CAPSTONE 3: INCREASE CUSTOMER SATISFACTION WITH MACHINE LEARNING

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PROBLEM

- Big banks will always get complaints from customers about all sorts of different products. Being able to classify complaints to help identify the root cause of the issue can be crucial in maintaining and improving customer satisfaction

RESULT

- Effective multi-class classification model achieving a 0.94 AUC score
- Topic modeling to uncover a more accurate root cause for complaint
  - Customer Service issues, etc

DATA

- Consumer Financial Protection Bureau (CFPB) complaint database
- Focused only on 4 large American banks
  - JP Morgan Chase
  - Bank of America
  - Wells Fargo
  - Citibank
- 600k records

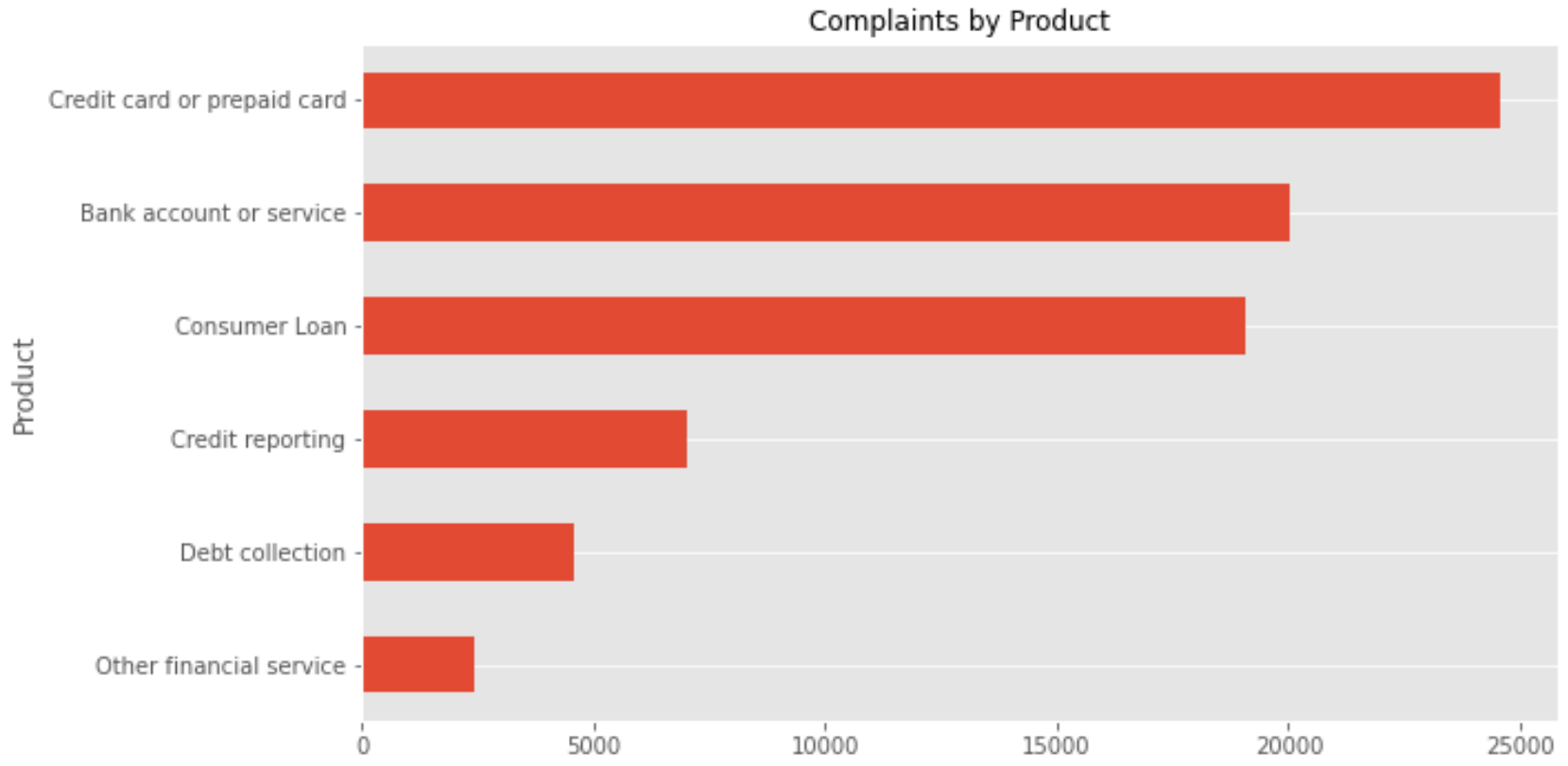
DATA CLEANING

- Filtered records without written complaint
- Sampled from full dataset to only include 4 banks
  - Left with 77k rows
- Consolidated products to solve redundancy
- Checked for duplicates and removed if necessary

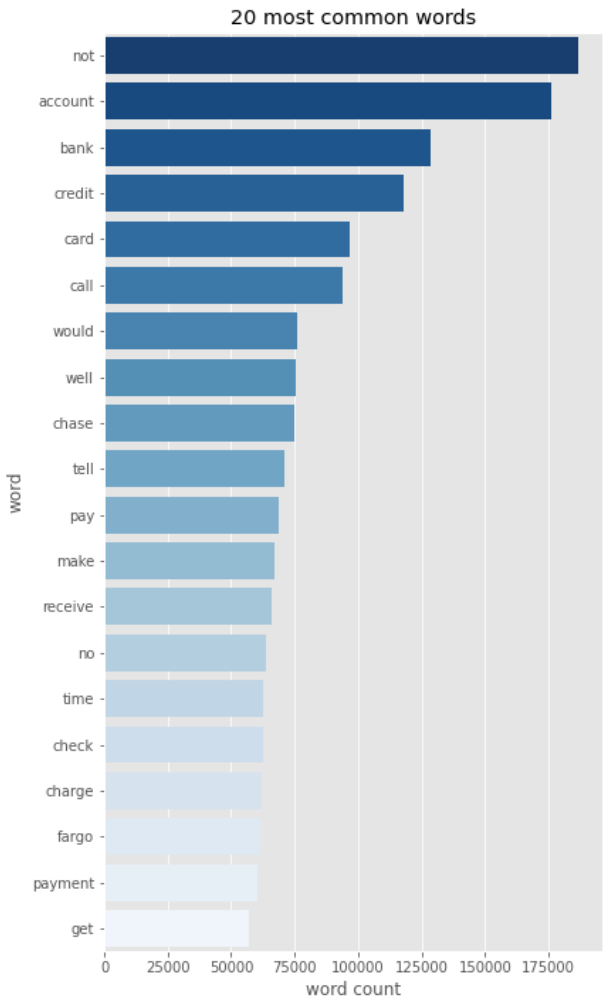
TEXT PREPROCESSING

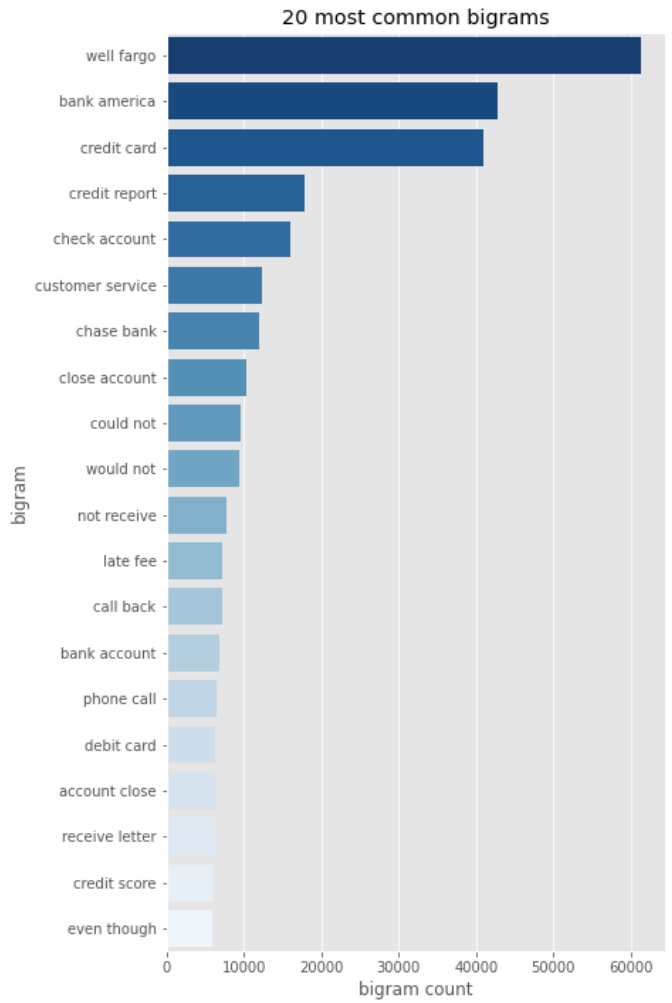
- Word tokenization
- Lemmatization
- Removal of stop words
- Convert back to a string

