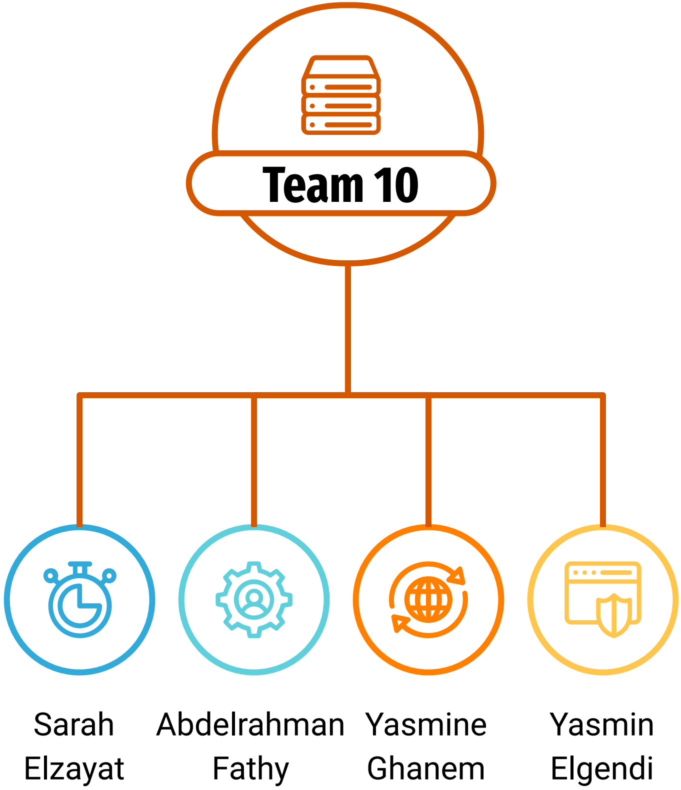
Big Data Project

PhiUSIIL Phishing URL (Website)



Eng/ Omar Samir

Agenda

Problem Intro

Definition of selected problem

Business Part

Business aspects of selected problem

Technical part

Technical aspect and approach solutions for problem

Conclusion

Results and Future Work

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Problem Intro

Definition

Phishing

Phishing attacks involve malicious websites pretending to be legitimate with the aim of deceiving individuals into proclaiming personal and sensitive information.

Objective

Security

Develop a comprehensive framework for distinguishing between phishing and legitimate websites.

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Business Part

Threat
Data breaches, financial losses, and damage to reputation.

Online Transactions
Robust cybersecurity measures is a MUST.

Brand Safety
Businesses may suffer long-term consequences from a single successful attack

Impact
Benefits across across various sectors, including e-commerce, finance, healthcare, and beyond.

Trust
safeguard their customers' data, preserve trust in online platforms

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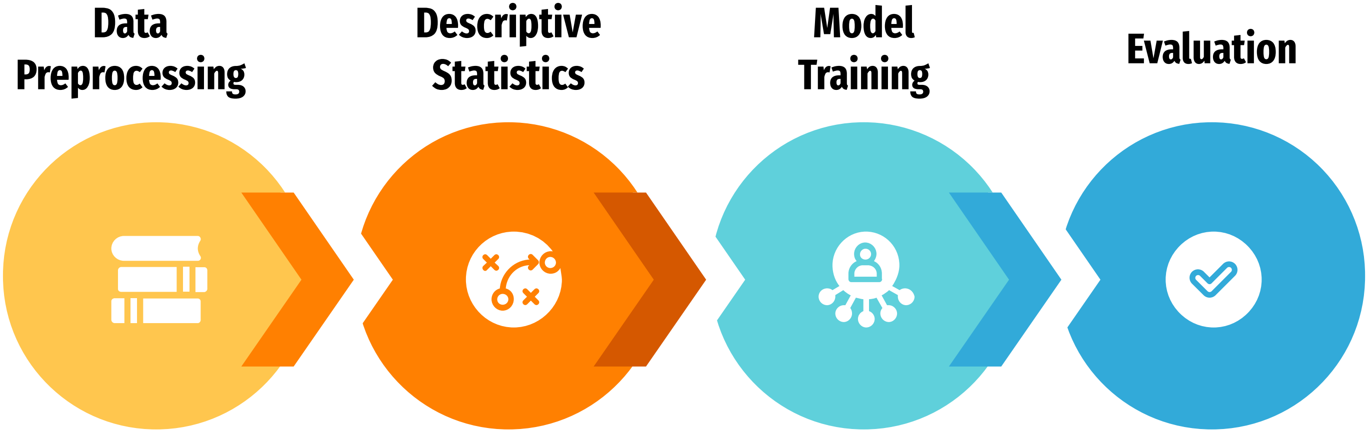
Project Pipeline



