Can the logistic regression predict which passenger will survive on the Titanic?

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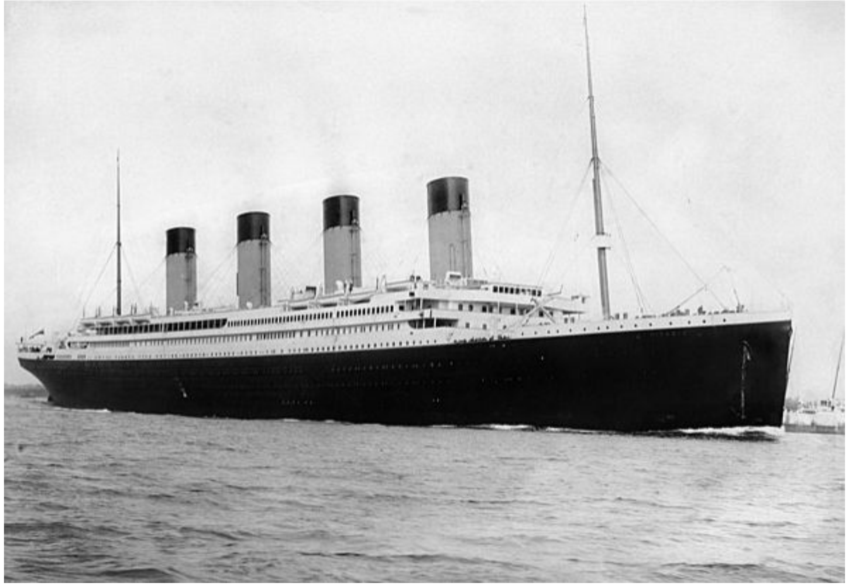
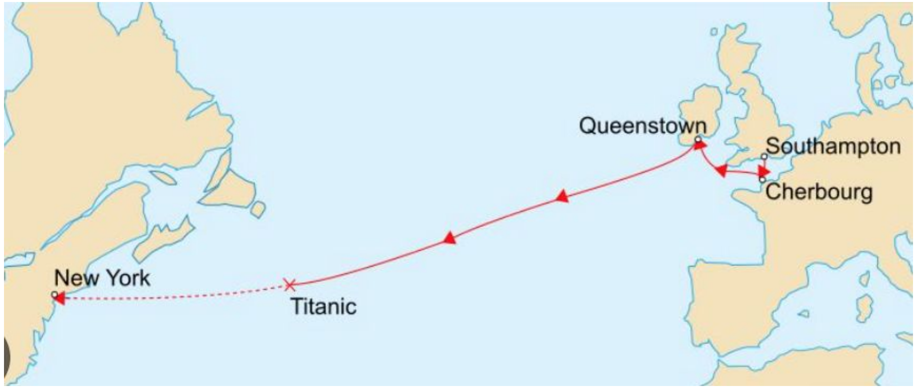
Backstory of titanic

RMS Titanic: Luxurious, most advanced ship passenger at that time

- Left Southampton on 10th April 1912 to NY
- Hit North Atlantic Ocean iceberg at 11:40 PM
- 3 hours to sink on 14 April 1912





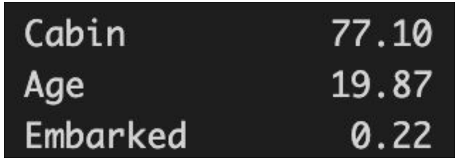
- 2,240 passengers on board incl 885 crew members
- Lifeboats for ⅓ passengers only
- 1500 died

The dataset

Train data for exploratory analysis:

- 891 entries
- 11 features
- 1 target variable: Survived
- 5 categorical + 7 numerical