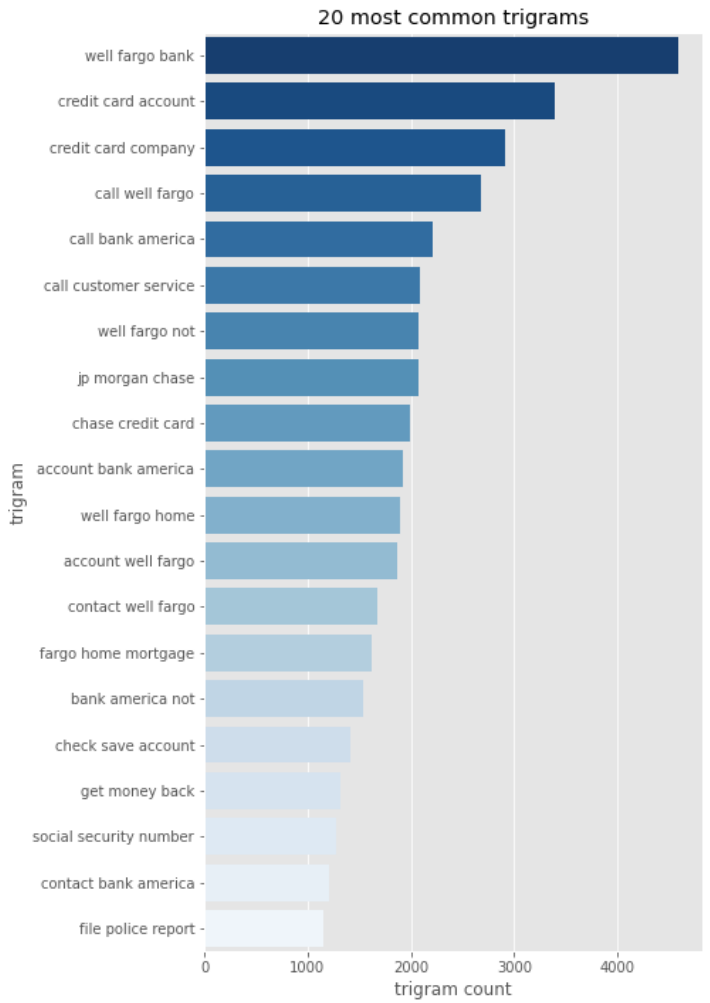
EXPLORATORY DATA ANALYSIS



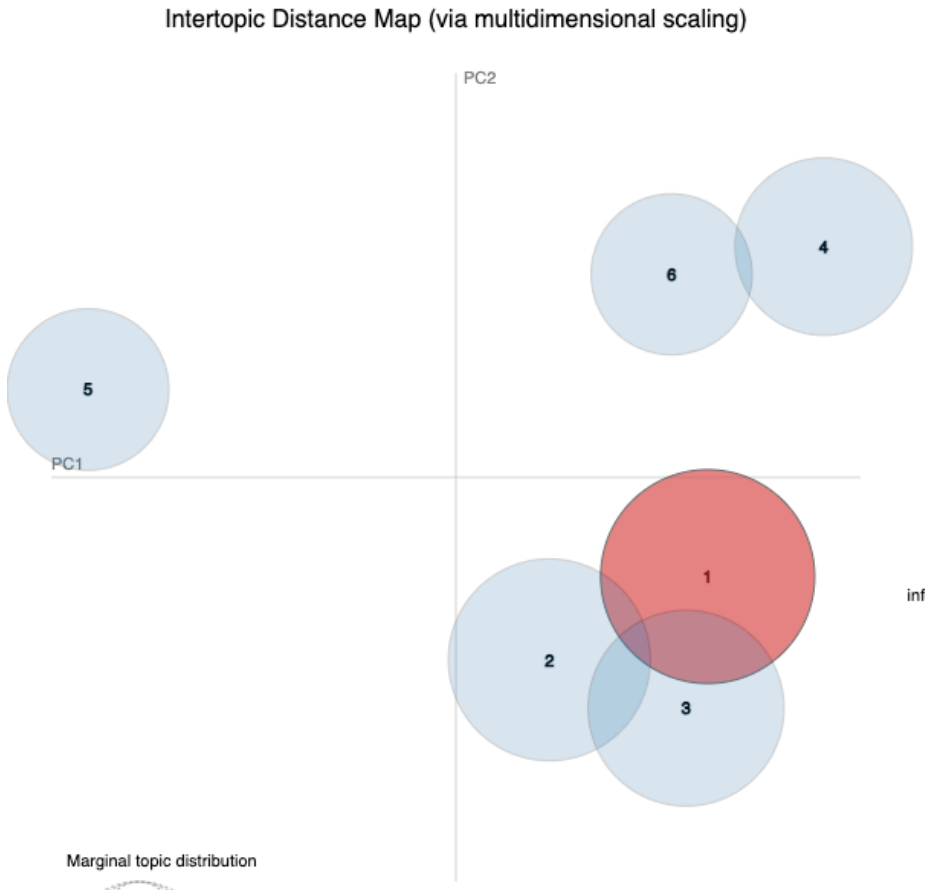