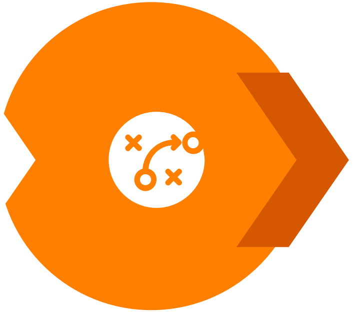
Project Pipeline

Data Preprocessing

1. Read Dataset
2. Check for missing or null values
3. Check for the unique values of some columns {URL}
4. Transfer categorical features to ONE-HOT encoding vector
5. Splitting the data into *Training, Testing & Validation*

Project Pipeline

Descriptive Statistics



To show the distribution of each column over the labels (phishing or legitimate). We used 2 types of plots

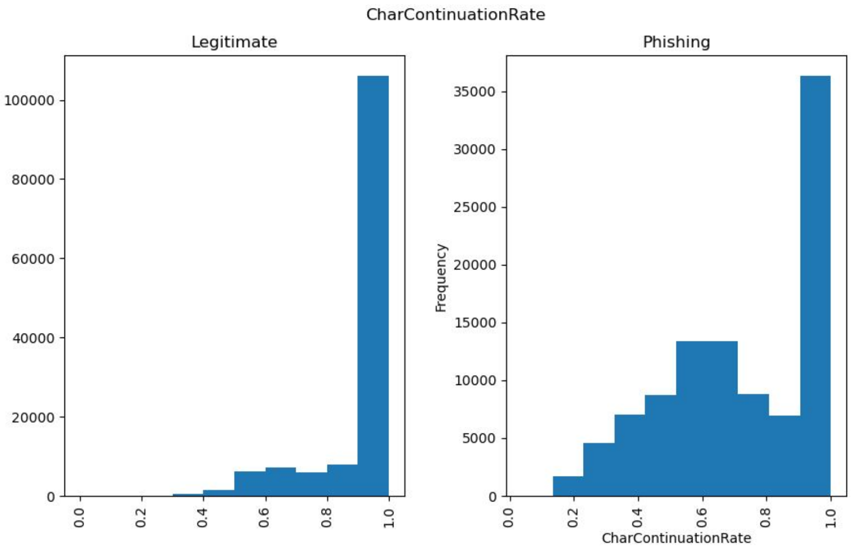
For **numeric features**, we used histograms.

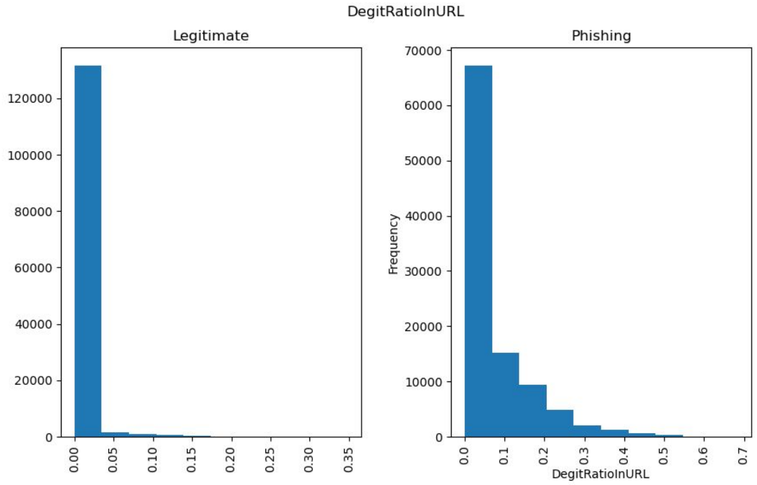
For **binary features**, we used count plots.