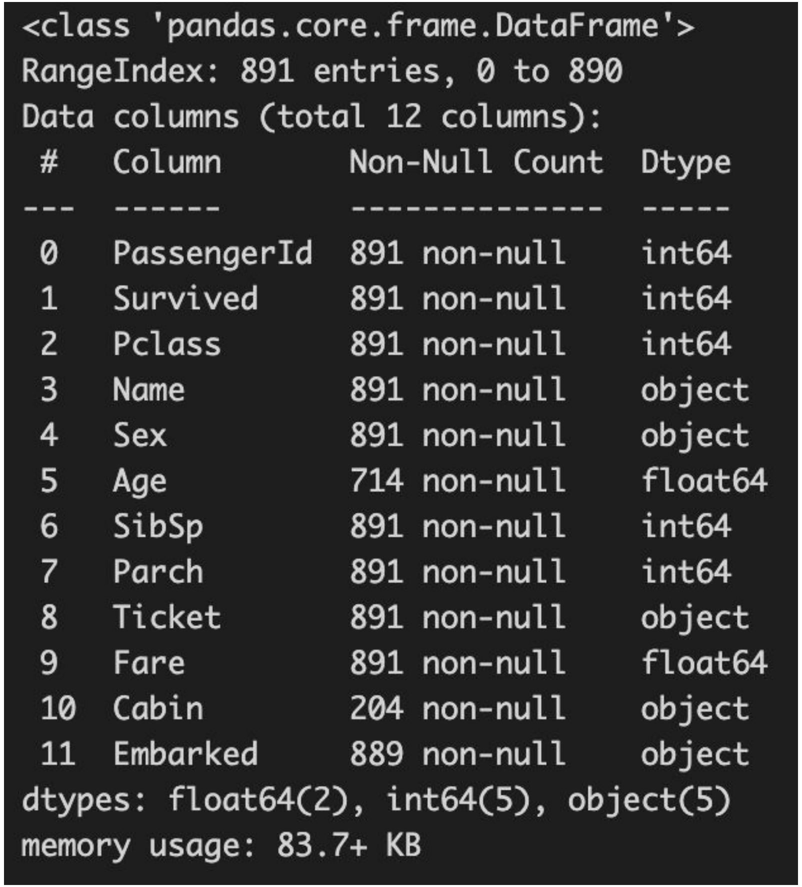
Cleaning:



```
Cabin         77.10
Age           19.87
Embarked       0.22
```

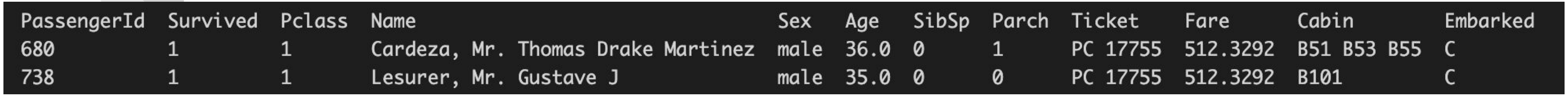
- Missing values (%)
- Deleted ‘Cabin’
- Replaced NaN age with mean
- Age range:0-80
- Embarked deleted 2 rows

=> only 889 entries + 11 columns



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

Example

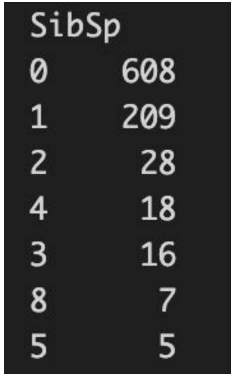


```
PassengerId  Survived  Pclass  Name                                Sex   Age   SibSp  Parch  Ticket    Fare      Cabin        Embarked
680          1         1       Cardeza, Mr. Thomas Drake Martinez  male  36.0  0      1      PC 17755  512.3292  B51 B53 B55  C
738          1         1       Lesurer, Mr. Gustave J              male  35.0  0      0      PC 17755  512.3292  B101         C
```

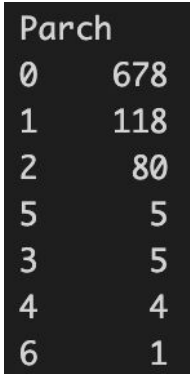
Sibsp = Number of sibling/spouse aboard (0-5)

Parch = Number of parents/children aboard (0-6)

-> Majority were on the boat on their own



```
SibSp
0    608
1    209
2     28
4     18
3     16
8      7
5      5
```



```
Parch
0    678
1    118
2     80
5      5
3      5
4      4
6      1
```

