Predicting Game Result

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What is League of Legends (LOL)?

- Multiplayer online battle arena
- 2 teams: Blue and Red
- Goal: To take down the enemy Nexus to win the game

Data Overview

First 10 minutes of LOL diamond ranked games

- 40 columns & 9879 rows
- Goal: Use a classification model to predict the outcome of a game based on the first 10 minutes statistics

Data Exploration
&
Data Cleaning

Data Exploration

- Game ID: To indicate each game is unique

- 19 features from each team (total 38) are collected after 10 minutes in game

redWardsPlaced
redWardsDestroyed
redFirstBlood
redKills
redDeaths
redAssists
redEliteMonsters
redDragons
redHeralds
redTowersDestroyed
redTotalGold
redAvgLevel
redTotalExperience
redTotalMinionsKilled
redTotalJungleMinionsKilled
redGoldDiff
redExperienceDiff
redCSPerMin
redGoldPerMin

blueWardsPlaced
blueWardsDestroyed
blueFirstBlood
blueKills
blueDeaths
blueAssists
blueEliteMonsters
blueDragons
blueHeralds
blueTowersDestroyed
blueTotalGold
blueAvgLevel
blueTotalExperience
blueTotalMinionsKilled
blueTotalJungleMinionsKilled
blueGoldDiff
blueExperienceDiff
blueCSPerMin
blueGoldPerMin

Target Variable

Target Value: blueWins

1 = Blue team wins

0 = Red team wins

```
df['blueWins'].value_counts()
```

```
0    4949
1    4930
Name: blueWins, dtype: int64
```

Correlation between Features

```
columns = df.columns
for i in columns:
    for j in columns:
        if abs(df[i].corr(df[j])) >= 0.95:
            if i != j:
                print([i, j, df[i].corr(df[j])])
                columns = columns.drop(i)
```

```
['blueFirstBlood', 'redFirstBlood', -1.0]
['blueKills', 'redDeaths', 1.0]
['blueDeaths', 'redKills', 1.0]
['blueTotalGold', 'blueGoldPerMin', 1.0]
['blueTotalMinionsKilled', 'blueCSPerMin', 1.0]
['blueGoldDiff', 'redGoldDiff', -1.0]
['blueExperienceDiff', 'redExperienceDiff', -1.0]
['redTotalGold', 'redGoldPerMin', 1.0]
['redTotalMinionsKilled', 'redCSPerMin', 0.9999999999999996]
```

Data Cleaning

We dropped the following columns:

- Inversely correlated
- Perfectly correlated
- All derived values

Finalized Data

```
RangeIndex: 9879 entries, 0 to 9878
Data columns (total 26 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   blueWins                      9879 non-null   int64
 1   blueWardsPlaced               9879 non-null   int64
 2   blueWardsDestroyed            9879 non-null   int64
 3   blueFirstBlood                9879 non-null   int64
 4   blueKills                     9879 non-null   int64
 5   blueDeaths                    9879 non-null   int64
 6   blueAssists                   9879 non-null   int64
 7   blueDragons                   9879 non-null   int64
 8   blueHeralds                   9879 non-null   int64
 9   blueTowersDestroyed           9879 non-null   int64
 10  blueTotalGold                 9879 non-null   int64
 11  blueAvgLevel                  9879 non-null   float64
 12  blueTotalExperience           9879 non-null   int64
 13  blueTotalMinionsKilled        9879 non-null   int64
 14  blueTotalJungleMinionsKilled  9879 non-null   int64
 15  redWardsPlaced                9879 non-null   int64
 16  redWardsDestroyed             9879 non-null   int64
 17  redAssists                    9879 non-null   int64
 18  redDragons                    9879 non-null   int64
 19  redHeralds                    9879 non-null   int64
 20  redTowersDestroyed            9879 non-null   int64
 21  redTotalGold                  9879 non-null   int64
 22  redAvgLevel                   9879 non-null   float64
 23  redTotalExperience            9879 non-null   int64
 24  redTotalMinionsKilled         9879 non-null   int64
 25  redTotalJungleMinionsKilled   9879 non-null   int64
```