By observing the data distributions, we **dropped some features** we found that don't differentiate enough between the classes.

Project Pipeline

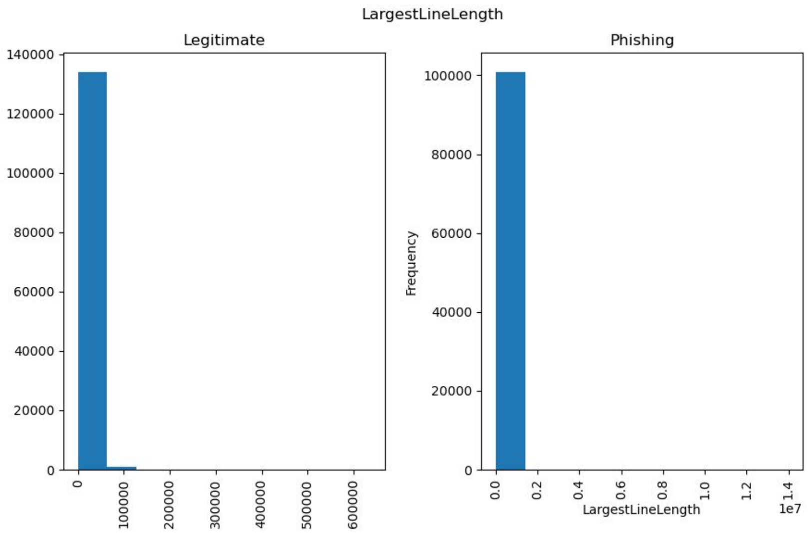
Some **numeric features**

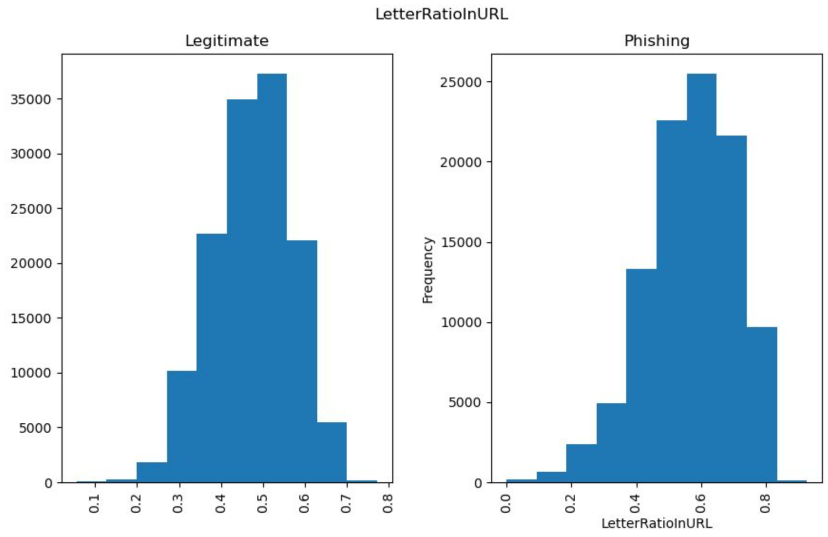




Project Pipeline

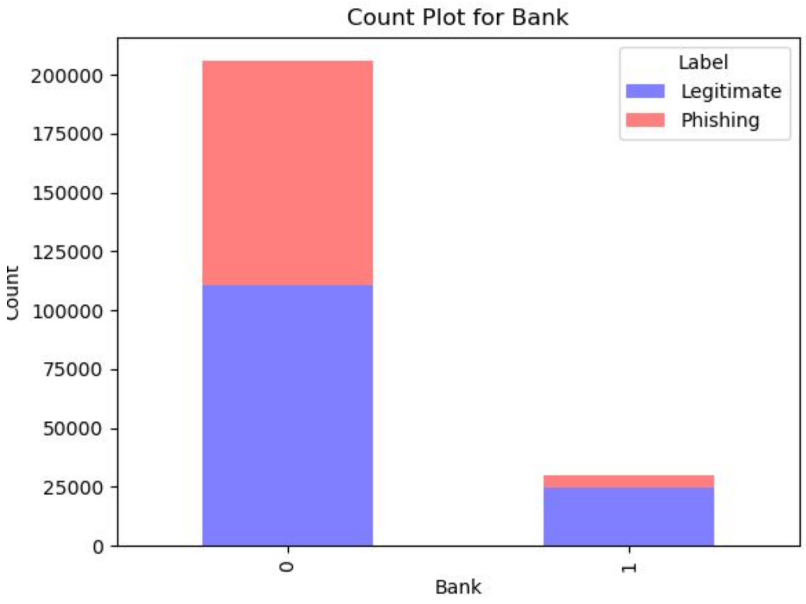
Some **numeric features**

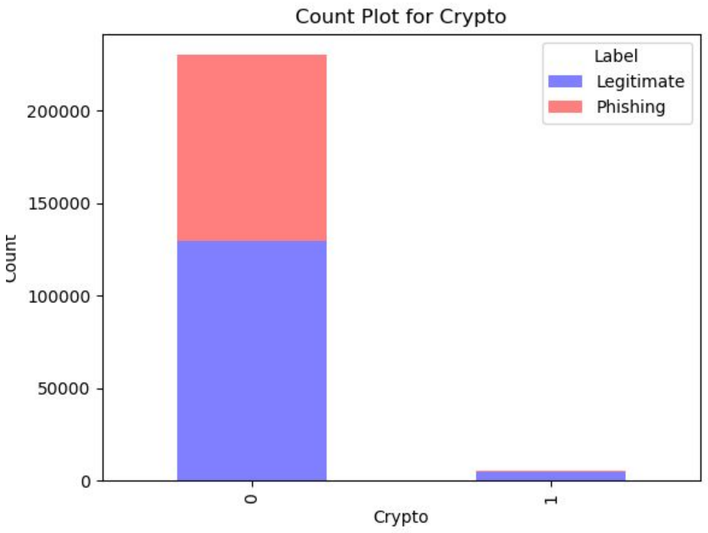