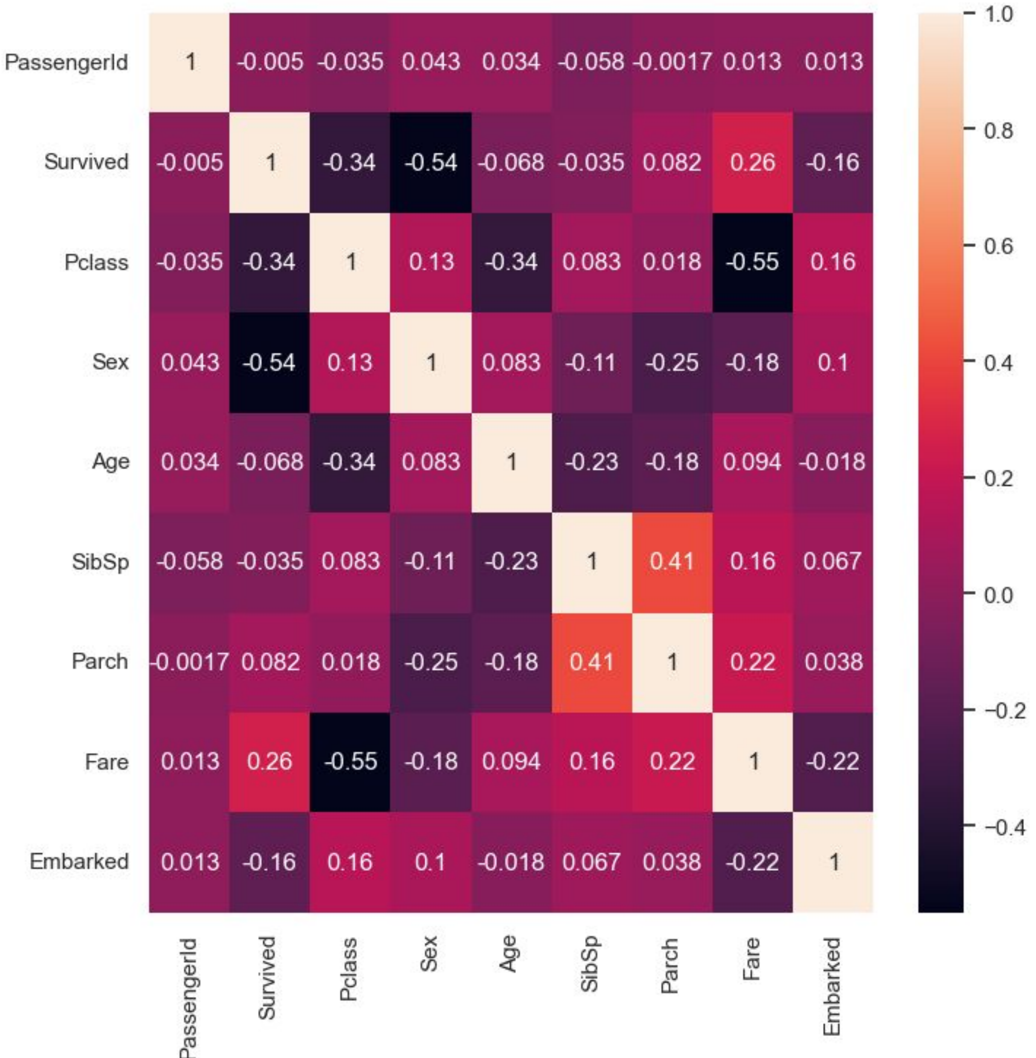
2nd cleaning: Pre-processing

- Encode: ‘Age’ and ‘Embark
- Standardise all

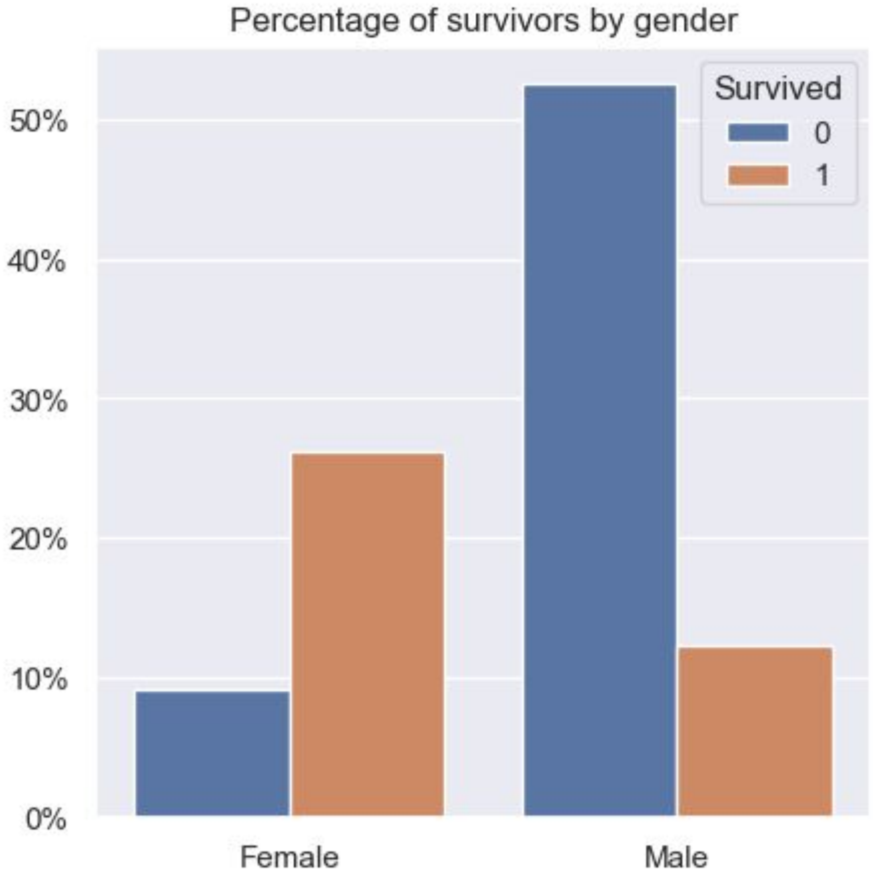
Correlation Matrix

Top 4 correlated variables:

- Sex: -0.54
- Pclass: 0.26
- Fare: 0.26
- Embarked: -0.16
- Remaining: <0.1



	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
PassengerId	1	-0.005	-0.035	0.043	0.034	-0.058	-0.0017	0.013	0.013
Survived	-0.005	1	-0.34	-0.54	-0.068	-0.035	0.082	0.26	-0.16
Pclass	-0.035	-0.34	1	0.13	-0.34	0.083	0.018	-0.55	0.16
