A data driven approach for Customer Churn prediction.

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Outline

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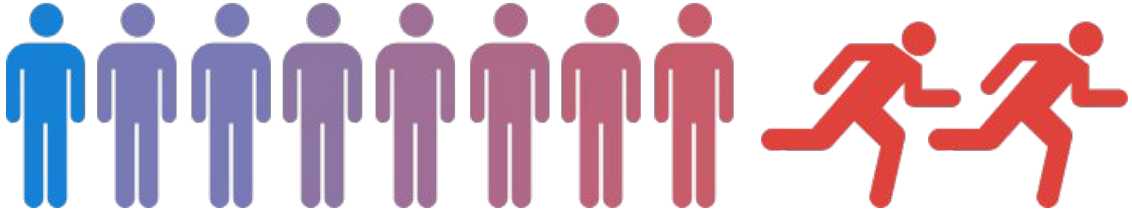
01. Introduction: What is customer churn?



Customer churn, also known as customer attrition, is when someone chooses to stop using your products or services

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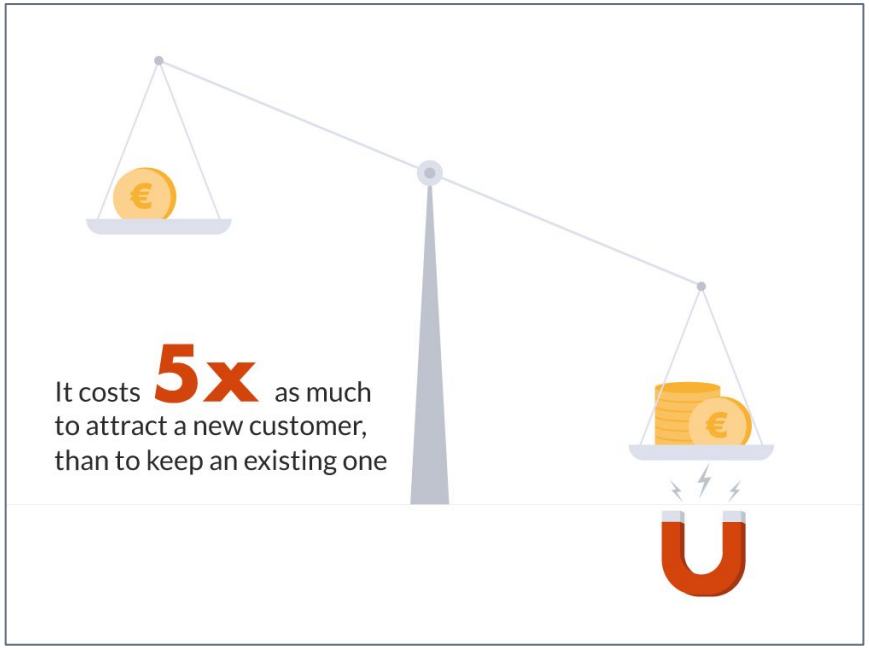
01. Introduction: Why does churn matter?



According to the Harvard Business School… a **5%** increase in customer retention rates results in **25% – 95%** increase of profits.

Source: https://www.superoffice.com/blog/reduce-customer-churn/

01. Introduction: Problem statement.

"The **TELCO** company is suffering
from a high customer churn rate
decreasing company revenue"