Project Pipeline

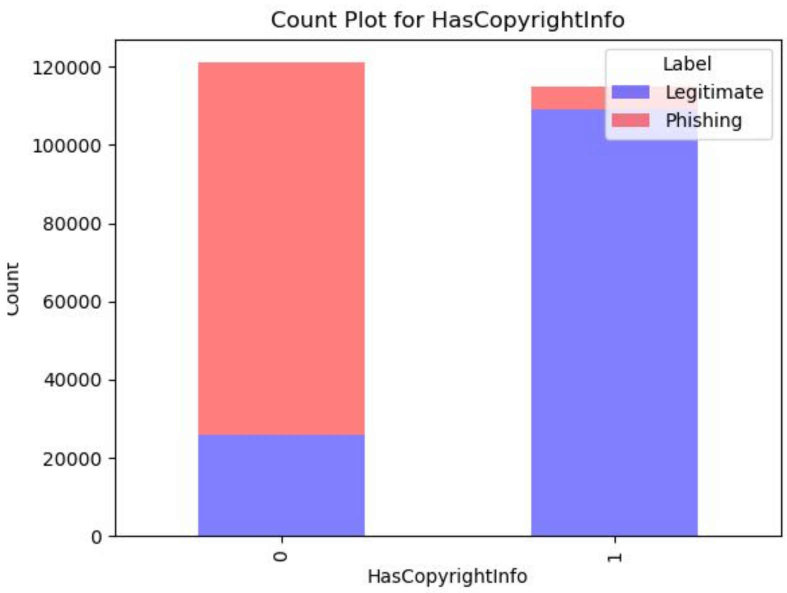
Some **binary features**

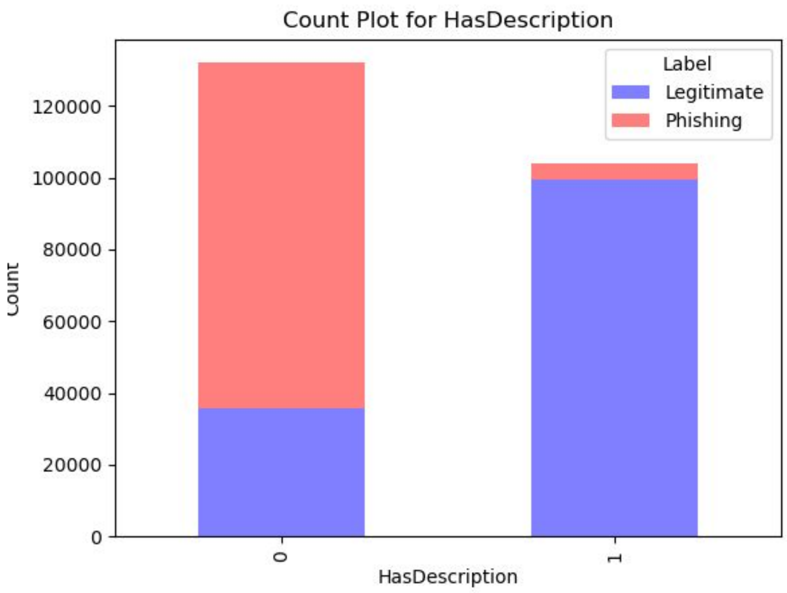




Project Pipeline

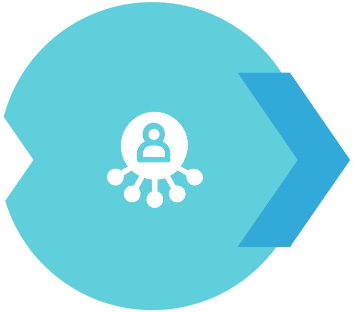
Some **binary features**





Project Pipeline

Model Training



We used various models as:

1. **Random Forest**
2. **SVM**
3. **KNN** (With MapReduce and without)
4. **Naive Bayes** (With MapReduce and without)

