

Executive management summaries of the bank marketing campaign

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Introduction of the project

How to increase profits is the most important topic of every company. This report will show how a bank use machine learning methods to improve profit from direct marketing campaigns.

The problem is solved in two steps. The first step is to build regression models to predict the profit of each customer. The second step is to establish multi-label classification models to predict which of the 3 products each customer will buy.

Step 1: The regression models to predict profit

For the regression models, the profit equation is **Profit = Revenue – Cost**. And the training set revenue and cost have been given. The profit is the target of the regression models.

Data processing adopts Lasso correlation method and Fisher-score method, and 15 variables are selected.

For the missing value, except for gender variable was dummied, other numeric missing value are replaced by 0.

For the resampling approaches, the 5-Fold method with negative mean square error of the loss function has been applied. 6 models have been used including Lasso, Elastic Net, Kernel Ridge, Gradient Boosting Regressor, XGB Regressor and LGBM Regressor. In the end the lasso model performed best with the Elastic Net score: 18.8630 (9.4652), the predicted total of profit top 120 profitable customer is 1136 euro.

Step 2: Multi-label classification models to predict products could be bought

There are 3 kinds of products, a single customer can market multiple products at once, a customer can only be target once. 3 classification targets are Sale_MF, Sale_CC and Sale_CL.

Based on the sales product data, there are several different ways to build a multi-label classification model. The first method is transformation of the problem, including the Binary Relevance, Classifier Chains and Label Powerset. The second method is Adapted Algorithm. The result shows Adapted Algorithm is the best model with accuracy score 0.42. It is predicted that 104 of 646 customers could buy at least 1 product.

Since not all customers in the product forecast will buy the product, after filtering out all the customers who is predicted to buy the product and the profit is greater than 0, the total profit is 711.29 euro.

Conclusion

Because profit forecasts and product purchase forecasts are carried out separately. Although there is no purchase volume for some products, there are still profit expectations. If the product and revenue can be predicted in advance in the same model, then the method of calculating profits may be more reasonable. To further improve the performance of the product prediction model, we can try to use Ensemble approaches