Sex	0.043	-0.54	0.13	1	0.083	-0.11	-0.25	-0.18	0.1
Age	0.034	-0.068	-0.34	0.083	1	-0.23	-0.18	0.094	-0.018
SibSp	-0.058	-0.035	0.083	-0.11	-0.23	1	0.41	0.16	0.067
Parch	-0.0017	0.082	0.018	-0.25	-0.18	0.41	1	0.22	0.038
Fare	0.013	0.26	-0.55	-0.18	0.094	0.16	0.22	1	-0.22
Embarked	0.013	-0.16	0.16	0.1	-0.018	0.067	0.038	-0.22	1

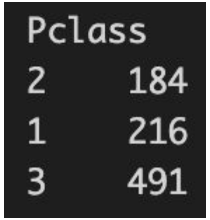


1)**<u>Sex:</u>** gender male/female

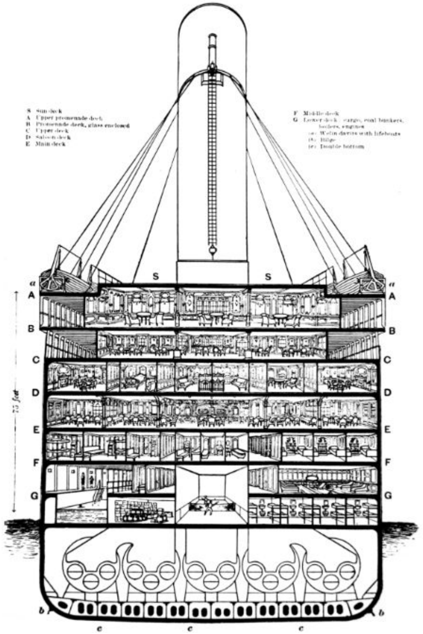
Correlation: -0.54

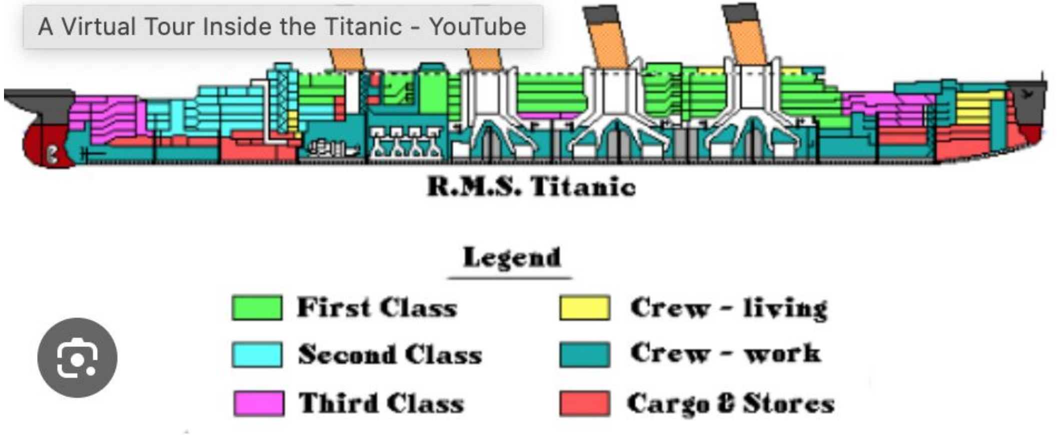
- Female survival rate: 26.15%
- Male survival: 12.23%

