METIS PROJECT 3 SUBMITTED BY MIKE BERNARDO

Surviving the Titanic

Using Classification for Survival Prediction

53%

1317 out of 2453 passengers max capacity when launched

38%

Only 498 of the passengers survived.

THE QUESTION

Would I Survive the Titanic?

Classifying Passengers

Data Aquisition
data downloaded from Kaggle.com
Titanic Survivor dataset

Initial EDA
analyze the correlation and directionality of the data using python libraries

Split Data
60% Training. 20% Validation and 20% Testing data

Build Model
build classification models using training data via feature engineering, transformations etc

Train Model
score models and perform more feature engineering / transformations as needed

Test Model
Use and evaluate model on Test data. Perform more EDA, feature engineering as needed.

Deploy Model
Predict survivability based on new data.

The Data

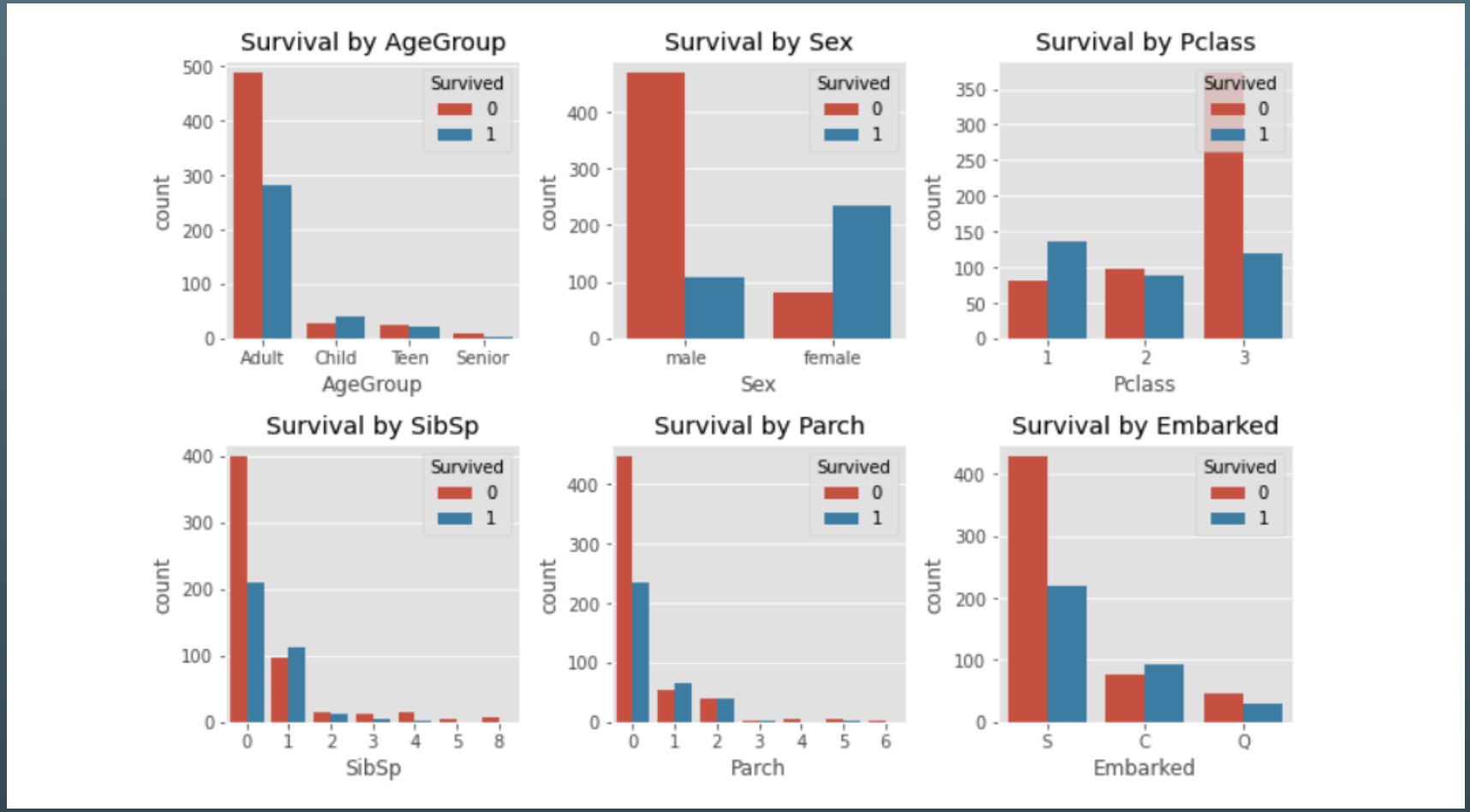
Feature	Description
PassengerID	A unique index for passenger
Survived	refers to whether passenger survived. 1 = survived 0 = not survived
Pclass	Ticket class. 1 = First class ticket. 2 = Second class ticket. 3 = Third class
AgeGroup	Child (<13), Teen(<18), Adult(<65>, Senior(65+)
Sex	Passenger's gender. Male or Female.
SibSp	Number of siblings or spouses travelling with each passenger
Ticket	Number of siblings or spouses travelling with each passenger
Parch	Number of parents of children travelling with each passenger
Embarked	Southhampton(S),Cherbourg(C) or Queesnstown(Q)

