

CUSTOMER CHURN PREDICTION:

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PHASE 4: PROJECT SUBMISSION

Development part 2

INTRODUCTION:

Churn prediction means detecting which customers are likely to leave a service or to cancel a subscription to a service. It is a critical prediction for many businesses because acquiring new clients often costs more than retaining existing ones. Once you can identify those customers that are at risk of cancelling, you should know exactly what marketing action to take for each individual customer to maximise the chances that the customer will remain.

WHY IT IS SO IMPORTANT?

Customer churn is a common problem across businesses in many sectors. If you want to grow as a company, you have to invest in acquiring new clients. Every time a client leaves, it represents a significant investment lost. Both time and effort need to be channelled into replacing them. Being able to predict when a client is likely to leave, and offer them incentives to stay, can offer huge savings to a business.

As a result, understanding what keeps customers engaged is extremely valuable knowledge, as it can help you to develop your retention strategies, and to roll out operational practices aimed at keeping customers from walking out the door.

**MAIN CHALLENGES:**

**1)To succeed at retaining customers who are ready to abandon your business, Marketers & Customer Success experts must be able to predict in advance which customers are going to churn and set up a plan of marketing actions that will have the greatest retention impact on each customer. The key here is to be proactive and engage with these customers. While simple in theory, the realities involved with achieving this “proactive retention” goal are extremely challenging.**

**2)The accuracy of the technique is critical to the success of any proactive retention efforts. If the Marketer is unaware of a customer about to churn, no action will be taken to retain that customer.**

**3)Special retention-focused offers or incentives may be provided to happy, active customers, resulting in reduced revenues for no good reason.**

**4)Your churn prediction model should rely on (almost) real-time data to quantify the risk of churning, not on static data. Although you will be able to identify a certain percentage of at-risk customers with even static data, your predictions will be inaccurate.**

**DATASHEET RELATED TO PYCARET :**

```
# import libraries
```

```
import pandas as pd
```

```
import numpy as np
```

```
# read csv data
```

```
data = pd.read_csv('https://raw.githubusercontent.com/srees1988/predict-churn-py/main/customer_churn_data.csv')
```

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	...	DeviceProtection	TechSup
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL	No	...	No	
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL	Yes	...	Yes	
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL	Yes	...	No	
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL	Yes	...	Yes	
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic	No	...	No	

5 rows × 21 columns

## EXPLORATORY DATA ANALYSIS:

---

customerID	object
gender	object
SeniorCitizen	int64
Partner	object
Dependents	object
tenure	int64
PhoneService	object
MultipleLines	object
InternetService	object
OnlineSecurity	object
OnlineBackup	object
DeviceProtection	object
TechSupport	object
StreamingTV	object
StreamingMovies	object
Contract	object
PaperlessBilling	object
PaymentMethod	object
MonthlyCharges	float64
TotalCharges	object
Churn	object