2) **PClass** = Proxy for socioeconomic classes , correlation at 0.26



```
Pclass
2      184
1      216
3      491
```



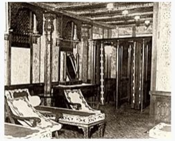


he Forward First Class ;rand Staircase of *Titanic*'s sister ship RMS *Olympic*. *Titanic*'s taircase would have ooked nearly identical. lo known photos of *Titanic*'s staircase exist.

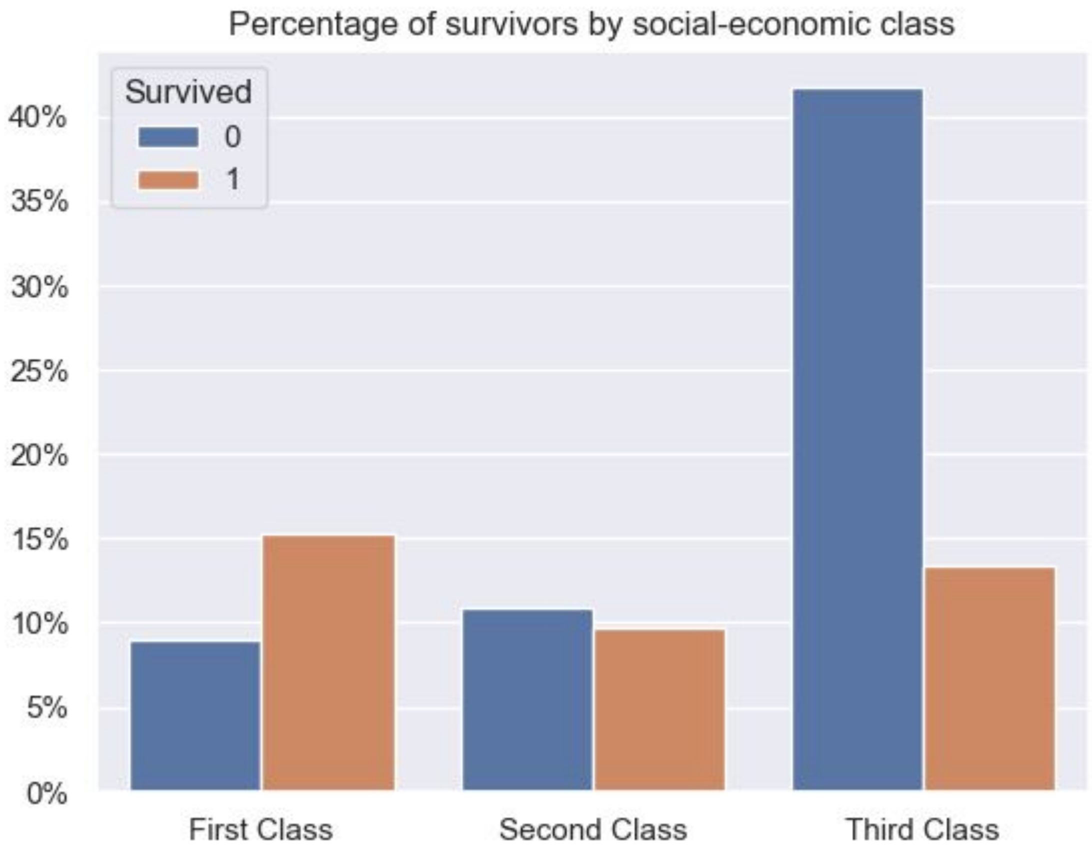
The gymnasium on the boat deck, which was equipped with the latest exercise machines

The à la carte restaurant on B Deck (pictured here on sister ship RMS *Olympic*), run as a concession by Italian-born chef Gaspare Gatti

