Customer Churn Prediction

A telecommunications case study

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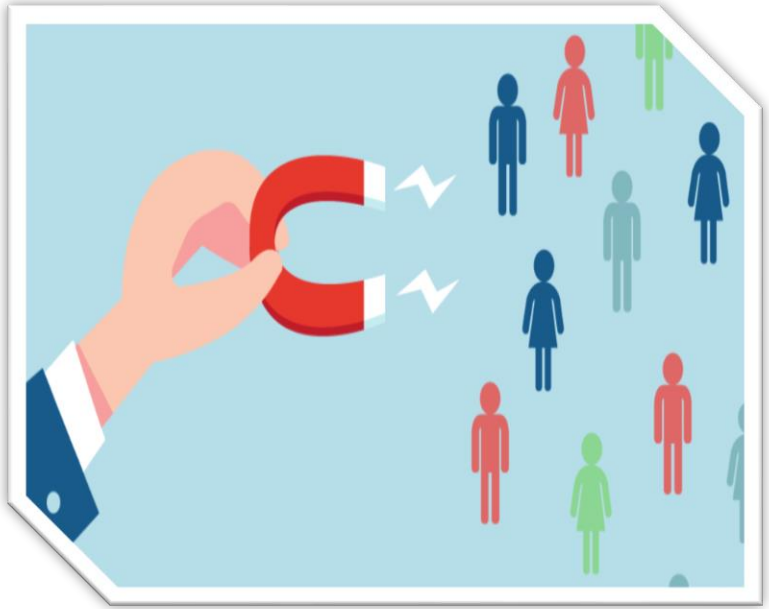
Why customer churn?

- Relevant and challenging problem affecting even the largest, most stable companies.
- Crucial for maintaining a sustainable business growth.
- The costs of acquiring new customers can be higher than the ones of retaining loyal ones.




"It is 6-7 times more expensive to acquire a new customer than it is to keep a current one"
Statement attributed to the White House Office of consumer affairs

Business Problem

How to better predict which customer is likely to churn?

In other words, we want to know **who is likely** to turnover and be able to target him with a specific campaign.

Performance measures: Testing error, AUC and Sensitivity.

Data Source

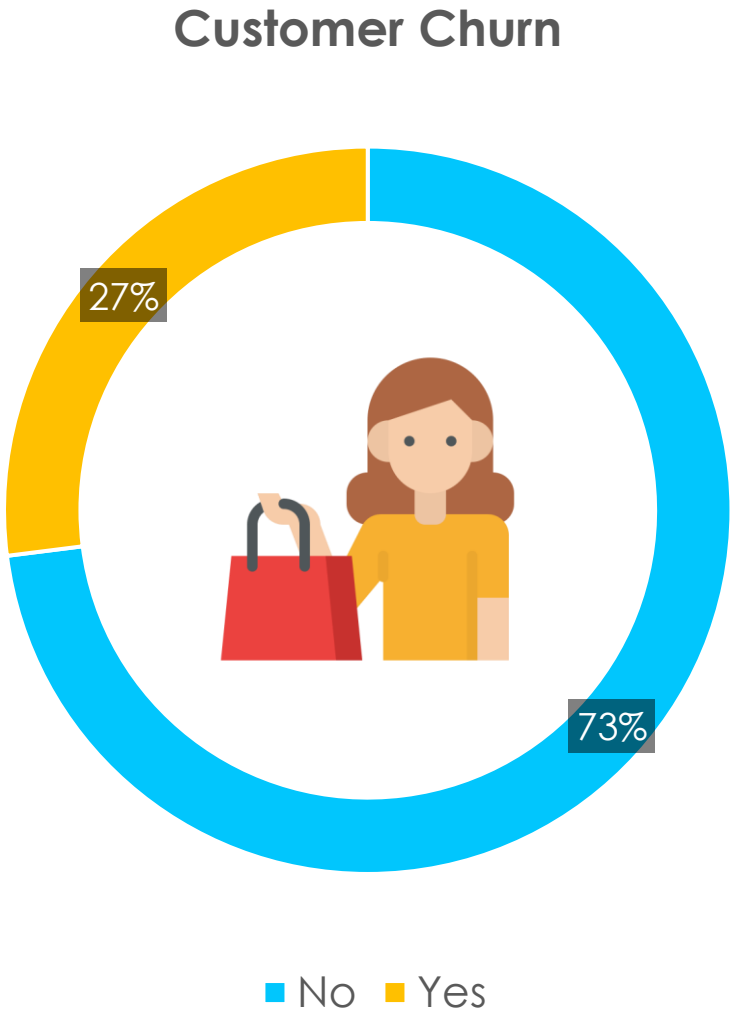
- Telco Customer Churn data set.
- 7043 observations and 21 variables
- Contains information about customer churn, contracted services and demographic characteristics, among others.