dtype: object

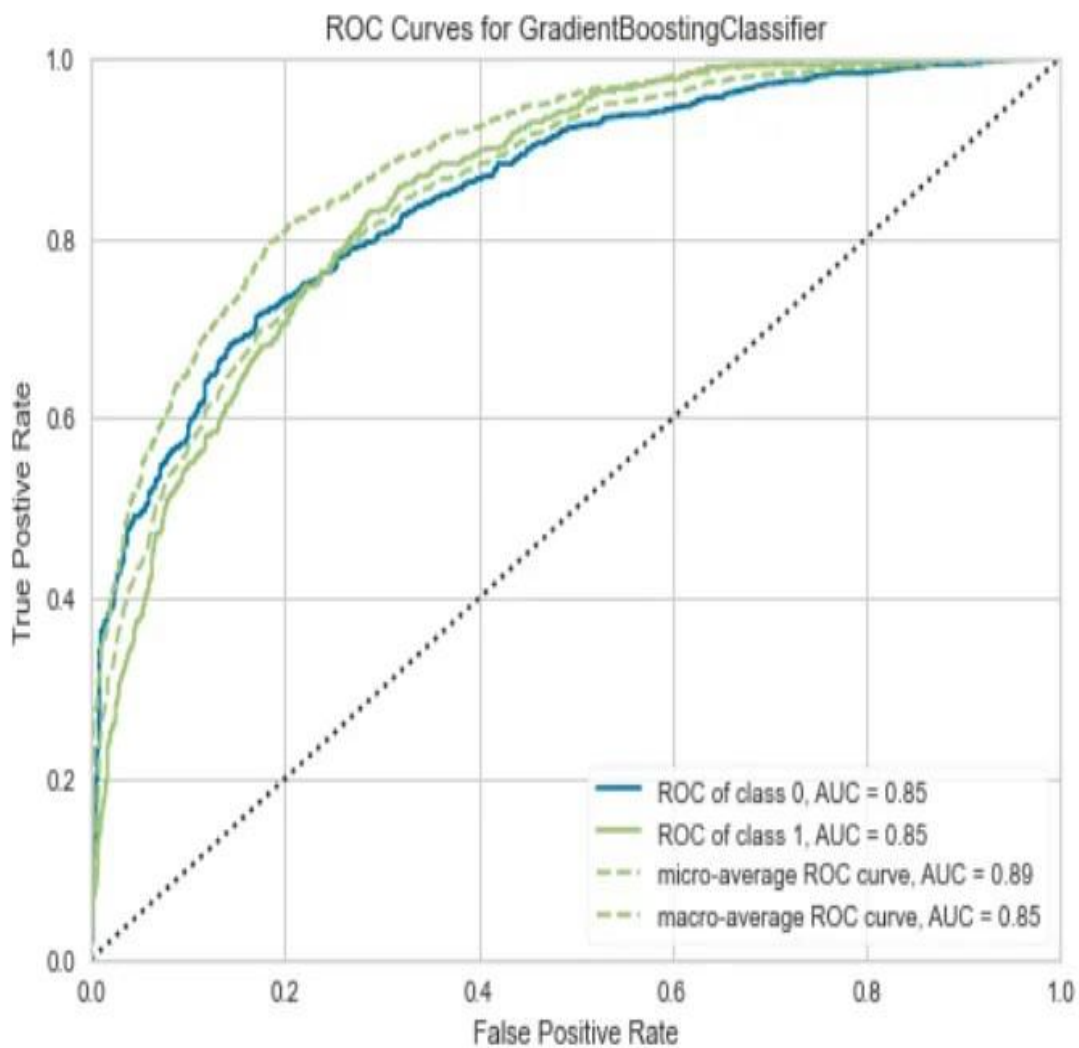
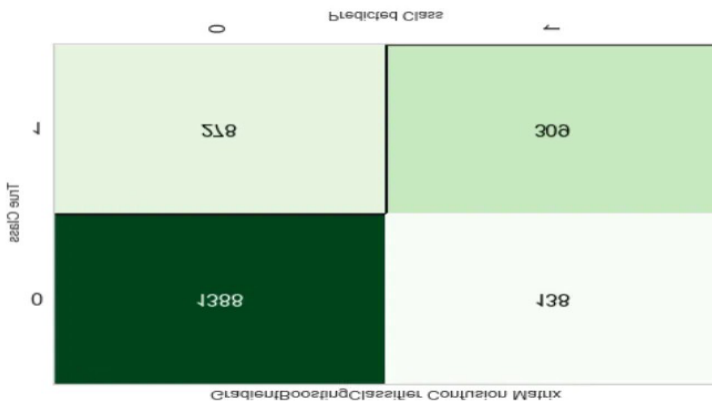
MODEL ANALYSIS:

# AUC Plot

plot\_model(tuned\_best\_model, plot = 'auc')

# Confusion Matrix

```
plot_model(tuned_best_model, plot = 'confusion_matrix')
```



ASSUMPTION :

Customer retention is one of the primary growth pillars for products with a subscription-based business model. Competition is tough in the SaaS market where customers are free to choose from plenty of providers even within one product category. Several bad experiences – or even one – and a customer may quit. And if droves of unsatisfied customers churn at a clip, both material losses and damage to reputation would be enormous.

