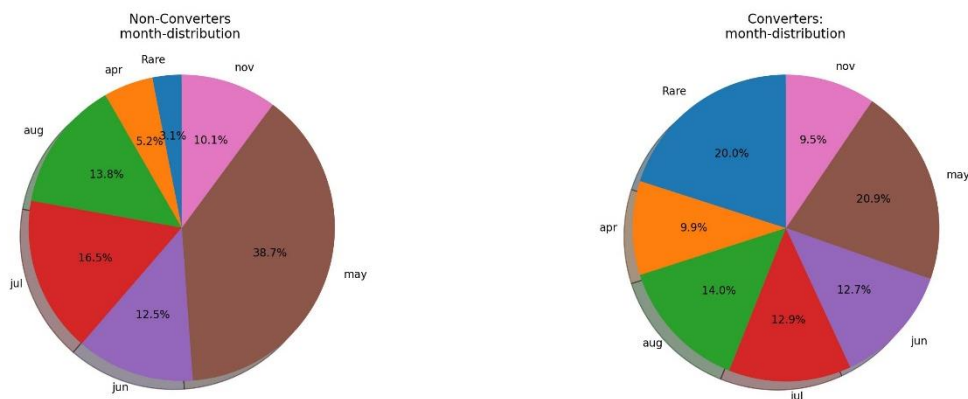

Figure 3. Pie-Plots of the monthly-distributions for the Non-Converters (left) and the Converters (right).

Figure 3 shows a clear seasonal effect on engagement rate. E.g., in the non-converters group, the largest proportion of customers is found in the month of May whereas in the converters group the proportion of

customers in May is clearly smaller. Therefore, the month of May seems to have an unfavorable effect on the success of a marketing campaign.
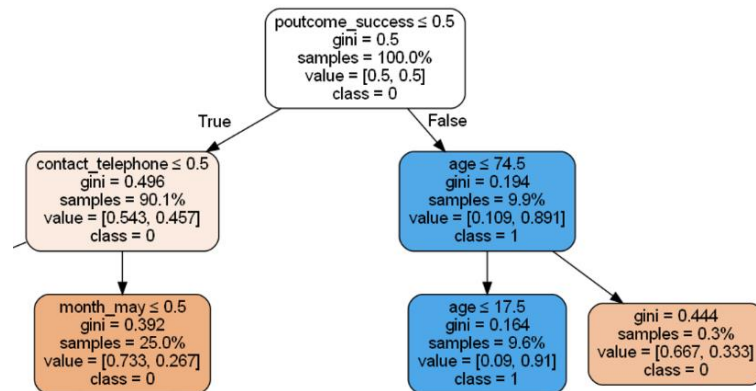
Figure 4. Prescriptive Analytics using a Simple Decision Tree.