02. Objectives.

1. To create a model to predict customer churn.
2. To design a retention program to increase engagement.

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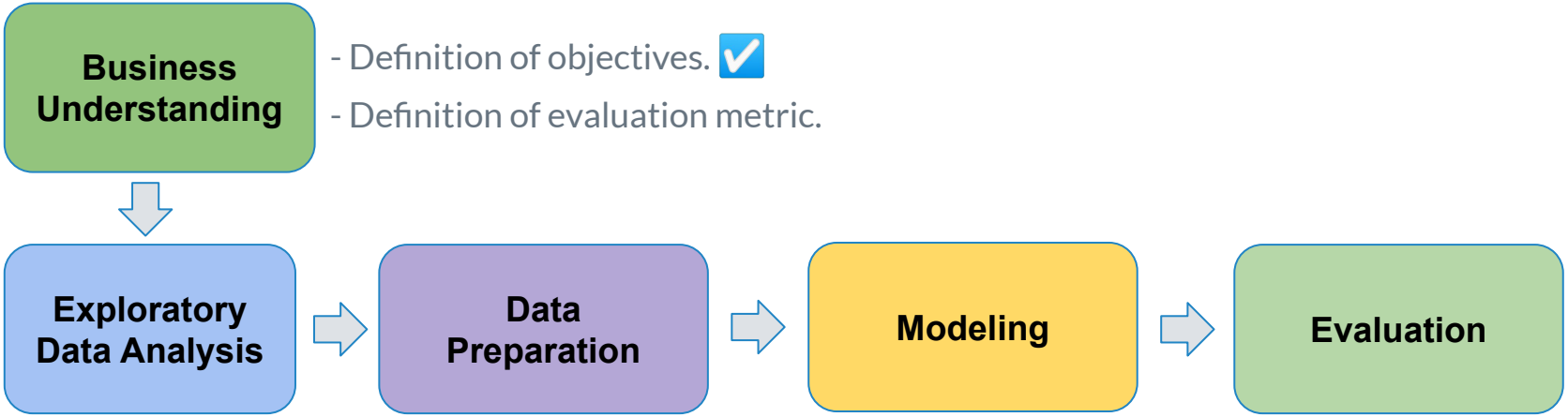
03. Methodology: overview.



- Univariate analysis.
- Bivariate analysis.
- Pearson's correlation.
- Cramer's V correlation,

- Data cleaning.
- Feature encoding.
- Dataset split.
- Feature scaling.

- Model selection.
- Hyperparameter tuning.
- K-fold cross validation.
- Generalization.

- Model evaluation.
- Statistical tests.
- Probability thresholds.

03. Methodology: Business Understanding

Model Evaluation Metric

Accuracy

F1-Score

F2-Score

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03. Methodology: EDA.

Demographic

- Gender.
- Senior Citizen.
- Partner.
- Dependents.

Customer

- Customer ID.
- Tenure.

Target

- Churn.

Services

- Phone Service.
- Multiple Lines.
- Internet Service.
- Online Security.
- Online Backup.
- Device.
- Protection.
- Tech Support.
- Streaming TV.
- Streaming Movies.

Billing

- Contract.
- Paperless Billing.
- Payment Method.
- Monthly Charges.
- Total Charges.

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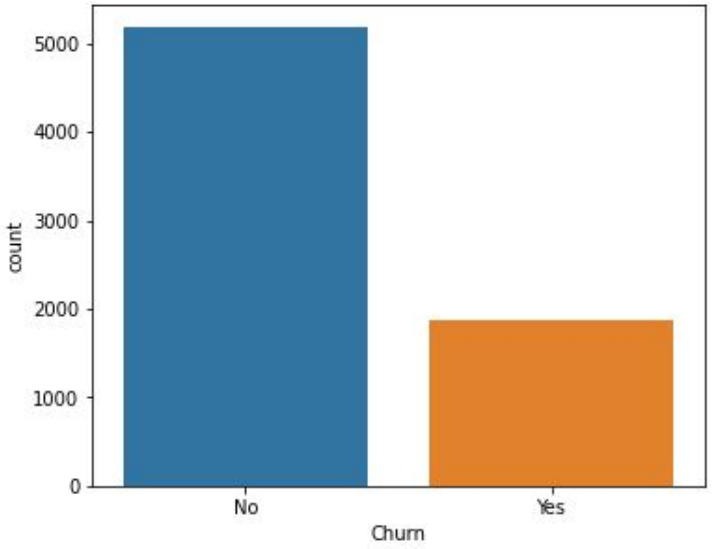
03. Methodology: EDA.

Churn count



Observation: About **27%** of the total customers are churners.