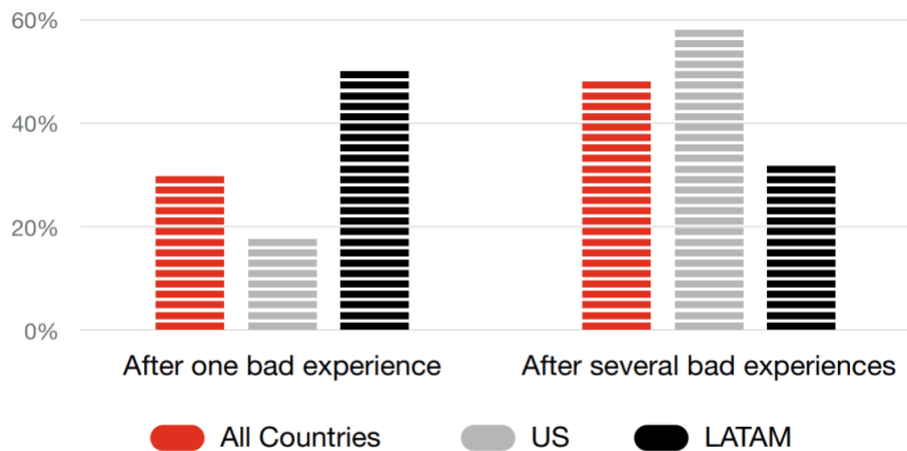
For this article, we reached out to experts from HubSpot and ScienceSoft to discuss how SaaS companies handle the problem of customer churn with predictive modeling. You will discover approaches and best practices for solving this problem. We'll discuss collecting data about client relationship with a brand, characteristics of customer behavior that correlate the most with churn and explore the logic behind selecting the best-performing machine learning models.

customer attrition:

Customer churn (or customer attrition) is a tendency of customers to abandon a brand and stop being a paying client of a particular business. The percentage of customers that discontinue using a company's products or services during a particular time period is called a customer churn (attrition) rate. One of the ways to calculate a churn rate is to divide the number of customers lost during a given time interval by the number of acquired customers, and then multiply that number by 100 percent. For example, if you got 150 customers and lost three last month, then your monthly churn rate is 2 percent.

There are many things brands may do wrong, from complicated onboarding when customers aren't given easy-to-understand information about product usage and its capabilities to poor communication, e.g. the lack of feedback or delayed answers to queries. Another situation: Longtime clients may feel unappreciated because they don't get as many bonuses as the new ones.

**Figure 4:** When do consumers stop interacting with a brand they love?



Q: At what point would you stop interacting with a company that you love shopping at or using?  
Source: PwC Future of Customer Experience Survey 2017/18

## DETECTING CUSTOMERS AT RISK OF CHURN ::

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Churn rate is a health indicator for businesses whose customers are subscribers and paying for services on a recurring basis, notes head of data analytics department at ScienceSoft Alex Bekker, “Customers [of subscription-driven businesses] opt for a product or a service for a particular period, which can be rather short – say, a month. Thus, a customer stays open for more interesting or advantageous offers. Plus, each time their current commitment ends, customers have a chance to reconsider and choose not to continue with the company. Of course, some natural churn is inevitable, and the figure differs from industry to industry. But having a higher churn figure than that is a definite sign that a business is doing something wrong.”

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The reality is that even loyal customers won't tolerate a brand if they've had one or several issues with it. For instance, 59 percent of US respondents to the survey by PricewaterhouseCoopers (PwC) noted that they will say goodbye to a brand after several bad experiences, and 17 percent of them after just one bad experience.

#### IMPACT OF CUSTOMER CHURN ON BUSINESSES:

Many surveys focusing on customer acquisition and retention costs are available online. According to this one by Invesp, conversion rate optimization company, getting a new customer may cost up to five times more than retaining an existing customer.