EXPLORATORY DATA ANALYSIS

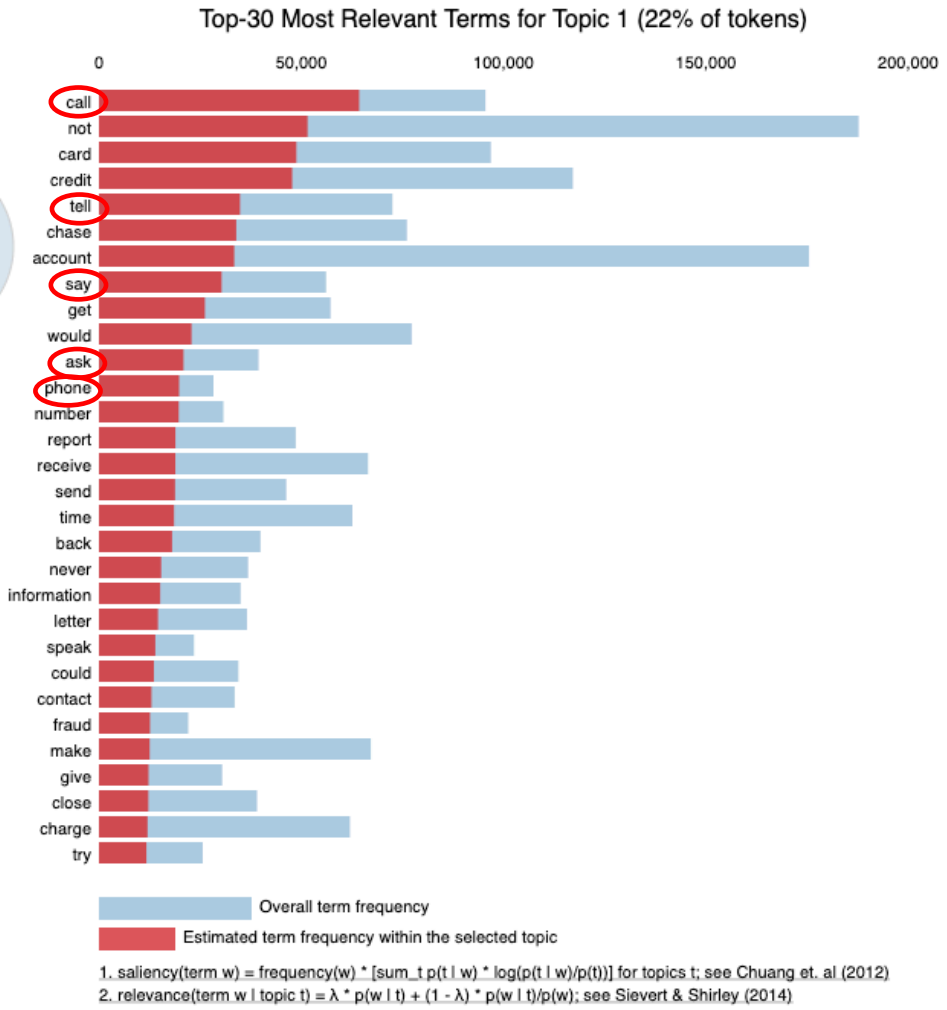






TOPIC MODELING





MODELS USED