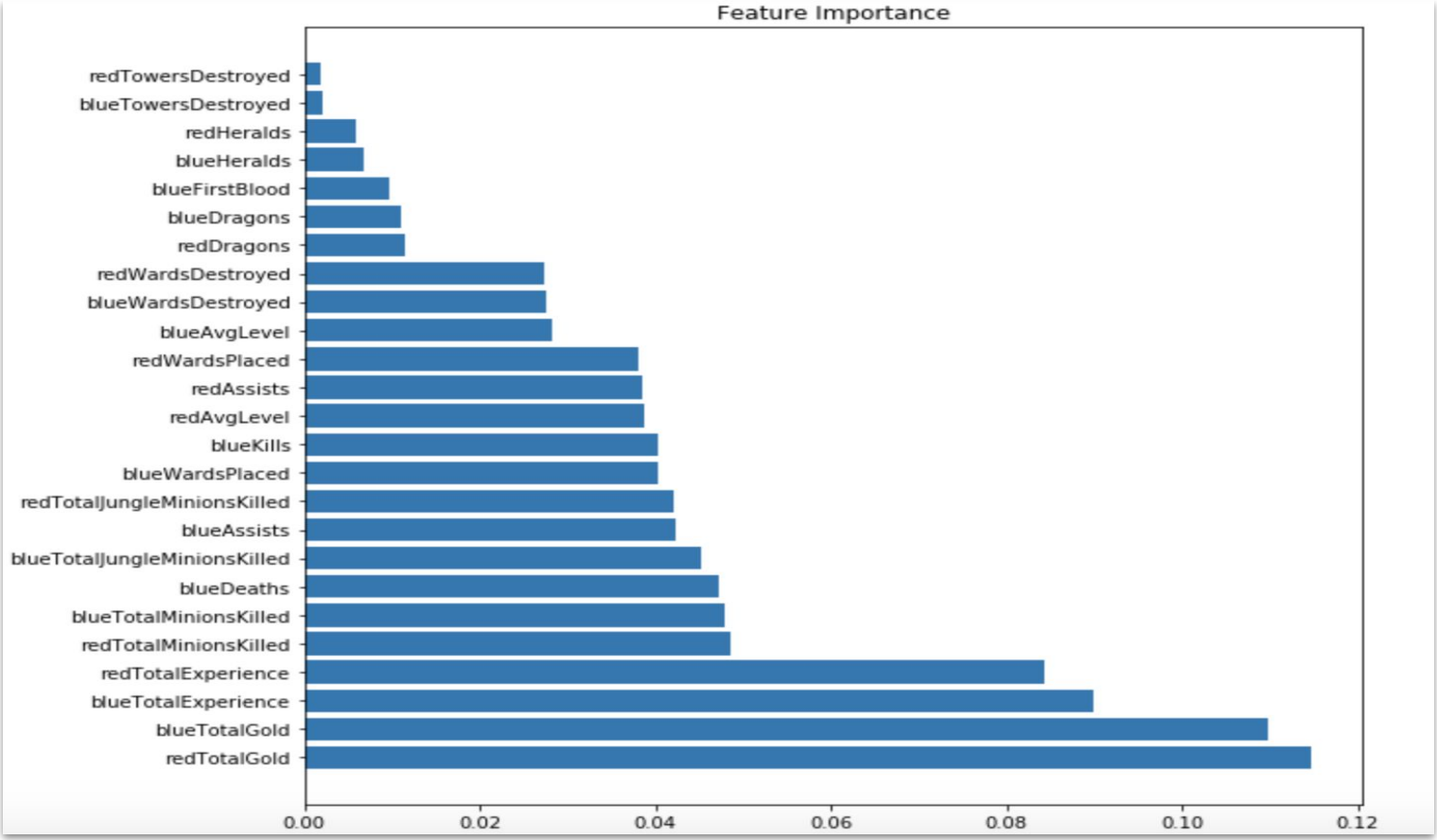
Transformation, Feature Selection, Modeling