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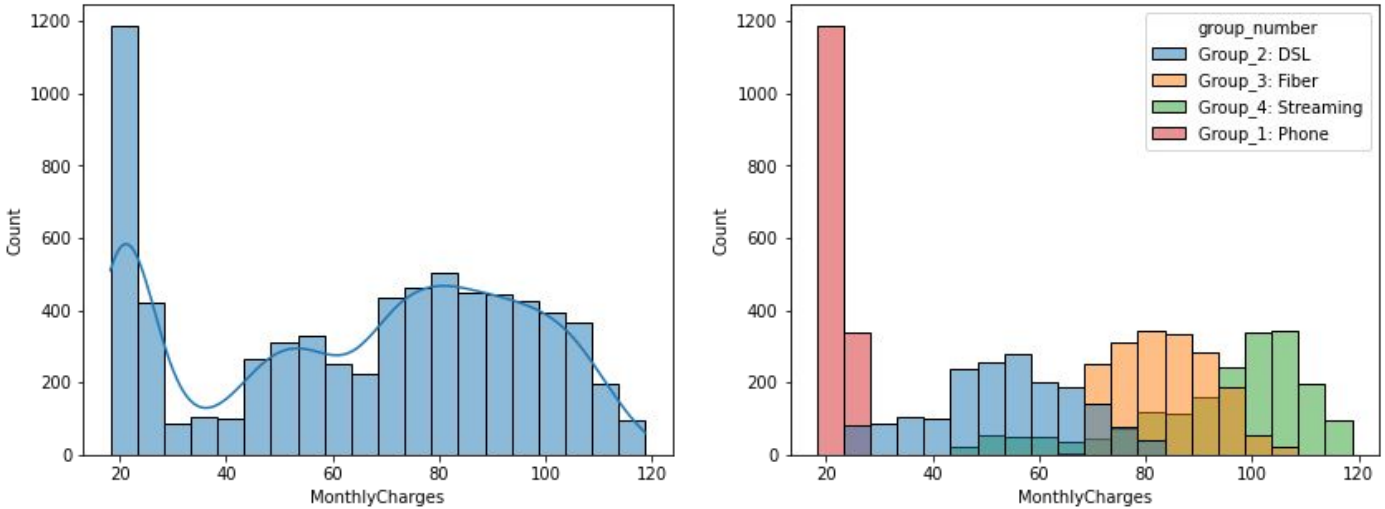
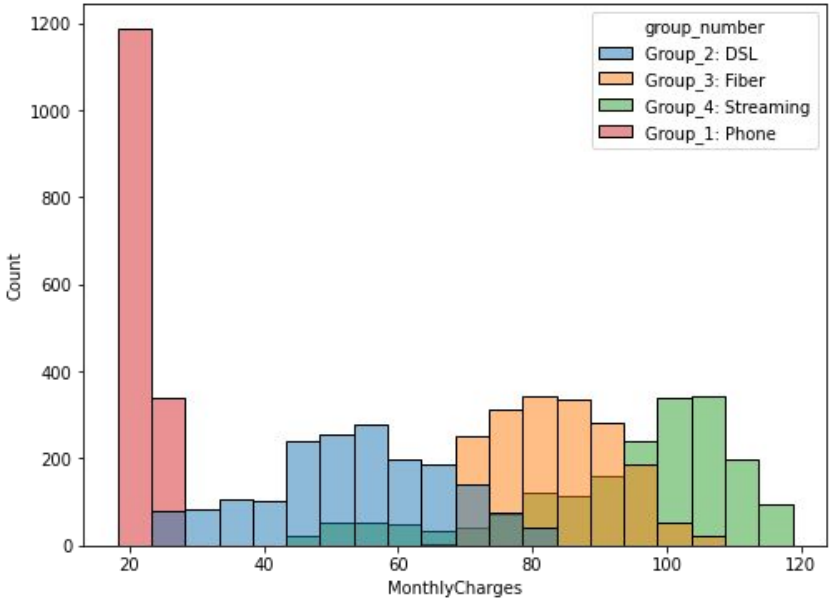
03. Methodology: EDA.