Churn rates do correlate with lost revenue and increased acquisition spend. In addition, they play a more nuanced role in a company's growth potential, continues Michael, "Today's buyers aren't shy about sharing their experiences with vendors through channels like review sites and social media, as well as peer-to-peer networks. HubSpot Research found that 49 percent of buyers reported sharing an experience they had with a company on social media. In a world of eroding trust in businesses, word of mouth plays a more critical role in the buying process than ever before. From the same HubSpot Research study, 55 percent of buyers no longer trust the companies they buy from as much as they used to, 65



percent don't trust company press releases, 69 percent don't trust advertisements, and 71 percent don't trust sponsored ads on social networks."

The expert concludes that companies with high churn rates aren't only failing to deliver in their relationships with ex-customers but also damage their future acquisition efforts by creating negative word-of-mouth around their products.

CallMiner conversational analytics solutions provider interviewed 1000 adults to learn why and how they interact with companies. The survey revealed that US businesses lose about \$136 billion a year due to customer attrition. What's more, the company behaviors that caused customers to cut ties with brands could have been corrected.

#### USE CASES FOR CUSTOMER CHURN PREDICTION:

Telecom companies (cable or wireless). These companies may provide a full range of products and services, including wireless network, internet, TV, cell phone, and home phone services (AT&T, Sprint, Verizon, Cox Communications, etc.). Some specialize in mobile telecommunications (China Mobile, Vodafone, T-Mobile, etc.).

Software as a service providers. The adoption of cloud-hosted software is growing. According to Gartner, the SaaS market remains the largest segment of the cloud market. Its revenue is expected to grow 17.8 percent and reach \$85.1 billion in 2019. The product range of SaaS providers is extensive: graphic and video editing (Adobe Creative Cloud, Canva), accounting (Sage 50cloud, FreshBooks), eCommerce (BigCommerce, Shopify), email marketing (MailChimp, Zoho Campaigns), and many others.

These company types may use churn rate to measure the effectiveness of cross-department operations and product management.

And now imagine a company that has been gathering customer data for a while, so it can use it to identify behavior patterns of potential churners, segment these at-risk customers, and take appropriate actions to gain back their trust. Those following a proactive approach to customer churn management use predictive analytics. That's one of four analytics types that entails forecasting the probability of future outcomes, events, or values by analyzing current and historical data. Predictive analytics utilizes various statistical techniques, such as data mining (pattern recognition) and machine learning .

Detecting customers at risk of churn helps take measures in advance:

Subscription-based businesses leverage ML for predictive analytics to find out which current users aren't fully satisfied with their services and address their issues when it's not too late: "Identifying customers at risk of churn as many as 11 months before their renewal enables our customer success team to engage these customers, understand their pain points, and with them, put together a long term plan focused on helping the customer realize value from the service they bought," explains Michael.

Use cases for predictive churn modeling go beyond proactive engagement with prospective churning customers and selecting effective retention actions. According to Redbord, ML-based software allows customer success managers to define which customers they should contact. In other words, employees can be sure they're speaking with the right customers at the right time.

**STEPS FOR EFFECTIVE CHURN PREDICTION:**

## 1). Reliable customer segmentation

Churn prediction is entirely based around the use of your company's historical data on your customer. You'll need your customer analytics to predict how customer churn is affecting your business accurately. Begin by exporting all historical data types that could potentially affect a customer's likelihood to churn.

Demographics and behavioral data:

\*)Is this user a single user or using your product on behalf of their company?

\*)What is their rate of use of the product in general and the specific features that are available to them?

\*)How often does this user submit tickets to your support service?