Feature Scaling

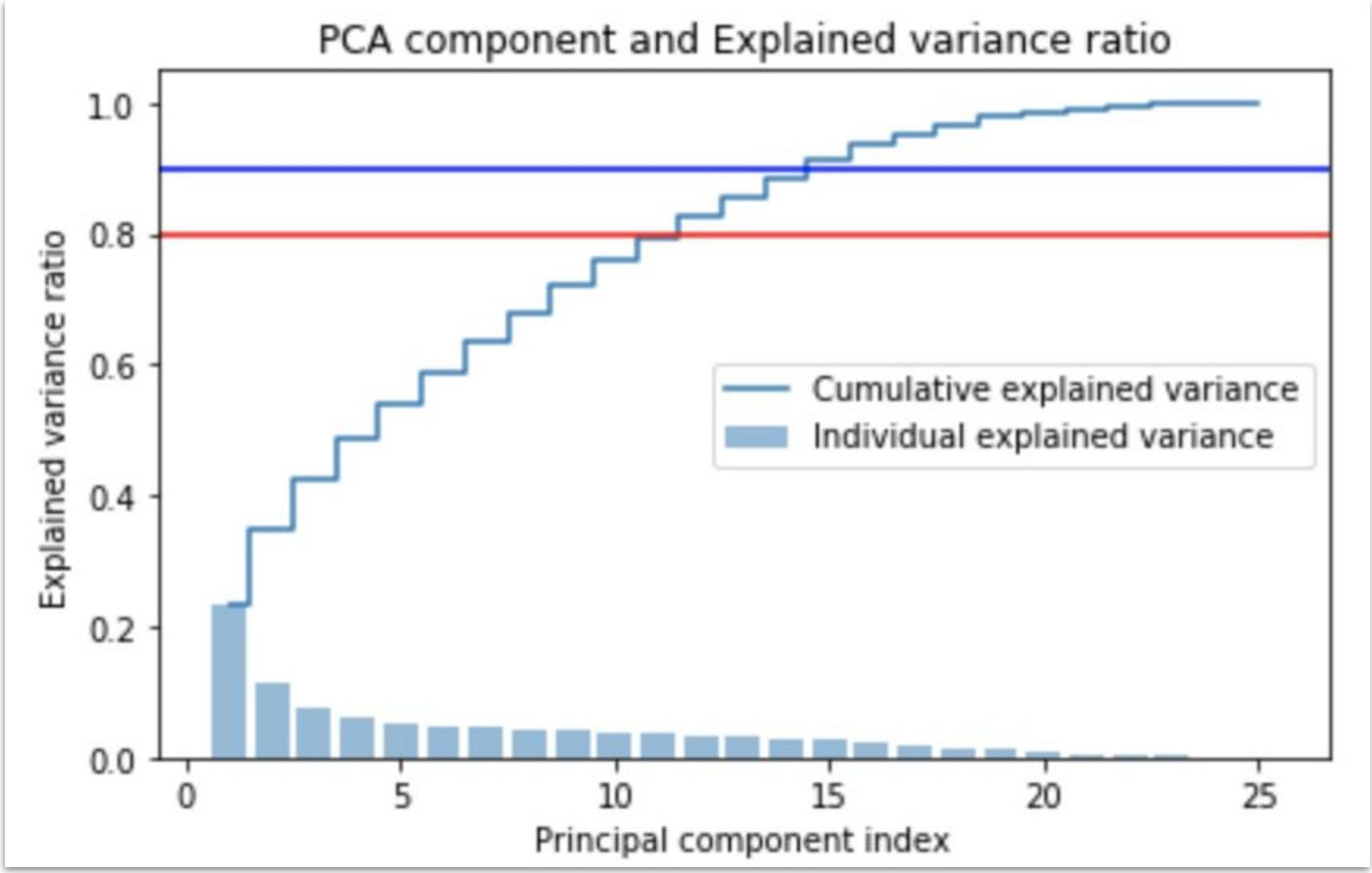
- Normalization via min-max scaling
- Standardization

Classification

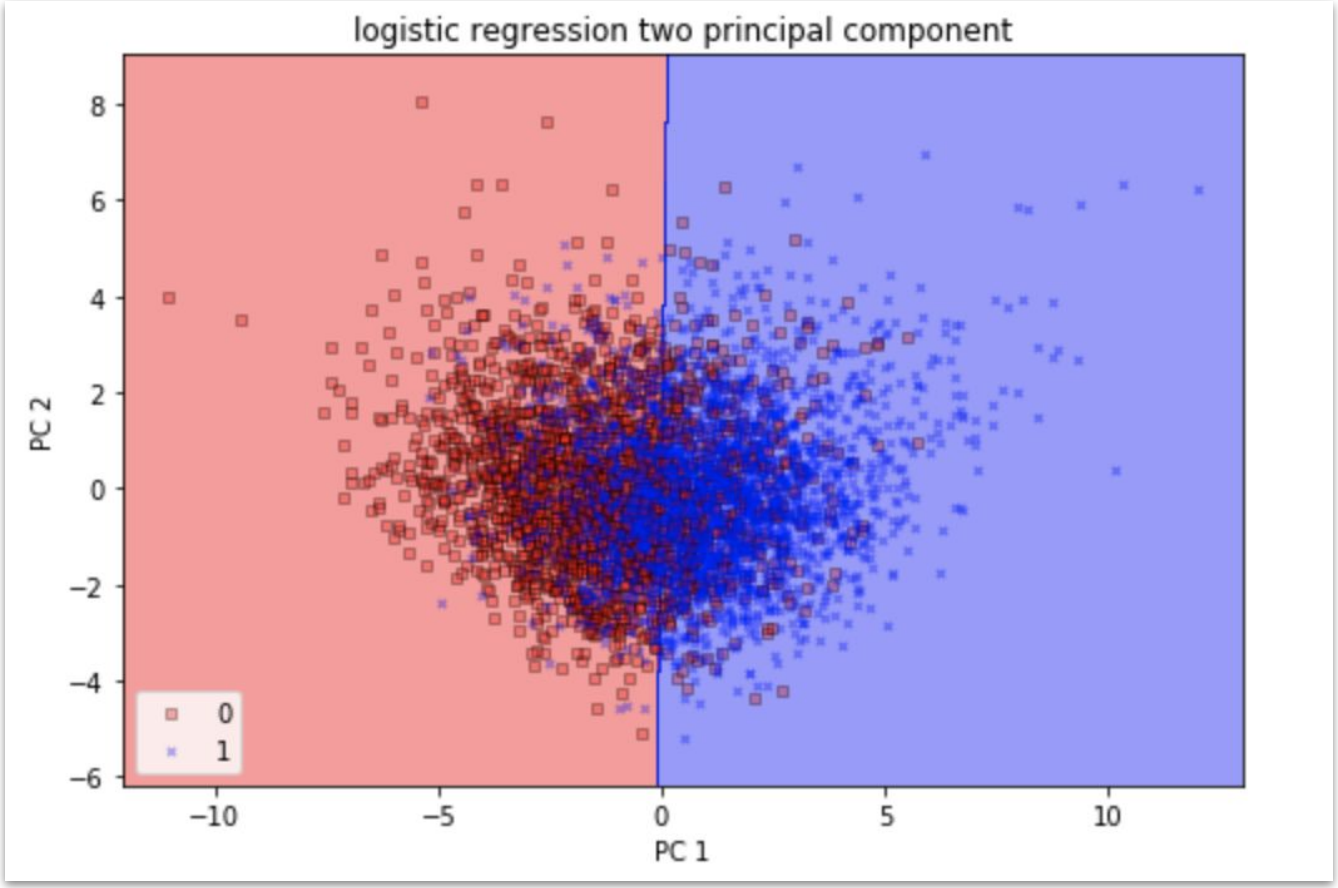
	Logistic	SVM	RandomForest	KNN	DecisionTree
UnScaled	72.8%	72.6%	71.6%	67.0%	63.4%
Standard Scaler	73.4%	72.4%	71.2%	68.2%	62.9%
MinMax Scale	72.8%	72.4%	71.7%	68.1%	63.1%