Monthly Charges distribution



Bundle type reduction: 13,122 —> 322 —> 4

03. Methodology: EDA segmentation.

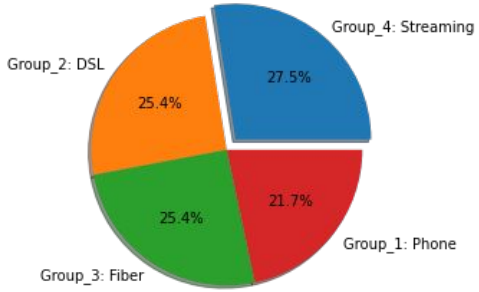


Group_1: Customers with PhoneService but no InternetService.

Group_2: Customers with InternetService (DSL).

Group_3: Customers with InternetService (Fiber optic).

Group_4: Customers with StreamingTV or StreamingMovies.



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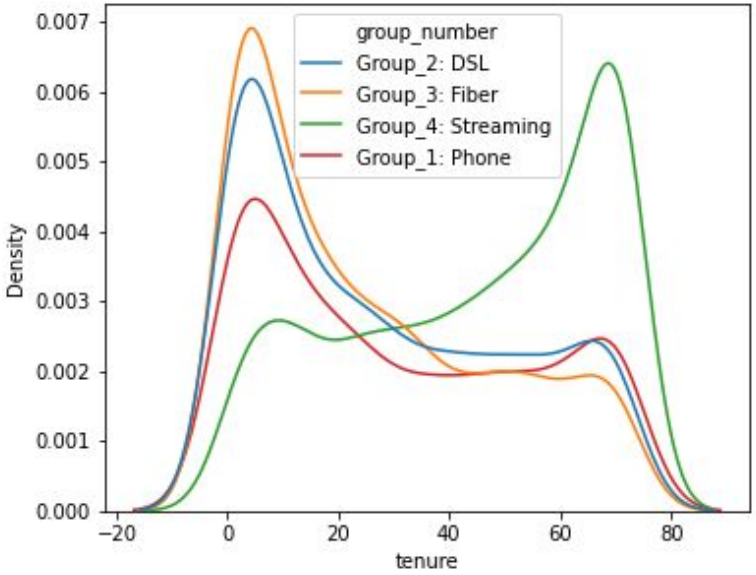
03. Methodology: EDA.

Tenure distribution vs. bundle type.



Observation: Customers consuming any streaming service are more likely to stay longer with the company.

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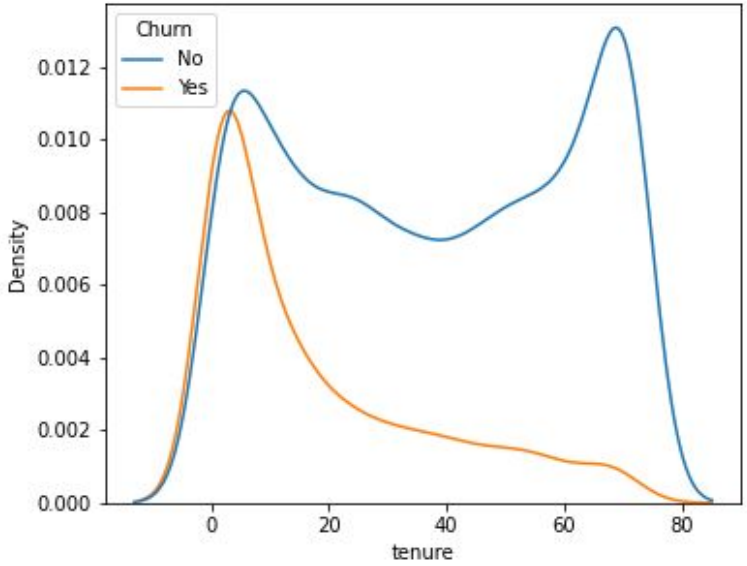
03. Methodology: EDA.

Tenure distribution vs. Churn.



Observation: Most churners leave the company at very early stages.