Project Pipeline

Random Forest

Initial run

Using cross validation, with 5 folds.

```
Test Accuracy = 0.9999
Test Precision = 0.9999
Test Recall = 0.9999
Test F1 Score = 0.9999
+-----+----------+-----+
|label|prediction|count|
+-----+----------+-----+
|    0|       0.0|24956|
|    1|       1.0|33370|
```

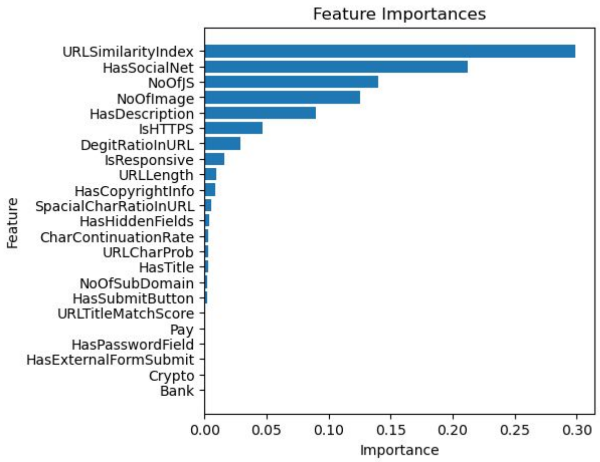
Train with all features, default parameters