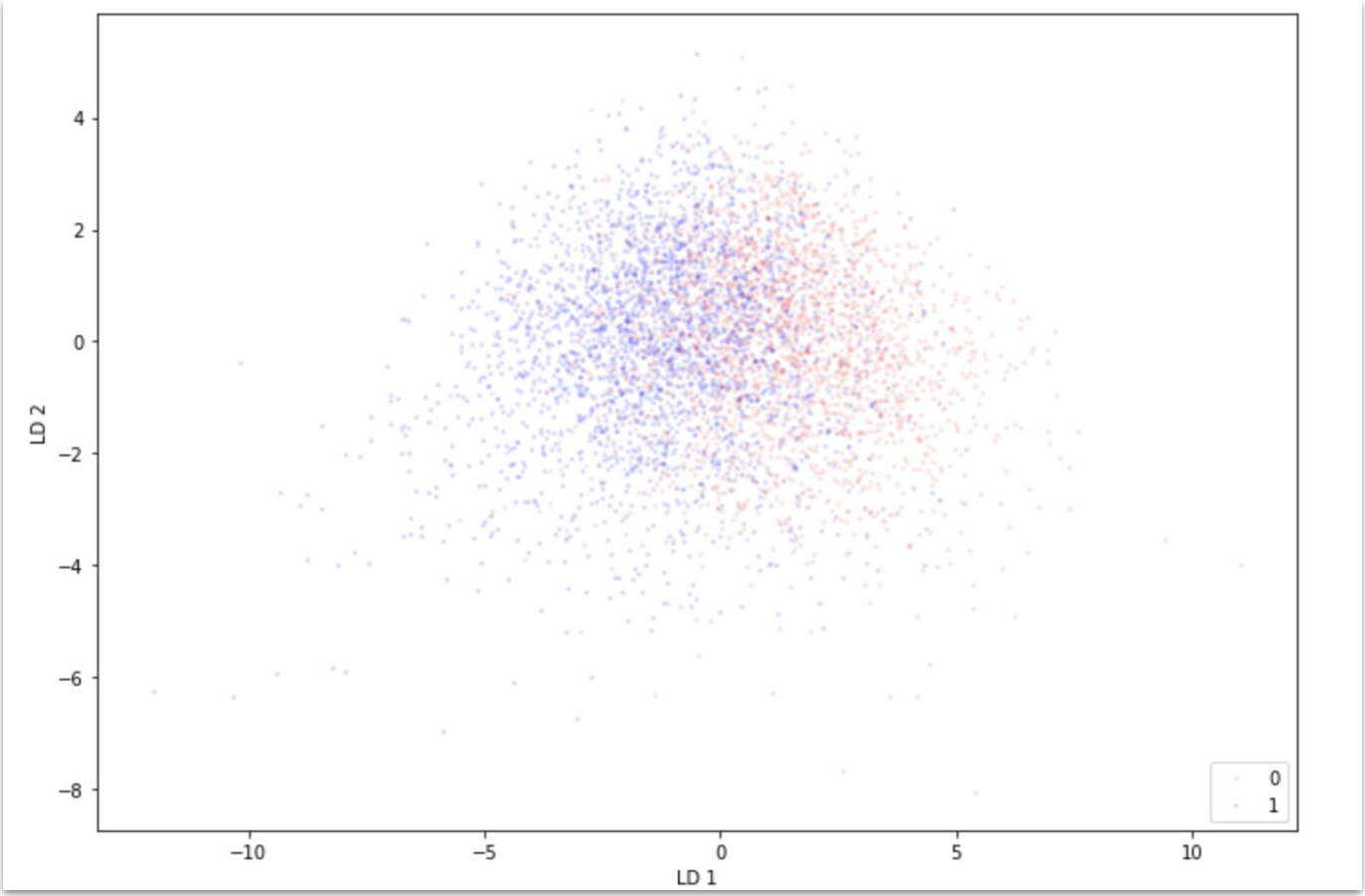
Important Feature


PCA component and Explained variance ratio
Explained variance ratio
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
Principal component index
Cumulative explained variance
Individual explained variance