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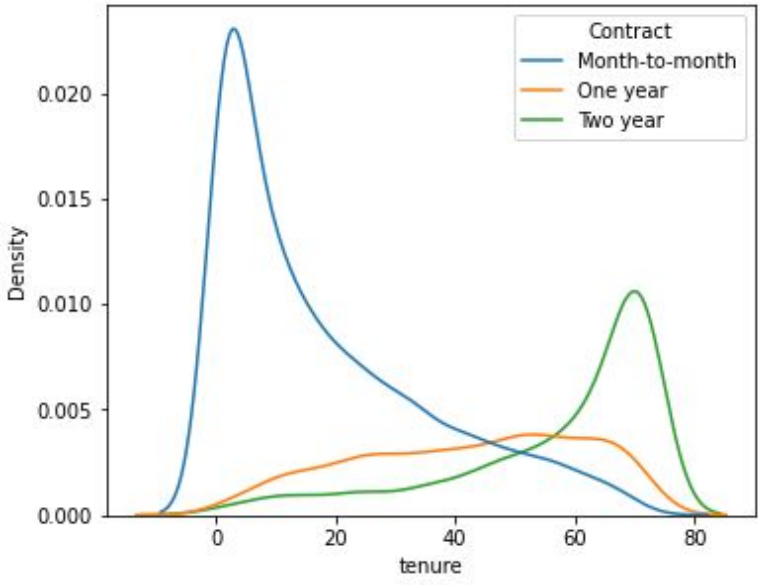
03. Methodology: EDA.

Tenure distribution vs. contract.



Observation: Month-to-month contract customers tend to leave the company much more easily.

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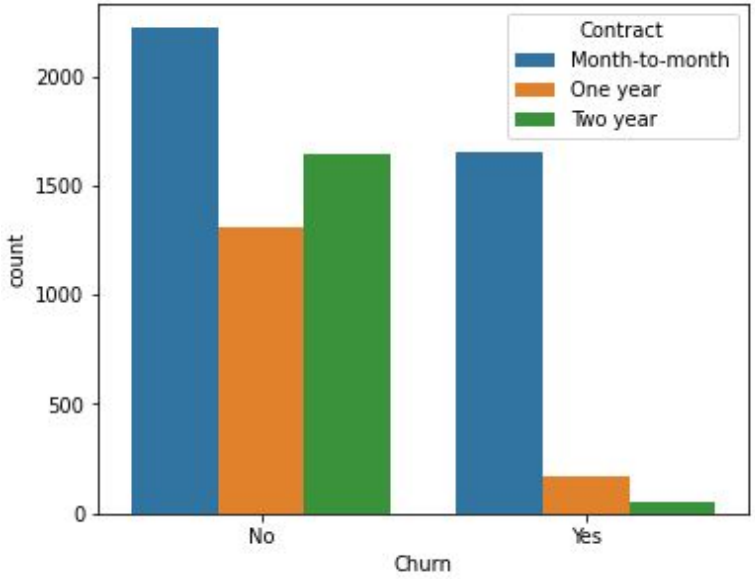
03. Methodology: EDA.

Churn vs. contract.



Observation: This just reaffirms our previous observation about Month-to-month contracts.

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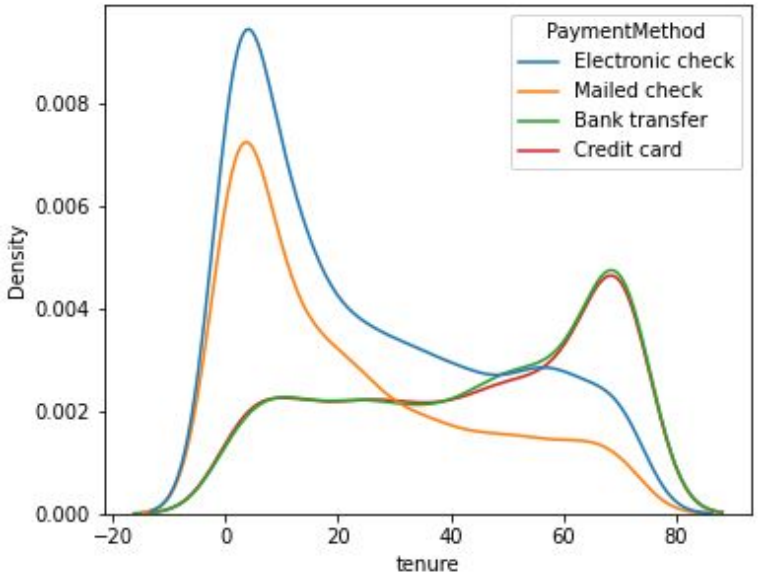
03. Methodology: EDA.