Visualizing the Data

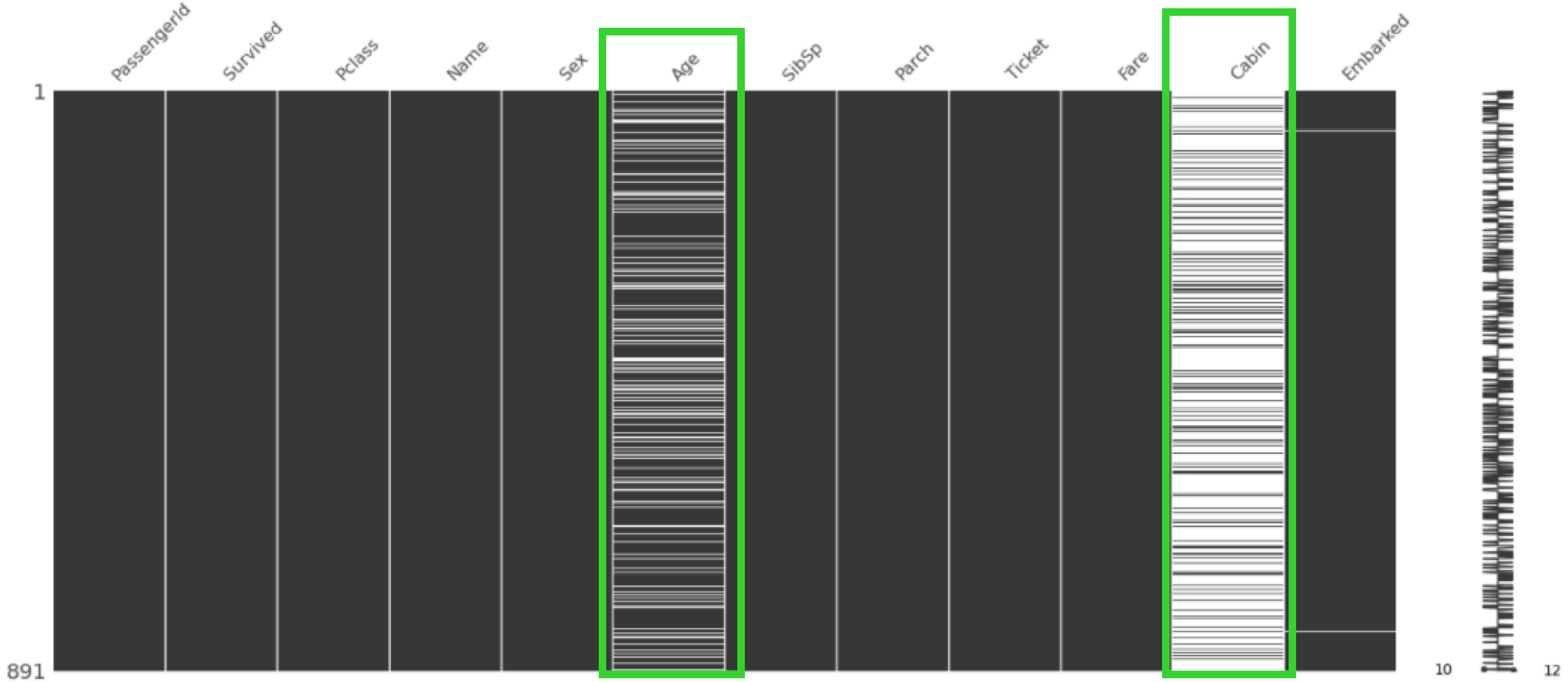
Looking at Survival rates based on gender and other features

More Survivors:

- Adults
- Females
- First Class
- Solo
- Southampton



EDA: Missing Data



EDA: Imputing Missing Data

Age:

- range from 0-80
- 177 missing values
- mean of ages to impute missing

Embarked:

- Southhampton(S),Cherbourg(C) or Queesnstown(Q)
- 2 missing values
- mode of Embarked to impute missing

Cabin:

- 687 missing values
- removed from dataset

Data Preparation: Feature Engineering

Numerically encoding categorical data using sklearn.preprocessing LabelEncoder

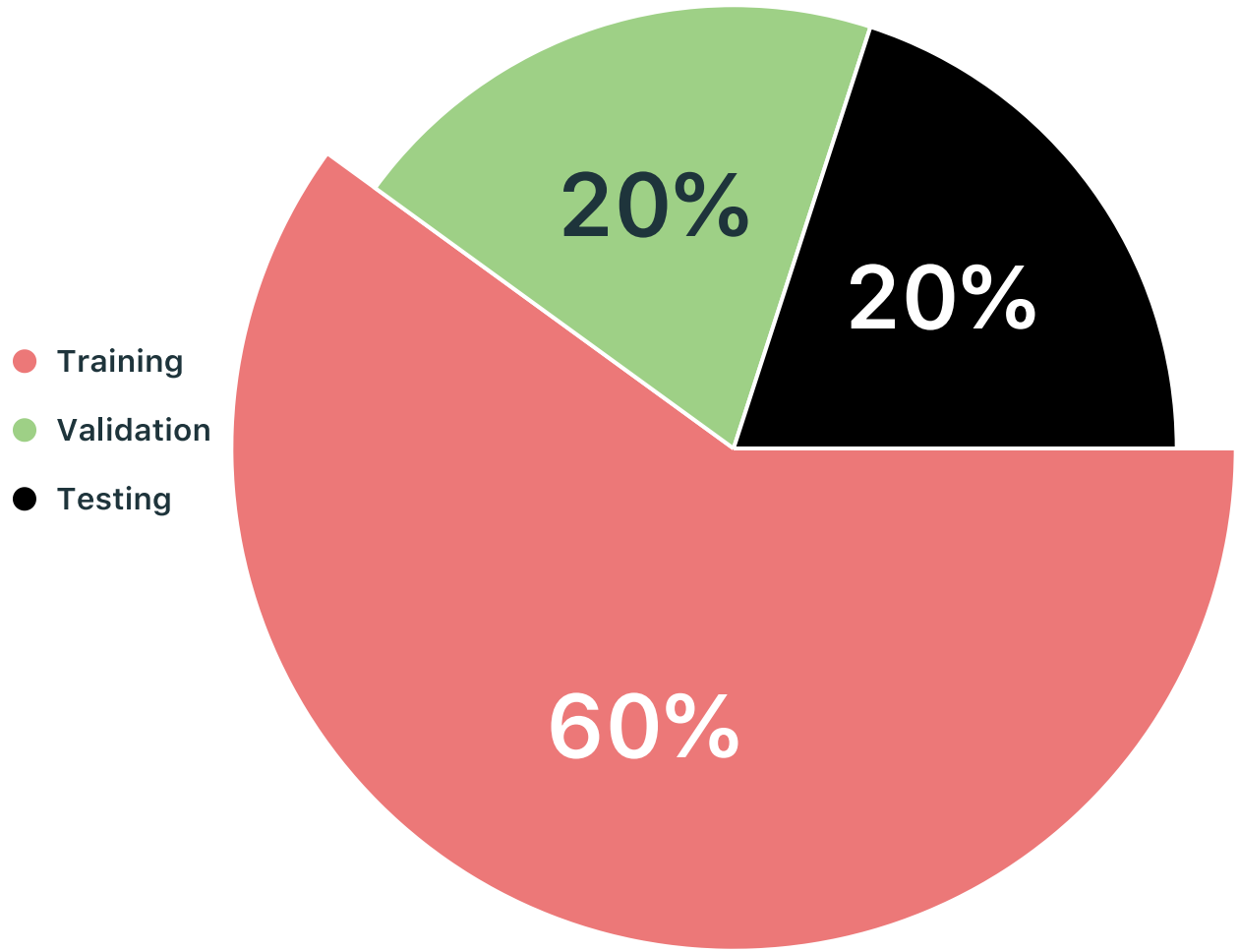
Tasks:

- Sex encoded as 0,1
- Age simplified to AgeGroup
- AgeGroup encoded to values 0,1,2,3
- Embarked encoded to 0,1,2
- Drop columns: passengerId, Name, Ticket

	Pclass	Sex	SibSp	Parch	Fare	Embarked	AgeGroup	Survived
0	3	1	1	0	7.2500	2	0	0
1	1	0	1	0	71.2833	0	0	1
2	3	0	0	0	7.9250	2	0	1
3	1	0	1	0	53.1000	2	0	1
4	3	1	0	0	8.0500	2	0	0
...	...	...	...	...	...	...	...	...
886	2	1	0	0	13.0000	2	0	0
887	1	0	0	0	30.0000	2	0	1
888	3	0	1	2	23.4500	2	0	0
889	1	1	0	0	30.0000	0	0	1
890	3	1	0	0	7.7500	1	0	0

Splitting Data

Before building any models, separate data into train, validation and test data sets



Model Selection: kNN

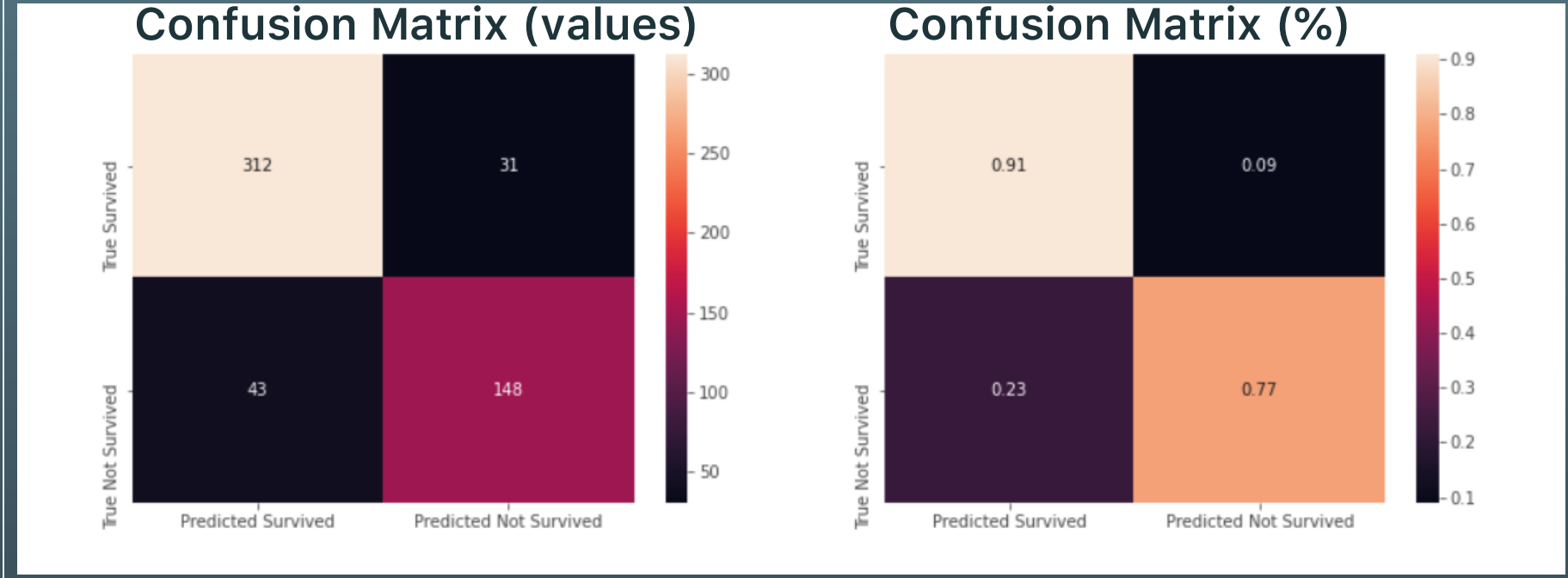
kNN algorithm on the training data, use K-fold then and show confusion matrix

kNN Scores:

- Model Score: 86%
- Accuracy: 80%
- Precision: 73%
- Recall: 69%
- F1: 71%

Hyperparameter: k

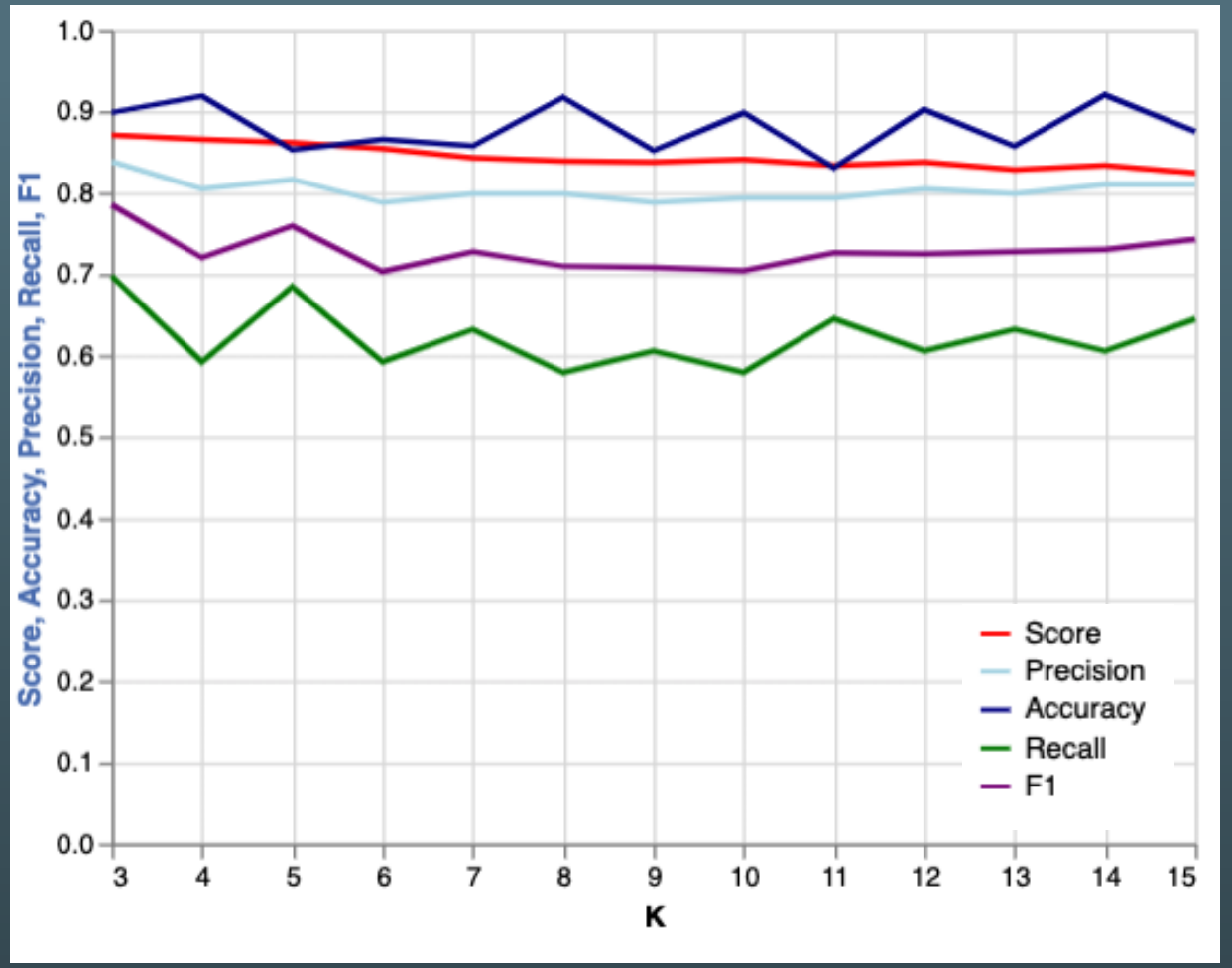
default value: 5



Model Tuning: kNN

Test different values for Hyperparameter k

	K	Score	Accuracy	Precision	Recall	F1
0	3.00	0.87	0.84	0.90	0.70	0.79
2	5.00	0.86	0.82	0.85	0.68	0.76
11	14.00	0.83	0.81	0.92	0.61	0.73
12	15.00	0.82	0.81	0.88	0.64	0.74
1	4.00	0.87	0.80	0.92	0.59	0.72
9	12.00	0.84	0.80	0.90	0.61	0.72
4	7.00	0.84	0.80	0.86	0.63	0.73
5	8.00	0.84	0.80	0.92	0.58	0.71
10	13.00	0.83	0.80	0.86	0.63	0.73
7	10.00	0.84	0.79	0.90	0.58	0.70
8	11.00	0.83	0.79	0.83	0.64	0.73
3	6.00	0.85	0.79	0.87	0.59	0.70
6	9.00	0.84	0.79	0.85	0.61	0.71



Model Tuning: Optimized kNN

Run model with k=3 (optimal value for highest Score)

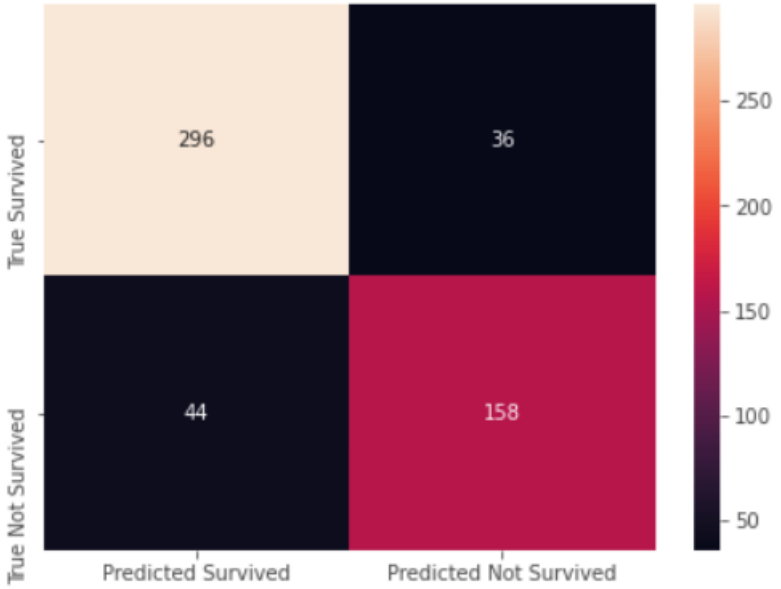
kNN Scores:

- Model Score: 87%
- Accuracy: 82%
- Precision: 75%
- Recall: 74%
- F1: 74%

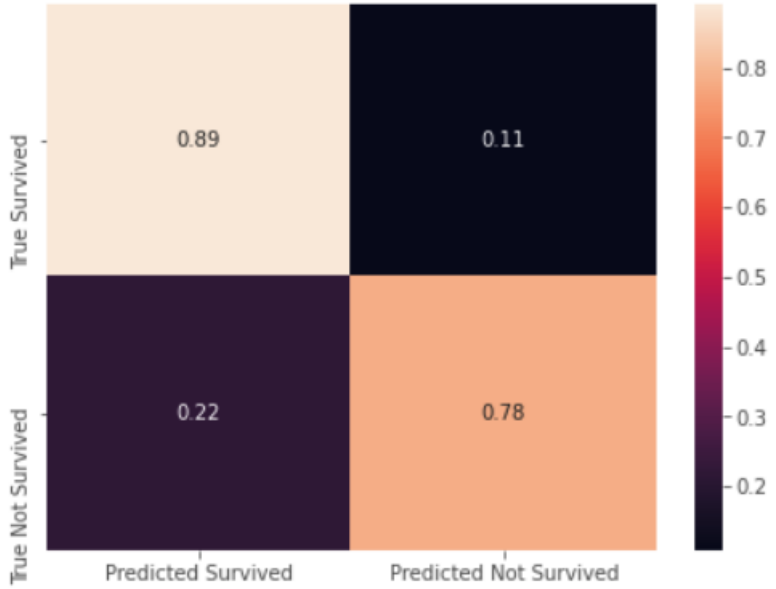
Hyperparameter: k

Optimal Value: 3

Confusion Matrix (values)



Confusion Matrix (%)



Model Selection: AdaBoost

Try different algorithms on the training data and show confusion matrix

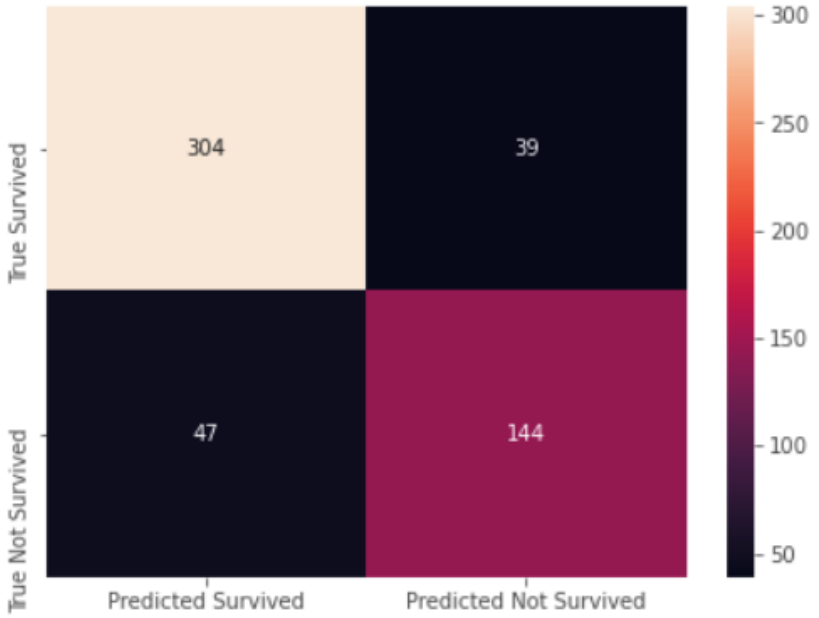
AdaBoost Scores:

- Model Score: 83%
- Accuracy: 79%
- Precision: 71%
- Recall: 66%
- F1: 68%

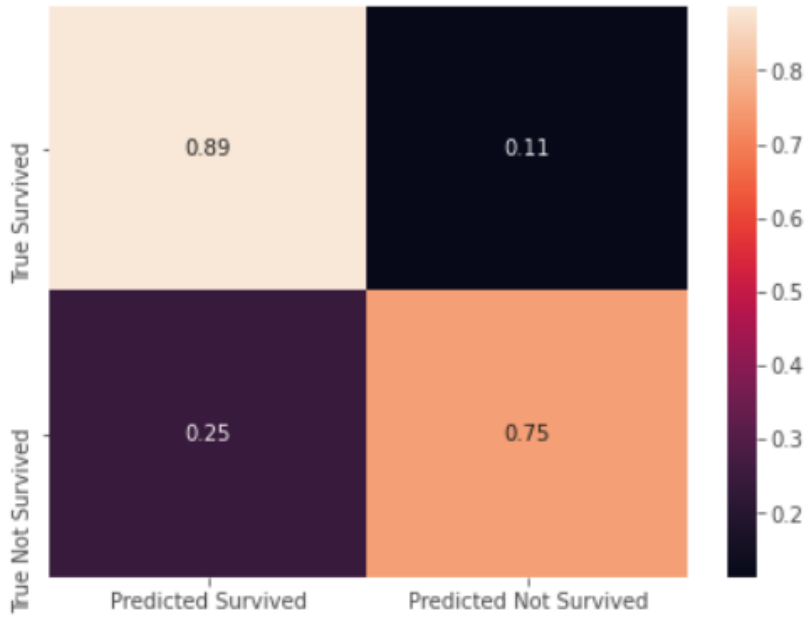
Hyperparameters:

- n_estimators = 50
- max_depth = 1
- Learning_rate = 1

Confusion Matrix (values)



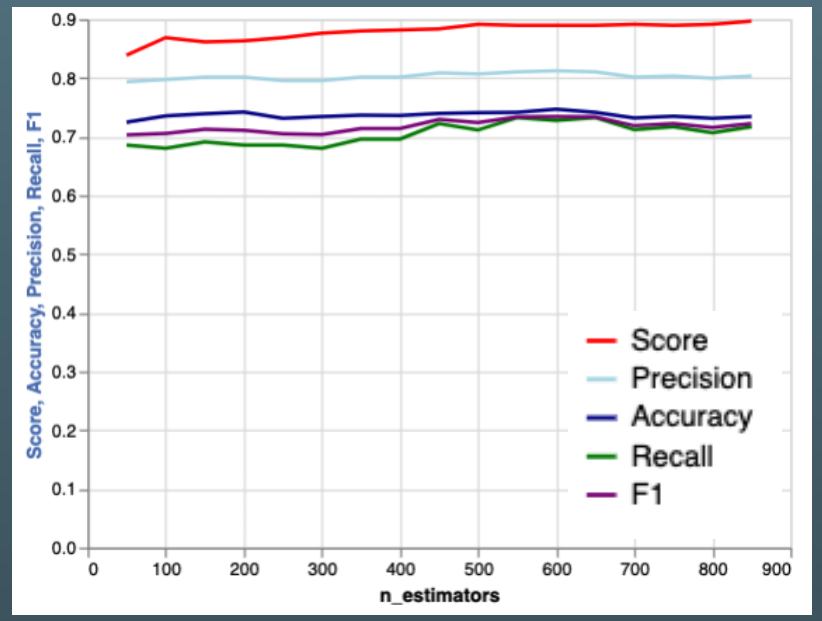
Confusion Matrix (%)

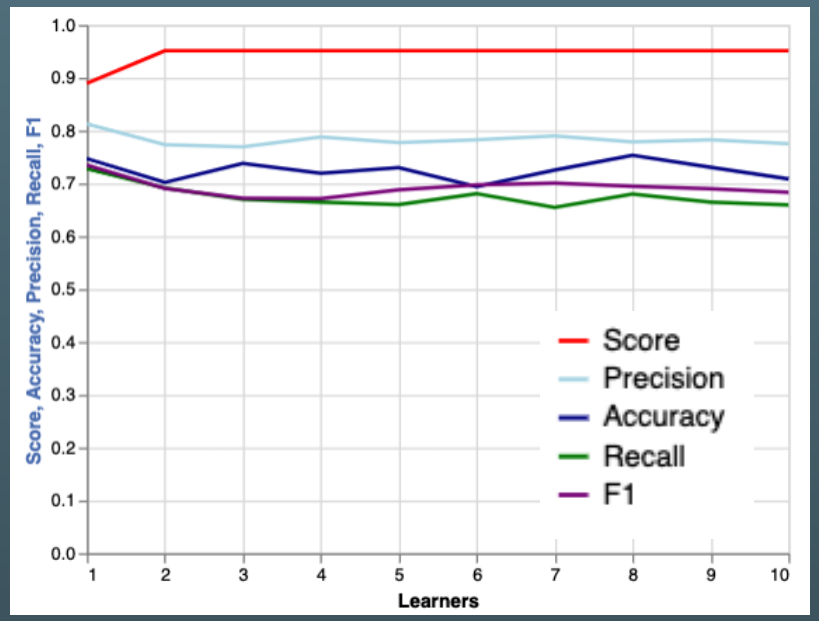


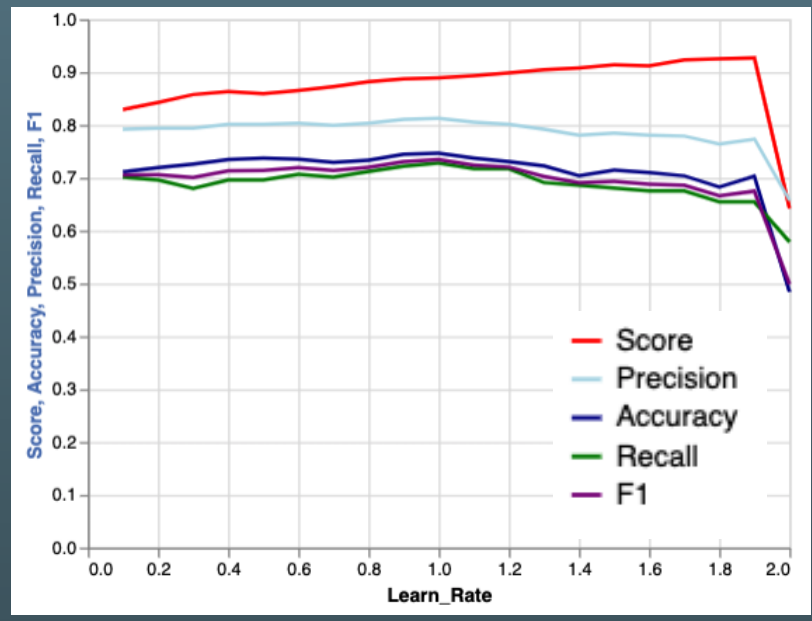
Model Tuning: AdaBoost

Experiment with different hyperparameter values on the training data

Optimized Hyperparameters:







- n_estimators = 600
- max_depth: 1
- learning_rate = 1.0

Model Tuning: Optimized AdaBoost

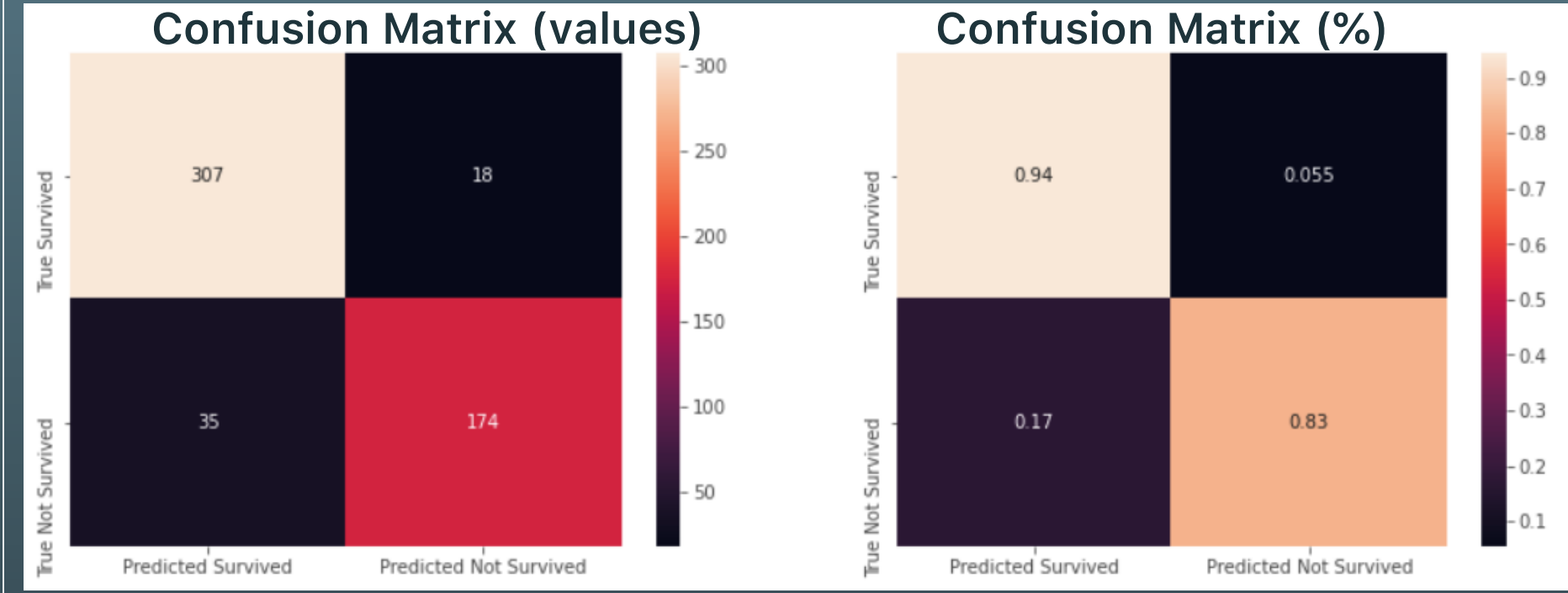
Run model with optimal hyperparameters

kNN Scores:

- Model Score: 88% (+9)
- Accuracy: 81% (+2)
- Precision: 73% (+1)
- Recall: 71% (+3)
- F1: 72% (+2)

Hyperparameters:

- n_estimators = 600
- max_depth = 1
- learn_rate = 1



Model Validation: AdaBoost

Run model with optimal hyperparameters on Validation data set

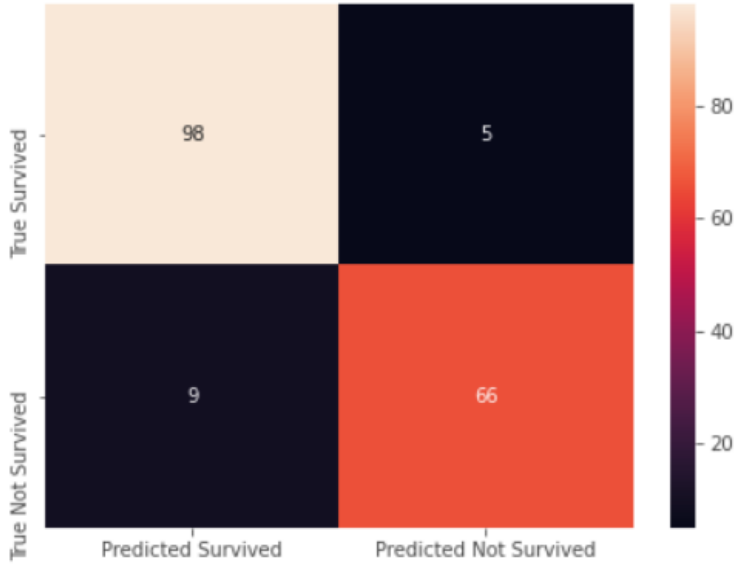
AdaBoost Scores:

- Model Score: 92% (+3)
- Accuracy: 69%
- Precision: 62%
- Recall: 67%
- F1: 65%

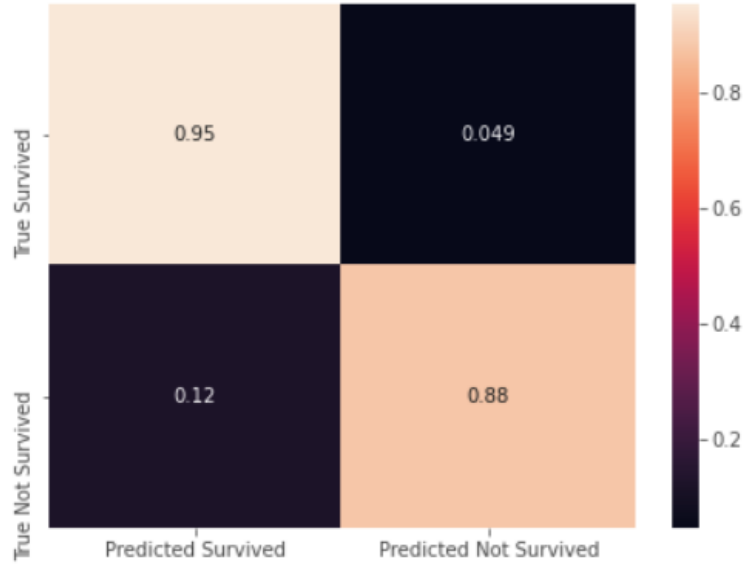
Hyperparameters:

- n_estimators = 600
- max_depth = 1
- learn_rate = 1

Confusion Matrix (values)



Confusion Matrix (%)



Model Testing: AdaBoost

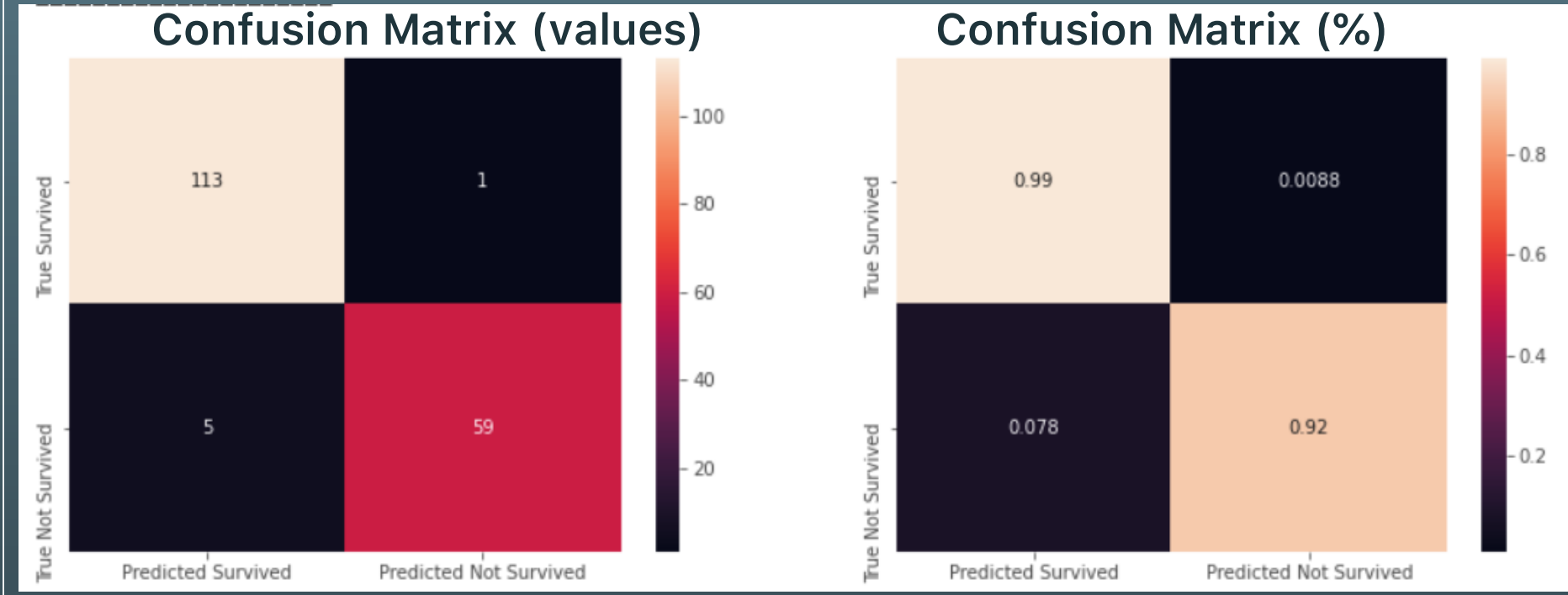
Run model with optimal hyperparameters on Test data set

AdaBoost Scores:

- Model Score: 94% (+6)
- Accuracy: 77%
- Precision: 71%
- Recall: 76%
- F1: 73%

Hyperparameters:

- n_estimators = 600
- max_depth = 1
- learn_rate = 1



Predicting Survival Using Model

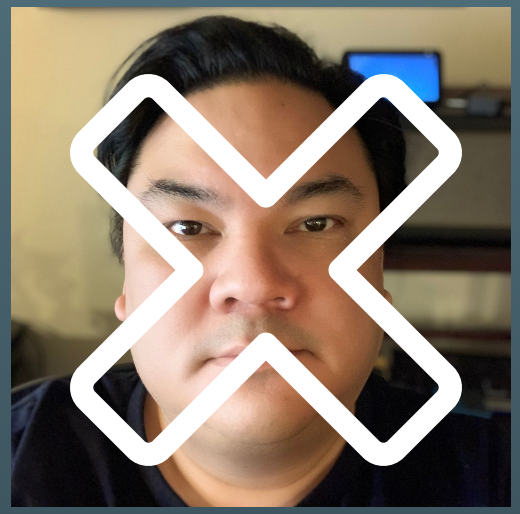
Would these people survive?

data =second class, male, solo, $30 fare, Southhampton, Adult

data = first class, female, with parents, $480 fare, Cherbourg, Adult

data = third class, female, $80 fare, Queenstown, Senior, solo

Predicting Survival Using Model



data =second class, male, solo, $30 fare, Southhampton, Adult

data = first class, female, with parents, $480 fare, Cherbourg, Adult

data = third class, female, $80 fare, Queenstown, Senior, solo

THANK YOU.

mike bernardo