PCA


logistic regression two principal component
PC 2
PC 1
8
6
4
2
0
−2
−4
−6
−10
−5
0
5
10
0
1

PCA Plot

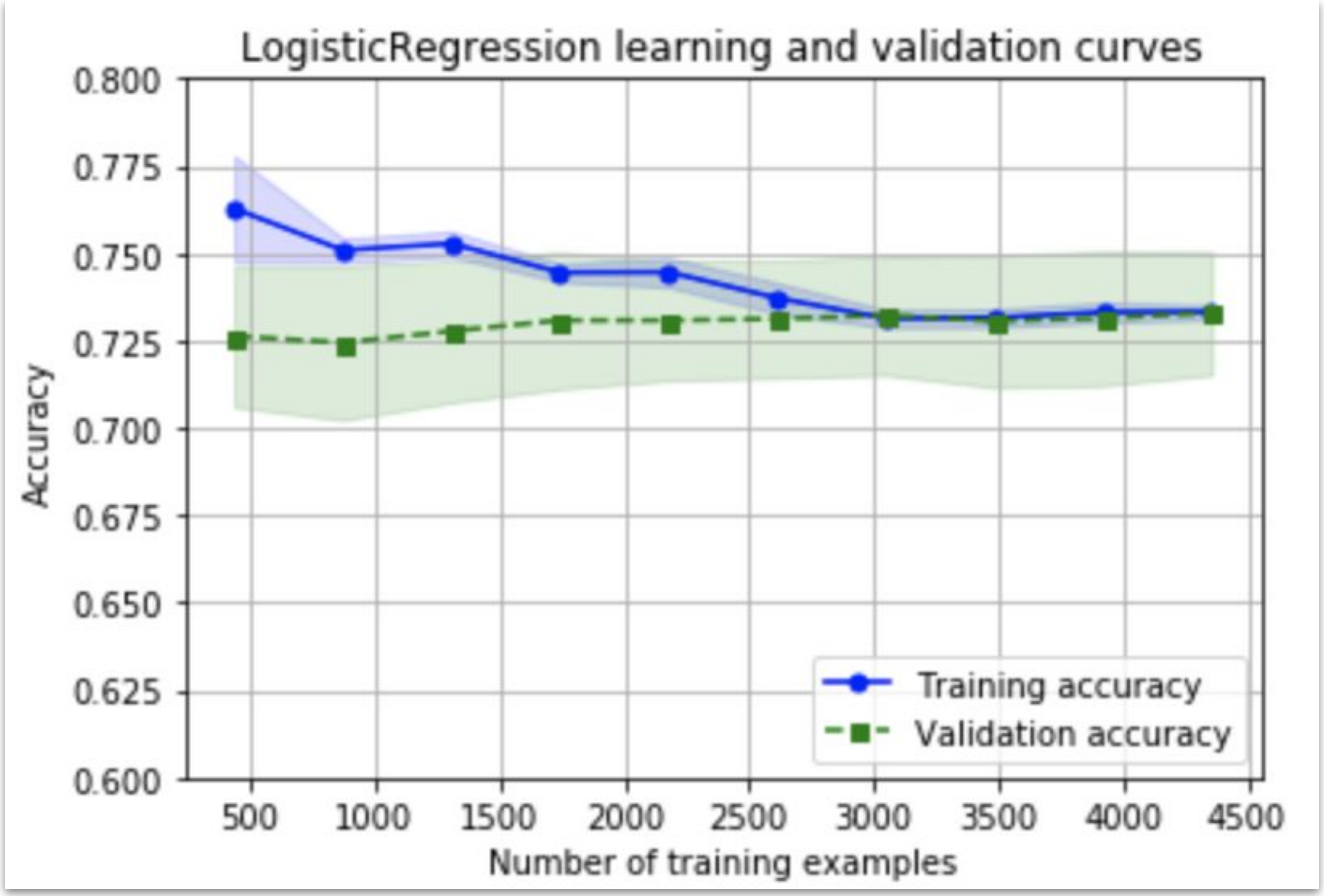


LDA

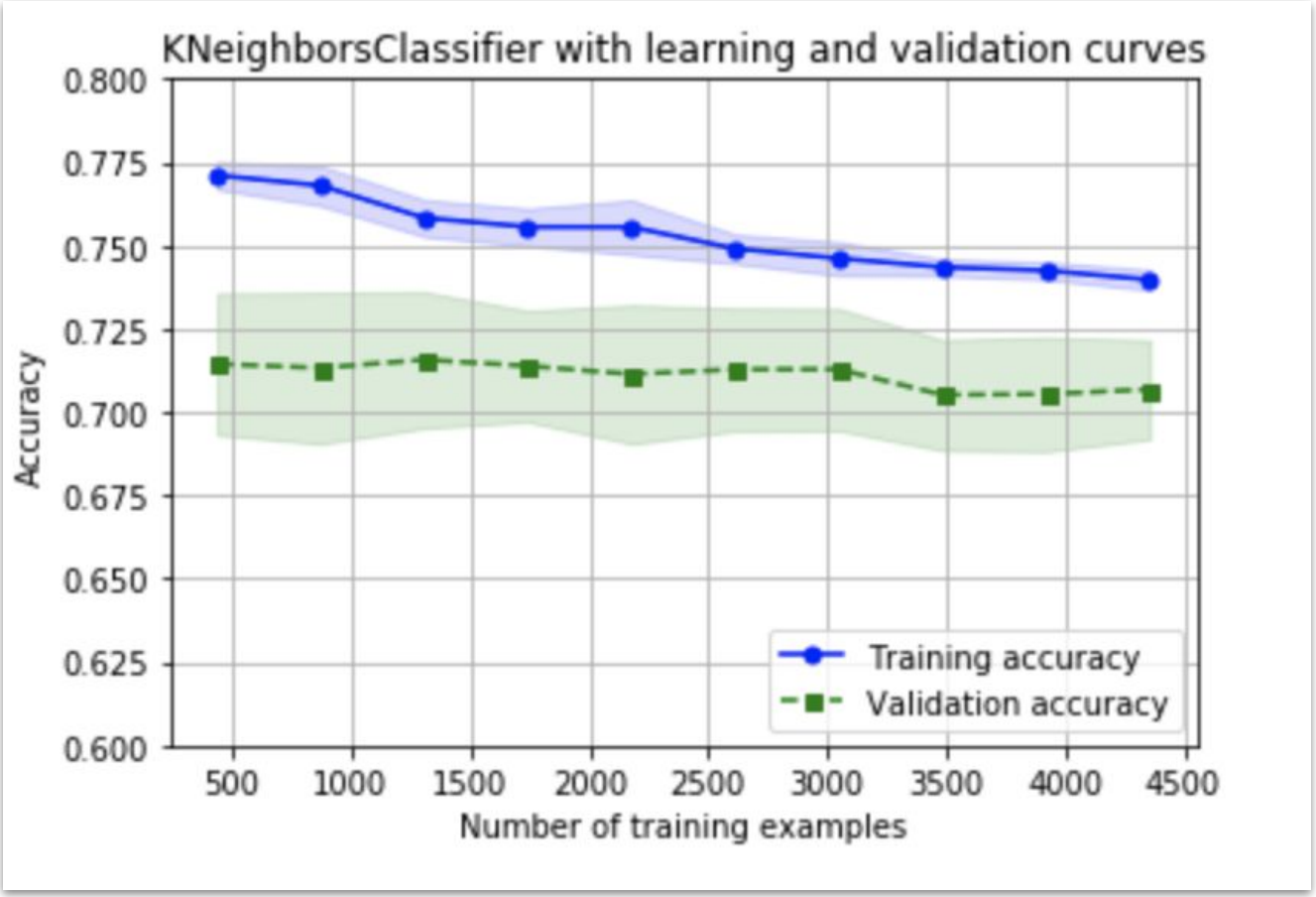
Grid Search CV

Best Params	Score
• LogisticRegression ○ C = 0.001	72.7%
• KNeighborsClassifier ○ n_neighbors = 21	70.1%
• SVM ○ C = 0.02, kernel='rbf'	72.5