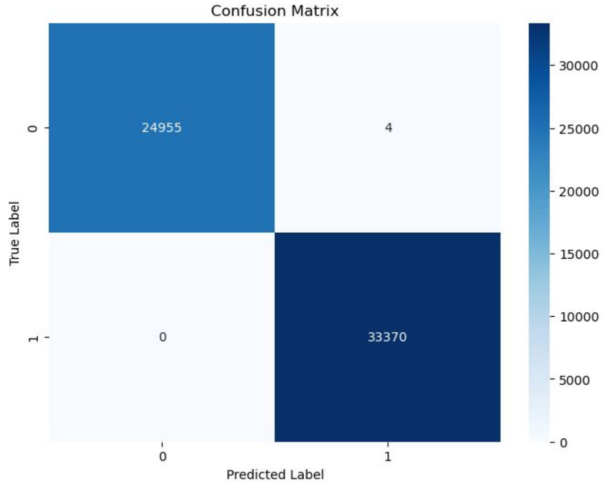
```
Test Accuracy = 0.9999314234771725 6513
Test Precision = 0.99993143169632792144
Test Recall = 0.99993142347717256513
Test F1 Score = 0.99993142278429758552
Validation Accuracy = 0.99991483321504615045
Validation Precision = 0.99991483415042059502
Validation Recall = 0.99991483321504603943
Validation F1 Score = 0.99991483285983306928
```

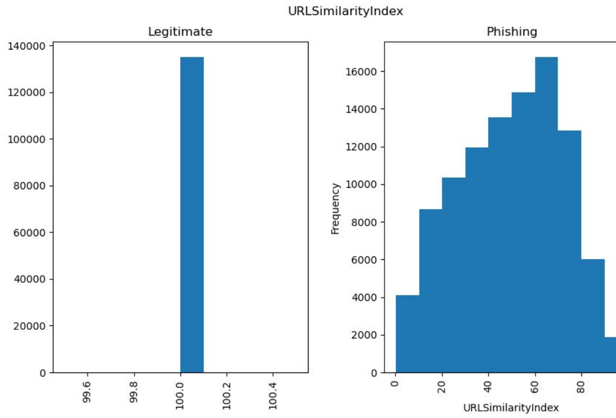
Project Pipeline

Random Forest

By observing the histogram distributions, the URL similarity index almost completely classifies the URL's correctly. Few features have significant weight