Tenure distribution vs. payment method.



Observation: Automatic payment methods like bank transfer or credit card are well related with longer engagement.

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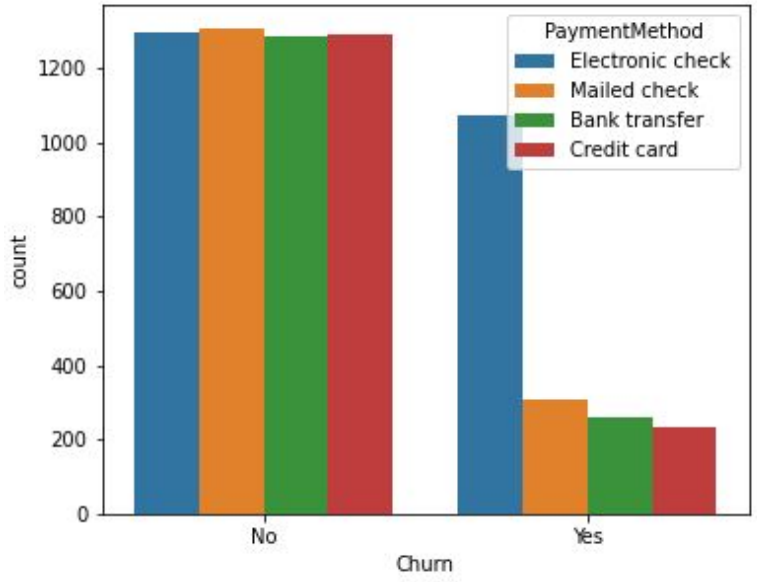
03. Methodology: EDA.

Churn vs. payment method.



Observation: Customers with Electronic Check as payment method are more likely to leave.

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03. Methodology: Data preparation.

Actions taken:

- 11 blank values in “TotalCharges” were replaced by a zero value (0).
- No duplicate values found.
- Categorical features were integer encoded then OneHot encoded.
- Dataset was split in a 80% /20% ratio for training and test.
- For numerical features: a z-score normalization was applied whenever a model was trained or cross-validated.