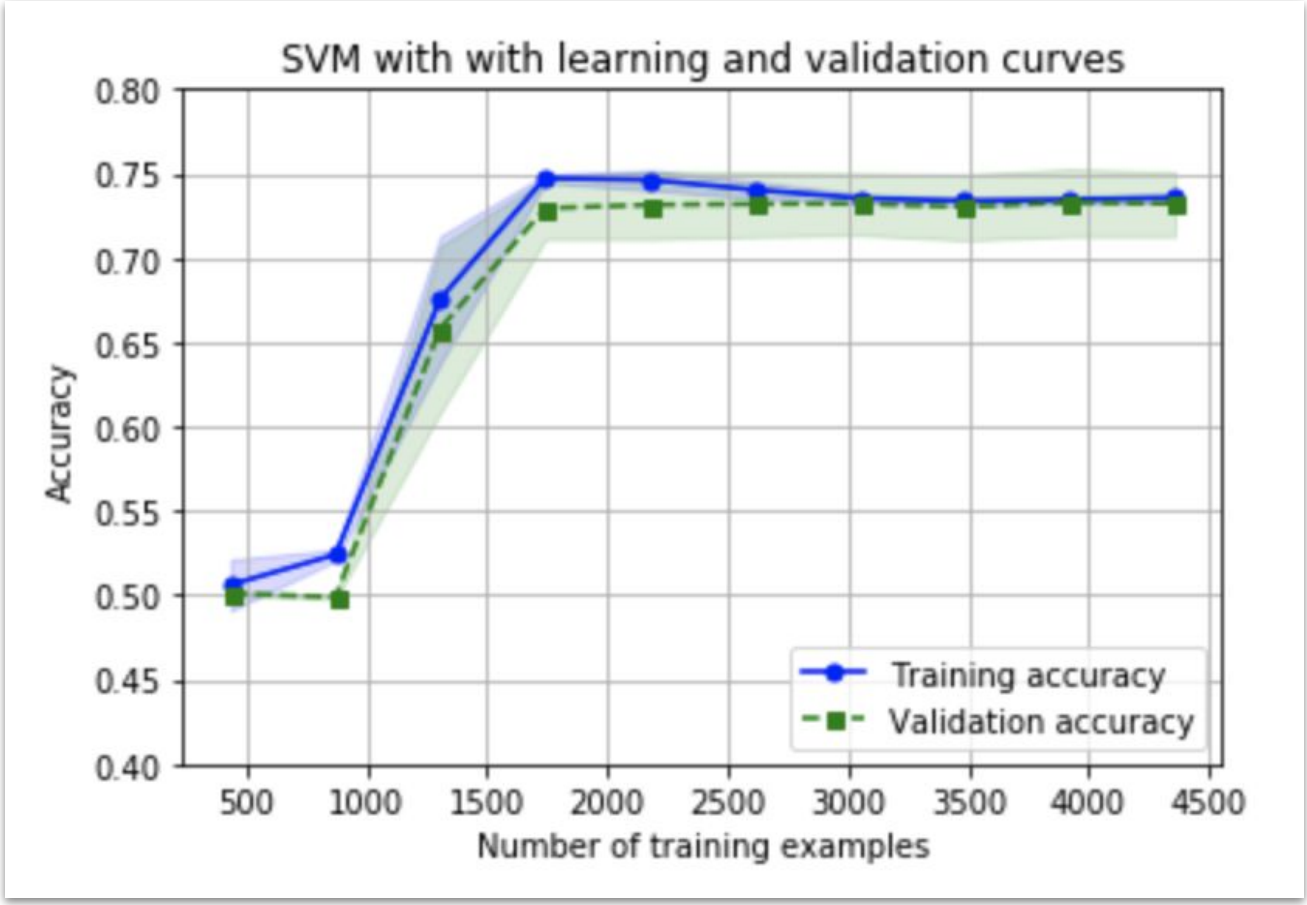
Metrics, Validation, Evaluation



Learning and Validation Curves



Learning and Validation Curves

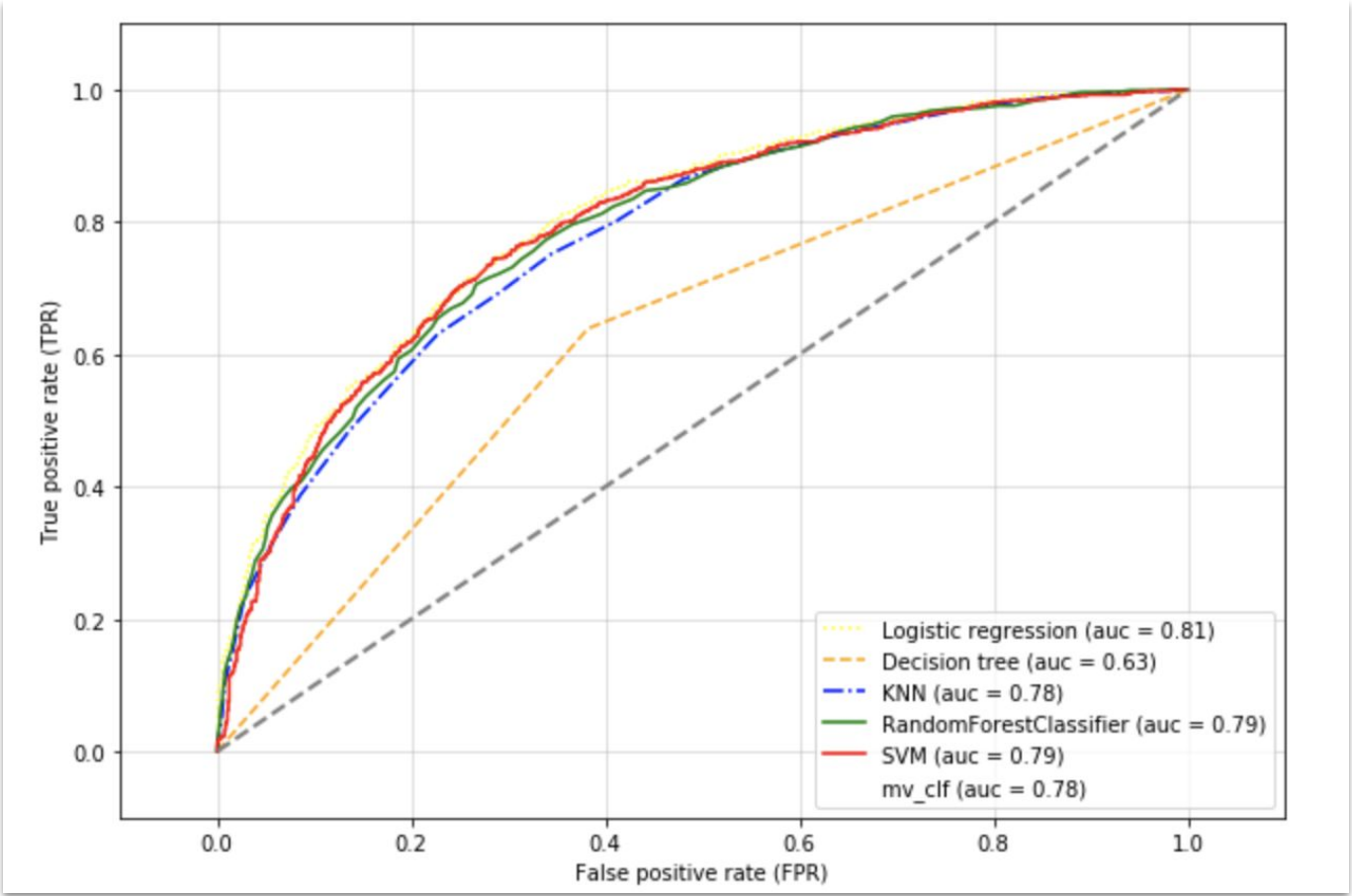


Learning and Validation Curves

Evaluating the Model Performance of Each Classifier

```
10-fold cross validation:

ROC AUC: 0.81 (+/- 0.02) [Logistic regression]
ROC AUC: 0.63 (+/- 0.01) [Decision tree]
ROC AUC: 0.78 (+/- 0.02) [KNN]
ROC AUC: 0.79 (+/- 0.02) [RandomForestClassifier]
ROC AUC: 0.79 (+/- 0.02) [SVM]
ROC AUC: 0.78 (+/- 0.01) [mv_clf]
```


1.0
0.8
0.6
0.4
0.2
0.0
True positive rate (TPR)
0.0
0.2
0.4
0.6
0.8
1.0
False positive rate (FPR)