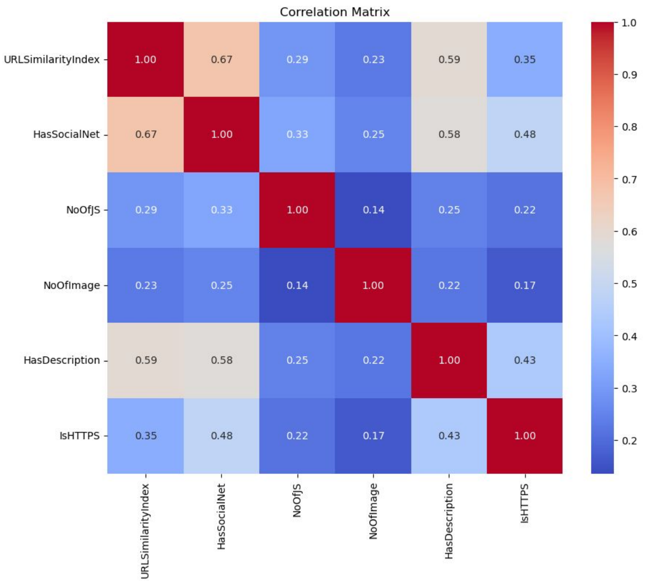


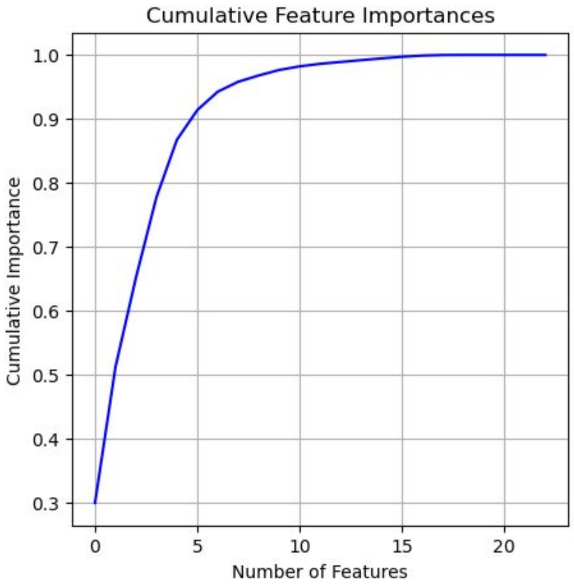


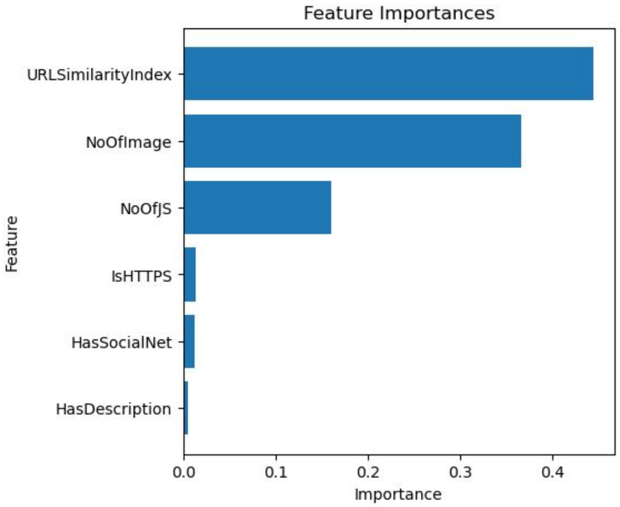
Project Pipeline

Random Forest

Final Model: we capped it down to the features that support up to 90% of the importance, which narrowed it to about 6 features





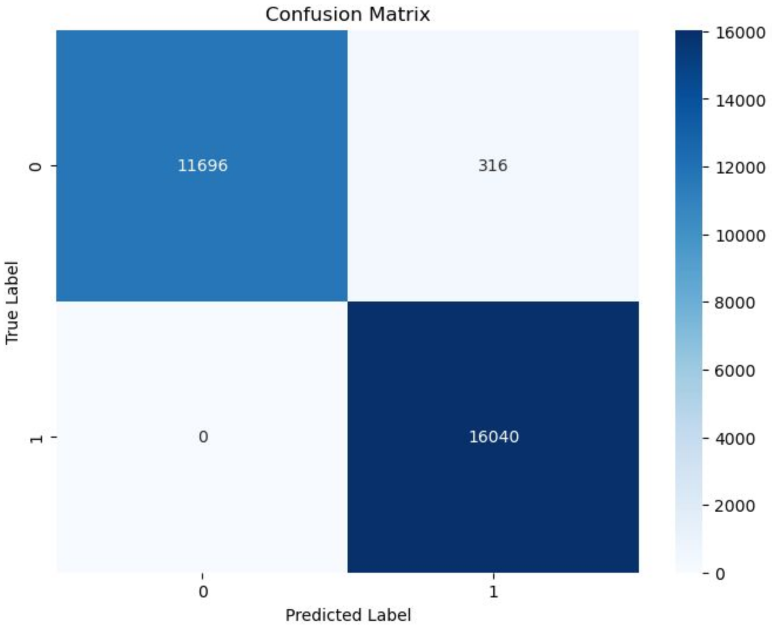


Project Pipeline

SVM

Validation data

```
Validation LinearSVC Accuracy = 0.98873520604591469407
Validation LinearSVC Precision = 0.98895284329765664744
Validation LinearSVC Recall = 0.98873520604591469407
Validation LinearSVC F1 Score = 0.98871507279793557910
```

