Solution for Santander Customer Satisfaction competition, 3rd place

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Outline

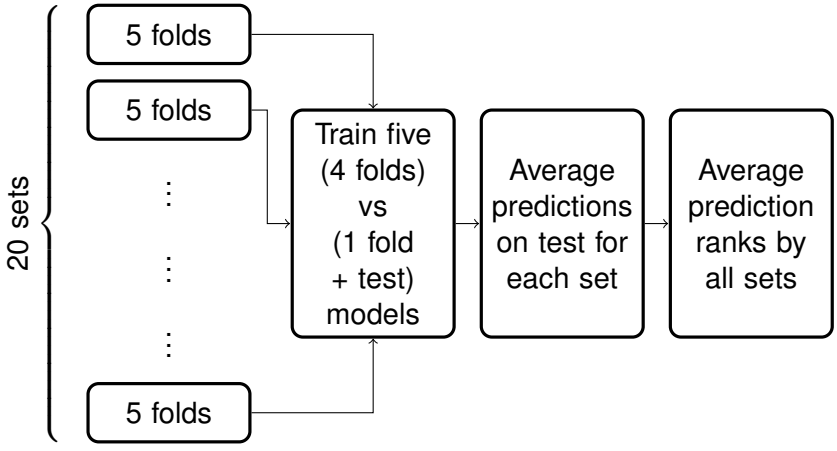
Cross validation scheme

Feature engineering

Models

Ensembling

Cross validation scheme



Feature preprocessing

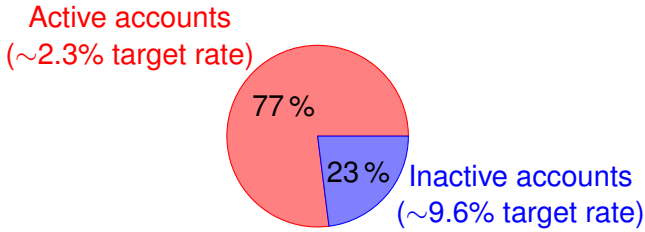
- removing constant features
- removing identical variables
- removing indicator features
- scaling features
- var38 = 117310.979016494 $\Rightarrow$ var38 = NA

Feature engineering

- **Sum of Zeros**
- **t-SNE**: mapping of feature space to lower feature space such that joint distribution of distances between points stays the same
- **PCA**: principal component analysis
- **K-means**: data clustering with number of cluster as a feature
- **Likelihoods**: the probability of target 1 within the subset of samples
- **Special features**

Special features

- Binary feature to determine if account is “active” or “inactive”: inactive accounts contain 18 non-constant features only



- Percentile rank of var38 (income?) within each var15 (age?) group
- Binary mod 3 features

Models

- **XGBoost**
- **RGF**
- **Neural network**
- **FTRL**
- **Random Forest**
- **Adaboost**
- **ExtraTrees**
- **KNN**
- **Lasso**
- **SVM**

Ensembling

- For each model we used bagging technique (train model on different subsets and average predictions) to reduce the noise
- The final prediction is a linear combination of predictions from all models
- AUC metric is not differentiable function, so we cannot use gradient descent
- To optimize AUC and find the best coefficients for the linear combination we used Nelder-Mead method (function `optim` in `R`)

Some lessons

- Build CV scheme correctly
- Trust your CV
- Choose the simplest model
- Working in big team is a very nice experience
- Search for something unusual in the data (special features?)

Thank you! Questions?

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