Importing Telco Churn dataset:

```
# Import required libraries
```

```
import numpy as np
```

```
import pandas as pd
```

```
# Import the dataset
```

```
dataset = pd.read_csv('telcochurndata.csv')
```

```
# Glance at the first five records
```

```
dataset.head()
```

```
# Print all the features of the data
```

```
dataset.columns
```

	State	Account length	Area code	International plan	Voice mail plan	Number vmail messages	Total day minutes	Total day calls	Total day charge	Total eve minutes	Total eve calls	Total eve charge	Total night minutes	Total night calls	Total night charge	Total intl minutes	Total intl calls	Total intl charge
0	KS	128	415	No	Yes	25	265.1	110	45.07	197.4	99	16.78	244.7	91	11.01	10.0	3	2.70
1	OH	107	415	No	Yes	26	161.6	123	27.47	195.5	103	16.62	254.4	103	11.45	13.7	3	3.70
2	NJ	137	415	No	No	0	243.4	114	41.38	121.2	110	10.30	162.6	104	7.32	12.2	5	3.29
3	OH	84	408	Yes	No	0	299.4	71	50.90	61.9	88	5.26	196.9	89	8.86	6.6	7	1.78
4	OK	75	415	Yes	No	0	166.7	113	28.34	148.3	122	12.61	186.9	121	8.41	10.1	3	2.73

Exploring Data Visualizations : To understand how variables are distributed.

# Import matplotlib and seaborn

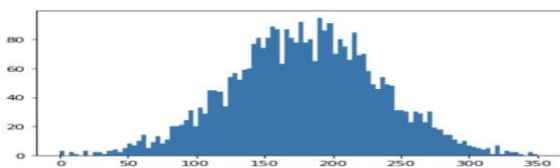
import matplotlib.pyplot as plt

import seaborn as sns

# Visualize the distribution of 'Total day minutes'

plt.hist(dataset['Total day minutes'], bins = 100)

# Display the plot



CONCLUSION:

Features and Labels

X = dataset.iloc[:, 0:19].values

y = dataset.iloc[:, 19].values # Churn

# Encoding categorical data in X

```
from sklearn.preprocessing import LabelEncoder

labelencoder_X_1 = LabelEncoder()
X[:, 3] = labelencoder_X_1.fit_transform(X[:, 3])

labelencoder_X_2 = LabelEncoder()
X[:, 4] = labelencoder_X_2.fit_transform(X[:, 4])

# Encoding categorical data in y
labelencoder_y = LabelEncoder()
y = labelencoder_y.fit_transform(y)

Code: Encoding State feature using One hot encoding

# Removing extra column to avoid dummy variable trap
X_State = pd.get_dummies(X[:, 0], drop_first = True)


# Converting X to a dataframe
X = pd.DataFrame(X)

# Dropping the 'State' column
X = X.drop([0], axis = 1)

# Merging two dataframes
frames = [X_State, X]

result = pd.concat(frames, axis = 1, ignore_index = True)

# Final dataset with all numeric features
X = result
```

Code : To Create Training and Test sets

```
# Splitting the dataset into the Training and Test sets  
from sklearn.model_selection import train_test_split  
X_train, X_test, y_train, y_test = train_test_split(X, y,  
                                                    test_size = 0.2,  
  
                                                    random_state = 0)
```

Code: To scale features of the training and test sets

```
# Feature Scaling  
from sklearn.preprocessing import StandardScaler  
sc = StandardScaler()
```

```
X_train = sc.fit_transform(X_train)
```

```
X_test = sc.transform(X_test)
```

Code: To train a Random Forest classifier model on the training set.

```
# Import RandomForestClassifier  
from sklearn.ensemble import RandomForestClassifier  
  
# Instantiate the classifier  
clf = RandomForestClassifier()  
  
# Fit to the training data  
clf.fit(X_train, y_train)
```

Code : Making Predictions

```
# Predict the labels for the test set
```

```
y_pred = clf.predict(X_test)
```

Code: Evaluating Model Performance

```
# Compute accuracy
```

```
from sklearn.metrics import accuracy_score
```

```
accuracy_score(y_test, y_pred)
```

OUTPUT:

Features and Labels

---

```
[[575  4]
 [ 37 51]]
```

CONCLUSION:

Data science customer analytics can provide companies with a competitive edge. Businesses may set themselves apart from their rivals and draw in and keep more customers by getting to know their clients better and being able to provide customized services and retention methods. This can help businesses establish a strong brand identity and maintain a loyal customer base.