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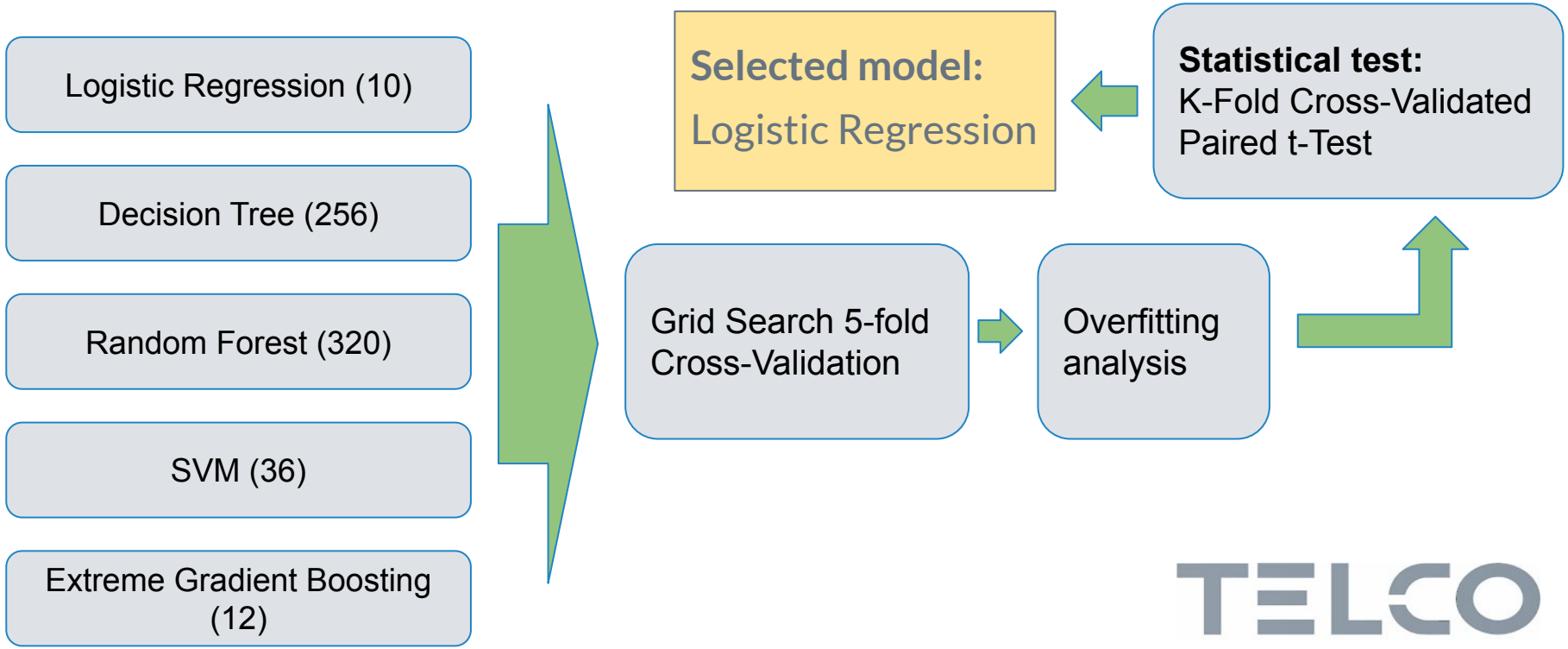
03. Methodology: Modeling.



03. Methodology: Modeling.

Overfitting analysis.

	mean_train_score	std_train_score	mean_test_score	std_test_score
Logistic Regression	0.72466	0.00502711	0.719093	0.0226338
Decision Tree	0.727275	0.0134499	0.714764	0.0154759
Random Forest	0.736085	0.00778334	0.725454	0.0158456
SVM	0.720131	0.00355627	0.720089	0.0142873
XG Boost	0.595087	0.00420724	0.550611	0.0269865

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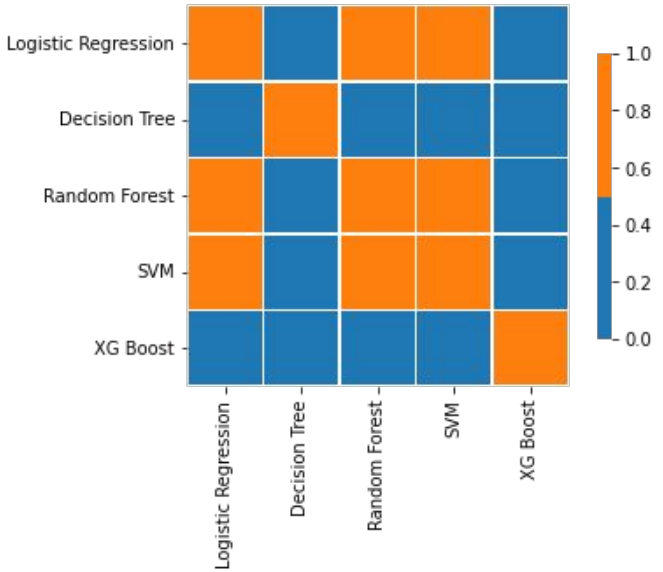
04. Model performance: evaluation.