The simple decision tree analysis in Fig.4 shows that features "p_outcome", "contact" and "age" are among the key engagement drivers. The "p_outcome" variable represents whether the last marketing campaign was successful with a particular customer or not. The "contact" and "age" variables represent the type of contact and the customer´s age, respectively. If we take a closer look at the decision tree, we can see, for example, that the conversion rate is 91% if the last marketing campaign was successful ("p_outcome_successfull") and the customer is in the younger age group ("age<17.5"). In comparison, the global conversion rate is only 12%. Hence, focusing on this young-age group would already lift the conversion rate by a factor of more than 7. The decision tree analysis remarkably shows the value this data-based analysis can add for optimizing marketing campaigns. However, we would like a more comprehensive insight into the key drivers and their effect on engagement rates. Therefore, we applied a state-of-the-art explainable artificial intelligence approach to gain complete insight to what drives marketing success.
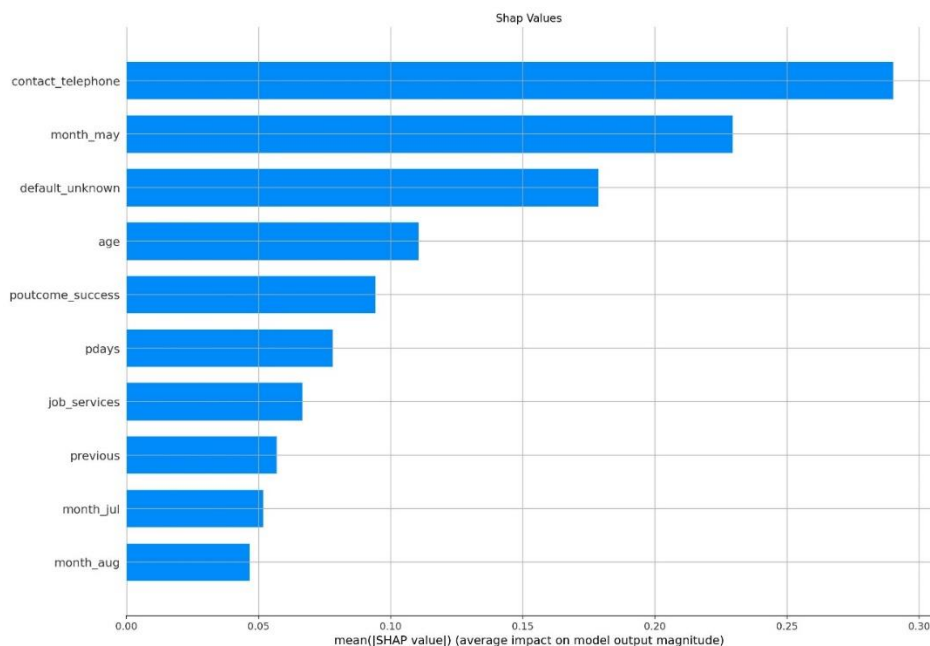

Figure 5. Key marketing engagement drivers detected by applying high performance complex machine learning models in combination with state-of-the-art explainable artificial intelligence methods.

Figure 5 shows that the top-5 key drivers to marketing engagement are the features "contact_telephone", "month_may", "default_unkknown", "age" and "poutcome_success". The x-axis shows the likelihood of conversion affected by each feature. E.g. the features "contact_telephone" and "age" affect the likelihood of conversion on average by approx. 28% and 11%, respectively.

Figure 6 yields a deep insight into the key drivers to engagement and their explicit affects on the likelihood on the conversion rate. Thereby each datapoint represents one customer. The impressive feature of this state-of-