kaggle

kaggle.com/blastchar/telco-customer-churn

Preliminar Analysis

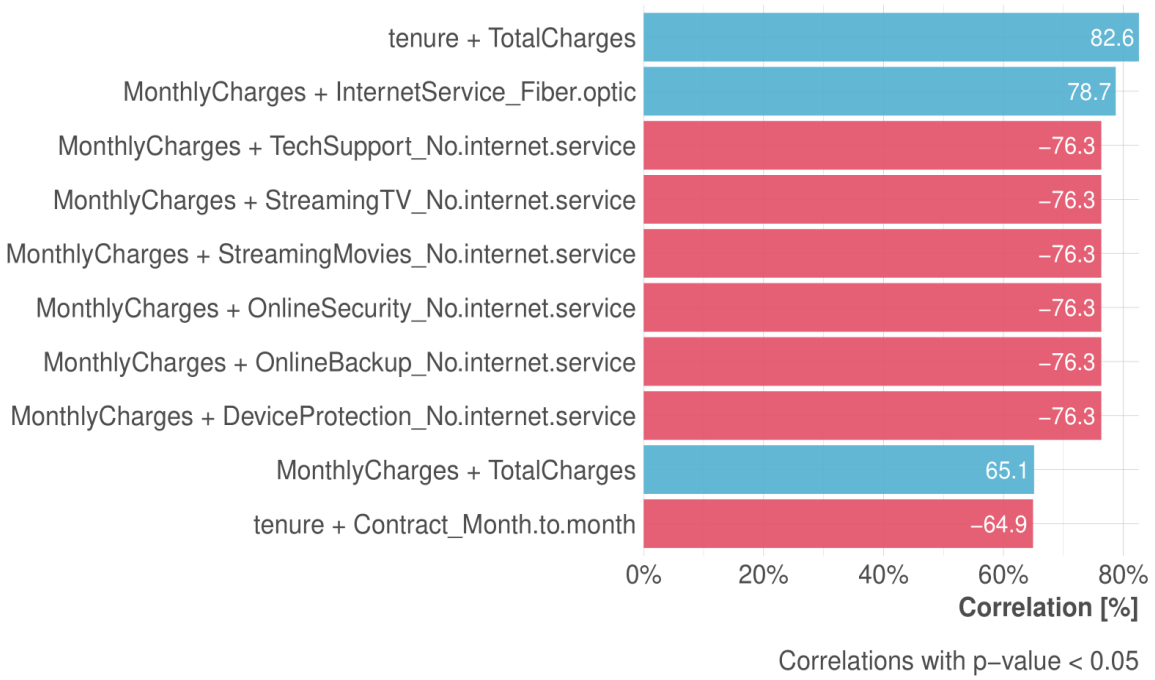
- 11 missing values
- No outliers (IQR method)
- Response variable: Churn