Logistic regression (auc = 0.81)
Decision tree (auc = 0.63)
KNN (auc = 0.78)
RandomForestClassifier (auc = 0.79)
SVM (auc = 0.79)
mv_clf (auc = 0.78)

ROC Curve

Conclusion

Accuracy Score Table

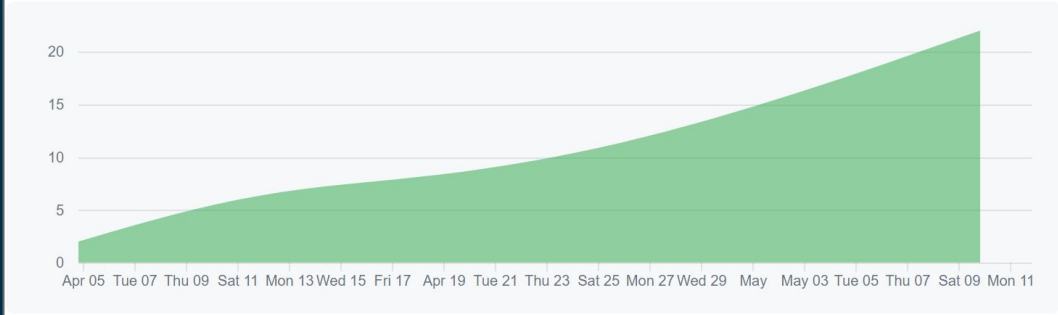
	Logistic	SVM	RandomForest	KNN	DecisionTree
train data	72.7%	72.5%	71.7%	70.1%	63.1%
test data	72.3%	72.1%	72.1%	70.6%	64.0%

Keras (Dense Layer)

Layers	Activation	UnScaled	Standard Scale	MinMax Scale
1 Layer	Softmax	~69%	~71%	~68%
1 Layer	relu	~50%	~50%	~50%
1 Layer	sigmoid	~50%	~72%	~68%
3 Layer	Softmax, relu, sigmoid	~50%	~71%	69.6%

Github

Contributions to master, excluding merge commits



Thank You!

Q&A