the-art explainable artificial intelligence approach is that the engagement probabilities can simply be linearly added up. E.g. contacting the customers not via telephone leads to a conversion probability of around 18% on average (center of blue distribution). The conversion probability is further increased by around 15% if the customer are not contacted in the month of May. Focusing on the customers with a known credit-default history increases the probability of engagement by further 10% approx. Hence, targeting this group, we end up with a net engagement probability of approx. 43%, which is significantly higher than the global conversion rate of 12%. Note that based on that powerful state-of-the-art explainable artificial intelligence approach, you can simply estimate the effective engagement probability for any target group! Figure 7 explicitly shows how the customers age relates to engagement probability.
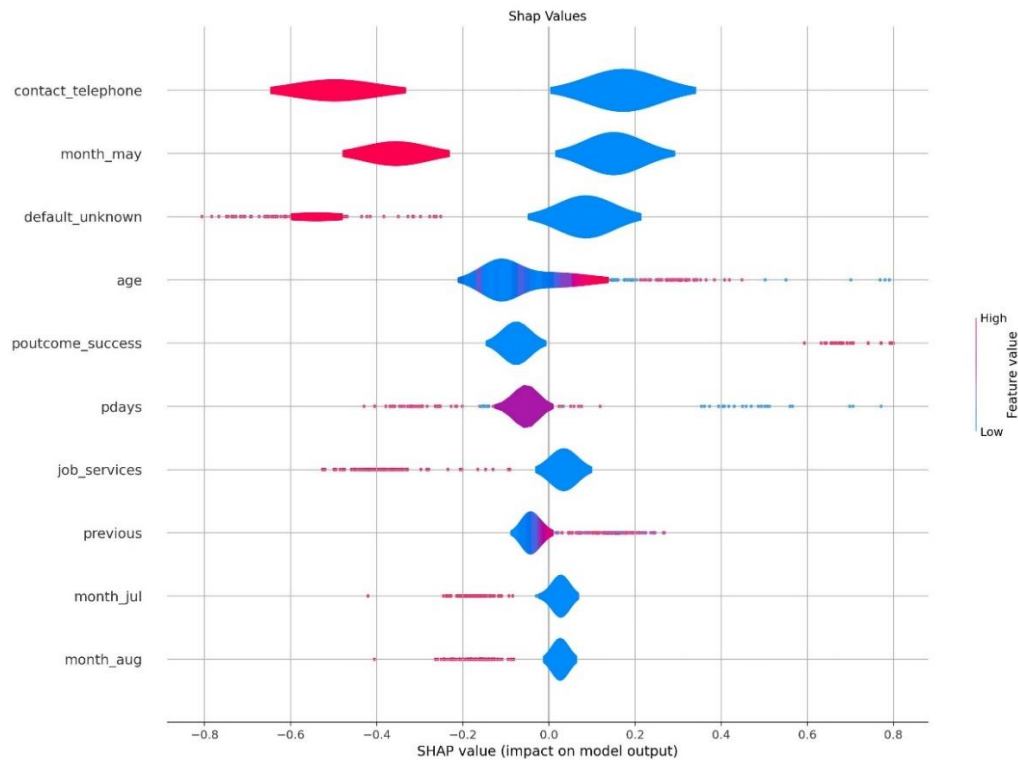
Figure 6. Key drivers and their explicit effect on the likelihood on engagement for each customer.
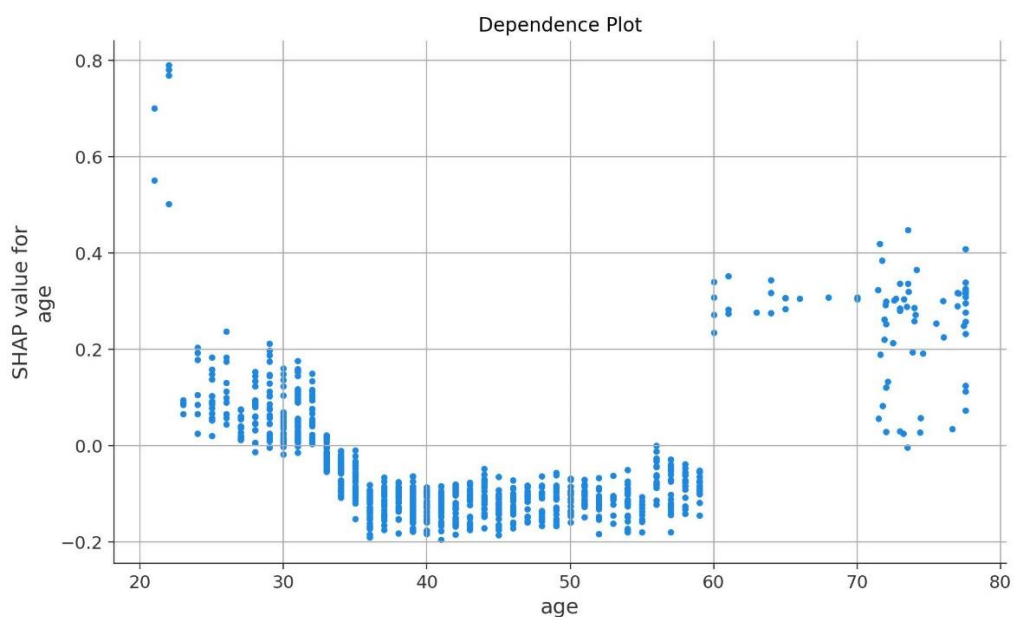
Figure 7. Age Effect on Engagement Probability.