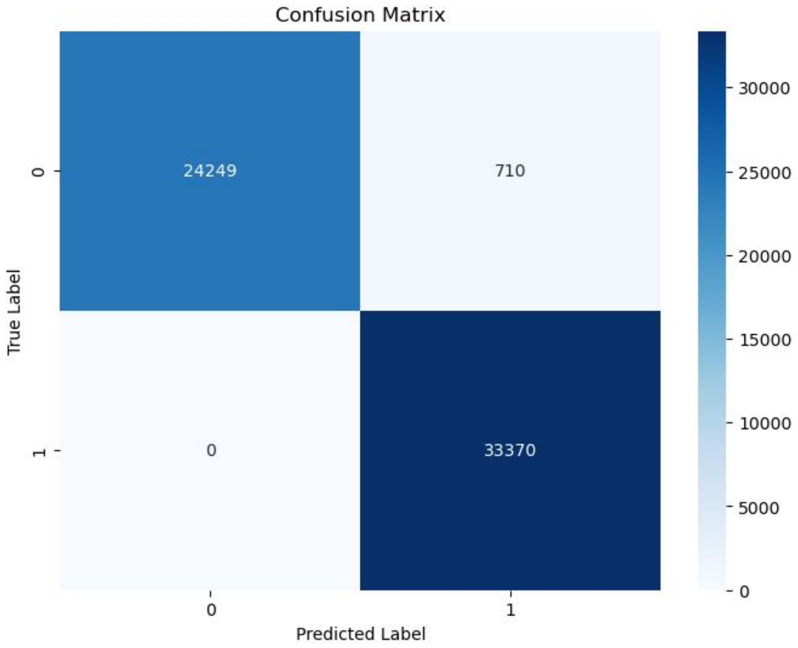


Project Pipeline

SVM

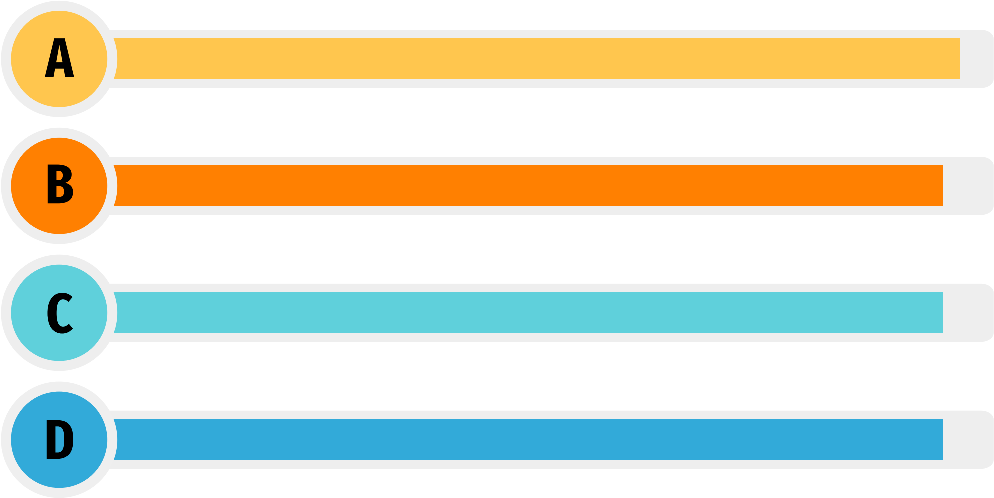
Test data

```
Test LinearSVC Accuracy = 0.987827667198
Test LinearSVC Precision = 0.98808125746
Test LinearSVC Recall = 0.98782766719813
Test LinearSVC F1 Score = 0.987803917562
```



Project Pipeline

Evaluation



A RF 99.64 %

B SVM 98.78%

C KNN 98.62%

D Naive Bayes 99.98%

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Data

Data had few features with actual importance/weight that is significant to classification. Therefore it was biased to an extent

Models

All models used got an accuracy above 98 % in classifications.

THANK YOU!

Any Questions?

Eng/ Omar Samir