Models with the best hyperparameters.

	precision	recall	f2-score	accuracy
Baseline	0.27	1	0.64	0.27
Logistic Regression	0.52	0.81	**0.73**	0.75
Decision Tree	0.54	0.74	0.69	0.77
Random Forest	0.51	0.78	0.71	0.75
SVM	0.47	0.82	0.71	0.7
XG Boost	0.68	0.52	0.55	0.81

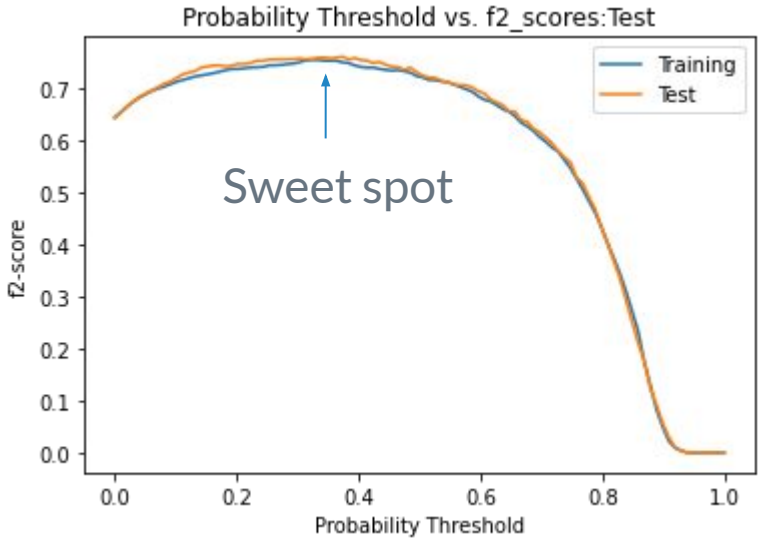
K-Fold Cross-Validated Paired t-Test. (20x5 scores)



Accepts null hypothesis: mean difference between paired observations is zero, α=0.05.

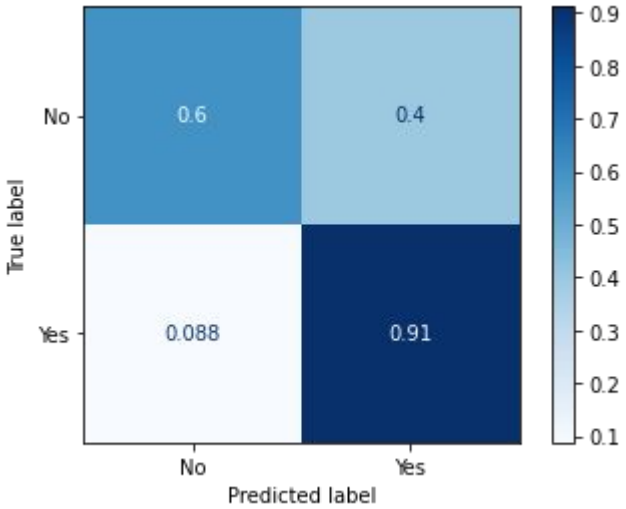
04. Model performance.

Moving probability thresholds for classifier predictions.



04. Model performance: final model.

Normalized confusion matrix.



Classification report.

	precision	recall	f1-score	support
0	0.95	0.60	0.74	1035
1	0.45	0.91	0.60	374
accuracy			0.68	1409
macro avg	0.70	0.76	0.67	1409
weighted avg	0.82	0.68	0.70	1409

F2-score: 0.76

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05. Retention program.

1

Retention Program 1: Encourage payment methods with autopay option by giving a 5% discount on the service.

2

Retention Program 2: Promote service bundle updates to include any streaming service.

3

Retention Program 3: Offer a substantial price discount on services to customers with longer contracts.

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05. Retention program cont.

4

Retention Program 4: Remove Month-to-month contracts.

5

Retention Program 5: Use the predictive model to gauge the level of risk for a person to churn and to create a proportional action.

Bonus: Reach anyone predicted to churn for a customer satisfaction / service evaluation survey. Act accordingly.

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Conclusions

- In this project, a data driven approach was implemented in order to reduce customer churn. A model with a very high recall (**91%**) of possible churners was generated. Even though the precision is around 50% the benefits overweights the related precision costs.

- Finally, a set of retention programas was proposed base on the information extracted from the data.