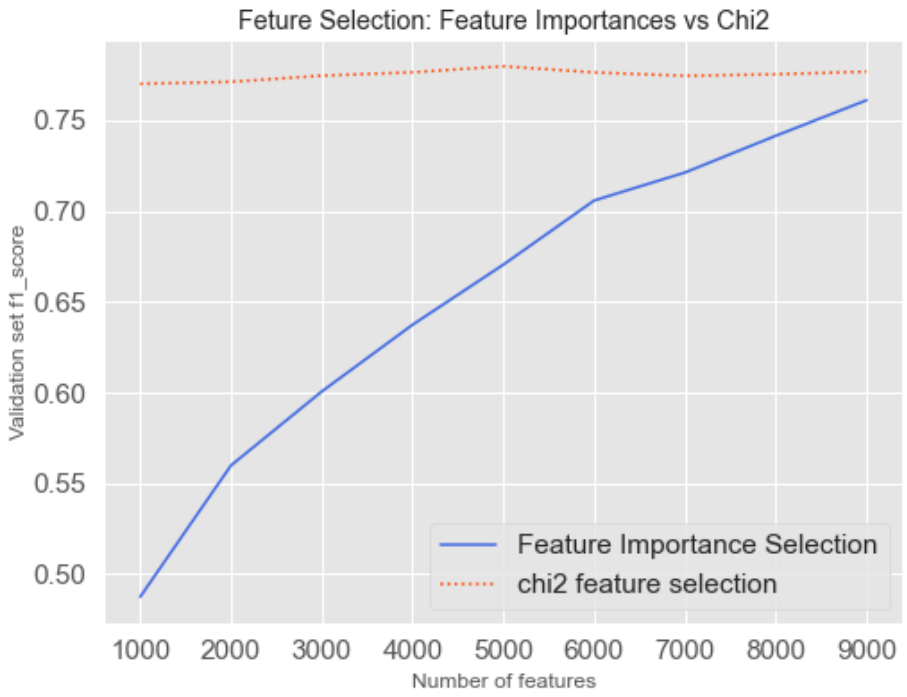
- Random Forest
- Multinomial Naïve Bayes
- Logistic Regression