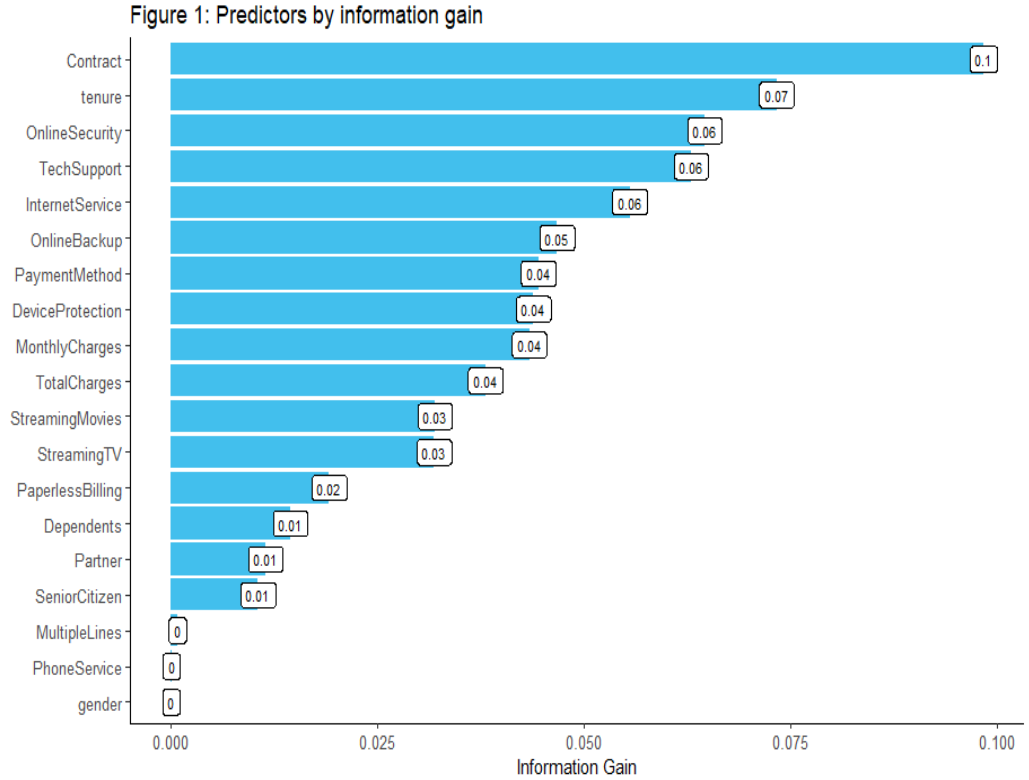


Potential predictors

Ranked Cross–Correlations

10 most relevant





Methodology

Used models:

- Naive Bayes Classifier
- Logistic Regression
- Random Forest
- Boosting
- Suppor Vector Machines

Important clarifications:

- Train-test Split: 9:1
- 100-fold MC cross-validation
- Testing error, AUC, Sensitivity
- T-test and Wilcox-test

Results: Misclassification Error (Testing)

	Mean	Median	Variance
Naive Bayes	0.27185	0.27454	0.00025
Logistic Regression	0.19502	0.19488	0.00018
Random Forest	0.24371	0.24395	0.00028
Boosting	0.19565	0.19488	0.00020
Support Vector Machines	0.31664	0.31579	0.00030

Results: Area under the ROC curve (AUC)

	Mean	Median	Variance
Naive Bayes	0.81949	0.81973	0.00030
Logistic Regression	0.84655	0.84804	0.00027
Random Forest	0.84366	0.84273	0.00029
Boosting	0.84961	0.85067	0.00028
Support Vector Machines	0.82758	0.83539	0.00498

Results: Sensitivity

	Mean	Median	Variance
Naive Bayes	0.80763	0.80878	0.00080
Logistic Regression	0.55223	0.55076	0.00137
Random Forest	0.78972	0.78847	0.00084
Boosting	0.58436	0.58220	0.00155
Support Vector Machines	0.86230	0.86163	0.00063

Conclusions

- Naive Bayes, Random Forest and Support Vector Machines are the best performing models overall.
- Among them, the Random Forest classifier provides a significantly better performance in terms of testing error and AUC.
- The Support Vector Machines classifier is the best if we only care about sensitivity.


THANK YOU FOR YOUR ATTENTION!

Image Sources

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