FEATURE SELECTION

- Chi-squared vs Feature Importances

Random Forest

Naïve Bayes

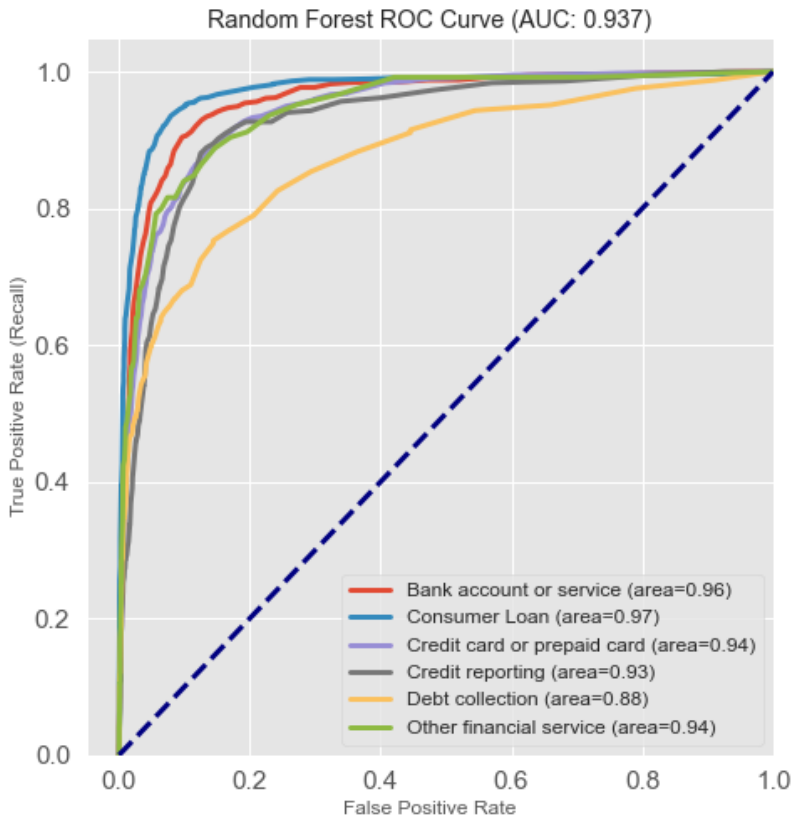


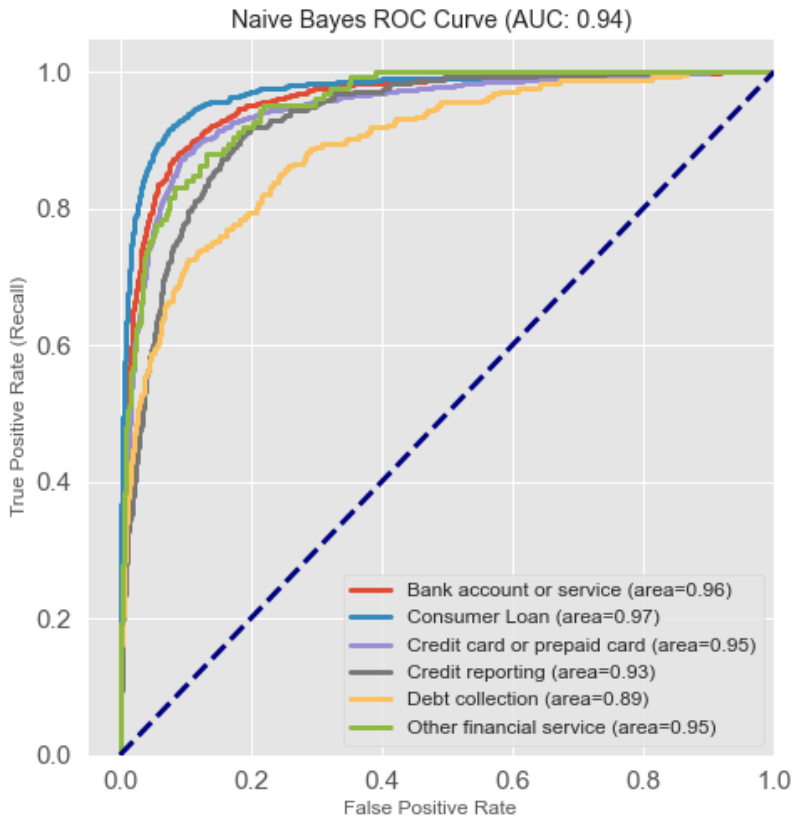
EVALUATION

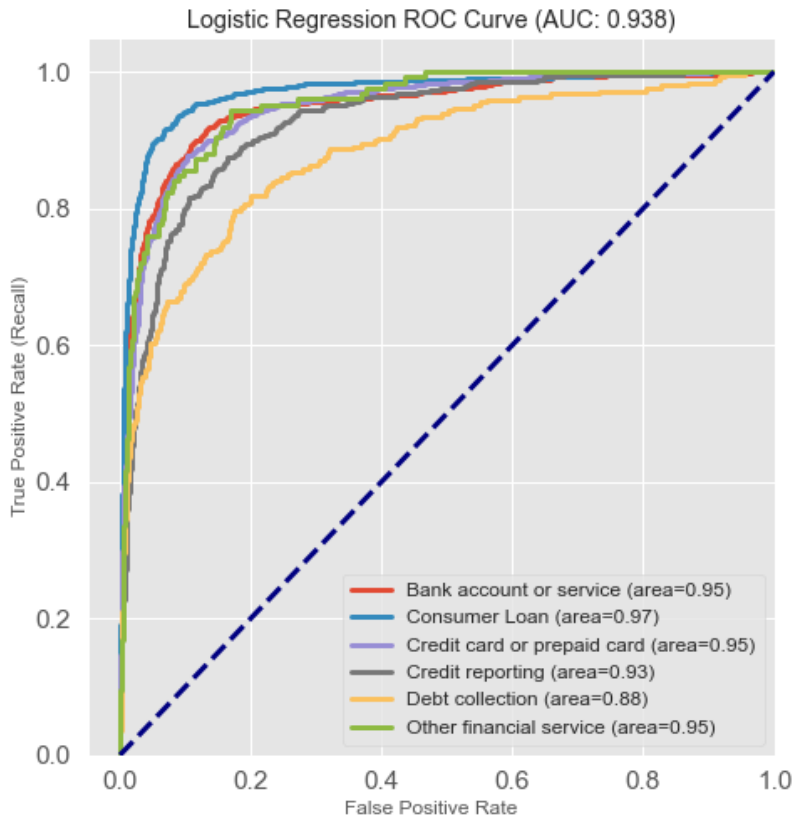
- My recommendation would be to use Naïve Bayes
  - Similar performance to Random Forest and Logistic Regression
  - Very computationally efficient

Model	Weighted f1	Runtime (mins)	AUC Scores
Random Forest Classification	0.787	1.0	0.937
Naive Bayes Classification	0.786	0.0	0.940
Logistic Regression	0.786	22.9	0.938

EVALUATION


Random Forest ROC Curve (AUC: 0.937)
True Positive Rate (Recall)
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
Bank account or service (area=0.96)
Consumer Loan (area=0.97)
Credit card or prepaid card (area=0.94)
Credit reporting (area=0.93)
Debt collection (area=0.88)
Other financial service (area=0.94)


Naive Bayes ROC Curve (AUC: 0.94)
True Positive Rate (Recall)
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
Bank account or service (area=0.96)
Consumer Loan (area=0.97)
Credit card or prepaid card (area=0.95)
Credit reporting (area=0.93)
Debt collection (area=0.89)
Other financial service (area=0.95)


Logistic Regression ROC Curve (AUC: 0.938)
True Positive Rate (Recall)
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
Bank account or service (area=0.95)
Consumer Loan (area=0.97)
Credit card or prepaid card (area=0.95)
Credit reporting (area=0.93)
Debt collection (area=0.88)
Other financial service (area=0.95)

VALUE TO CUSTOMER

- Effectively identify product alignment of complaint
- Compare with the assigned topic to understand a possible other driver
- Executives can use it to action on complaints instead of reading/analyzing them manually
- Company saves on more productive leaders and increased customer satisfaction

EXPLORE FURTHER

- Neural Network
- Try more techniques to involve Sentiment Analysis

QUESTIONS?