The First Class lounge of RMS *Olympic*, *Titanic*'s sister ship

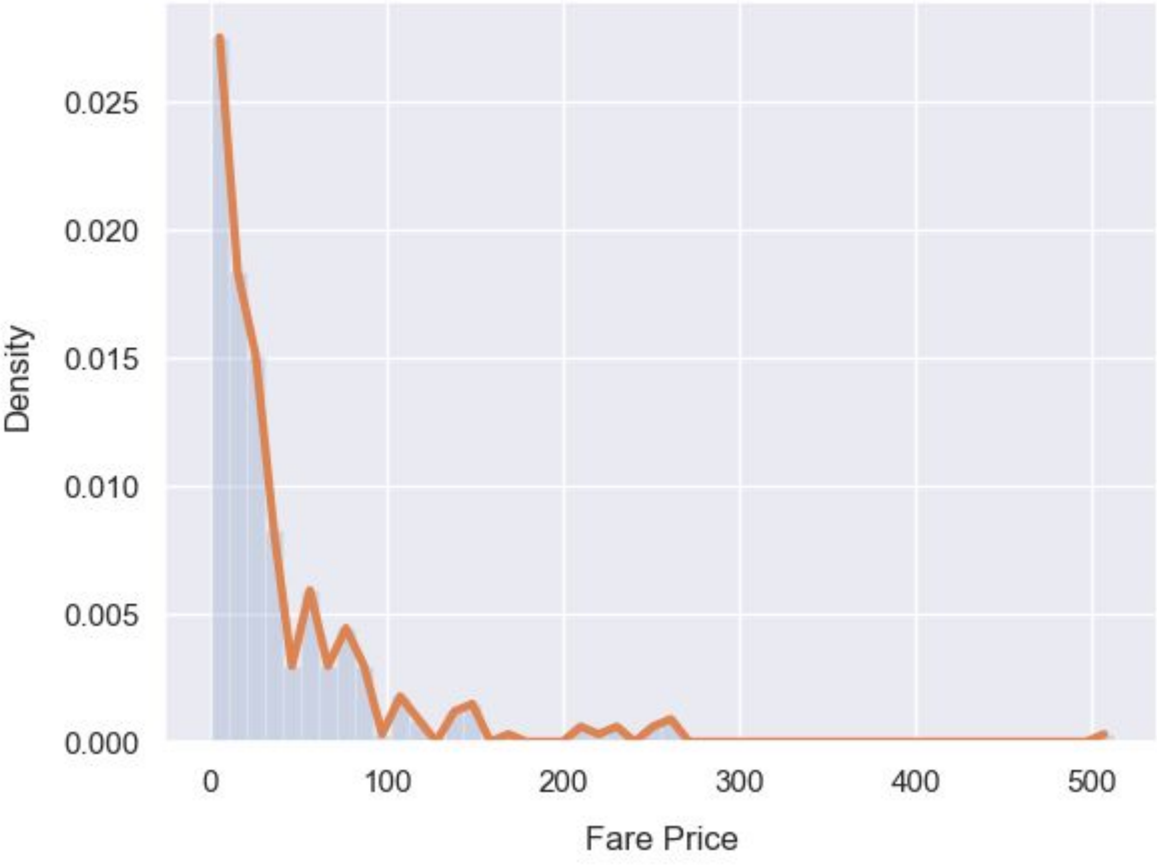


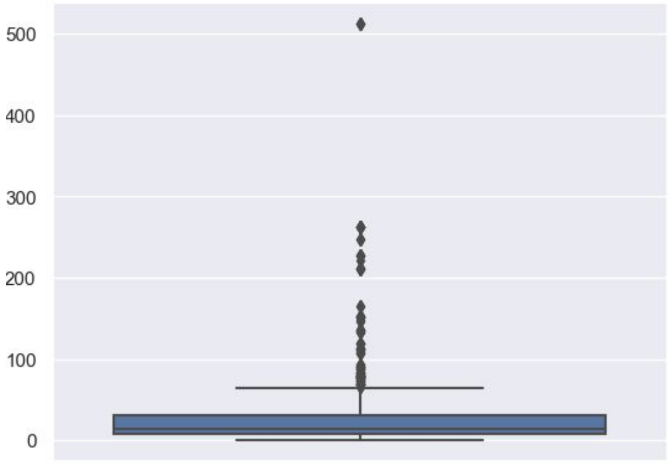
The First Class turkish baths, located along the Starboard side of F-Decl

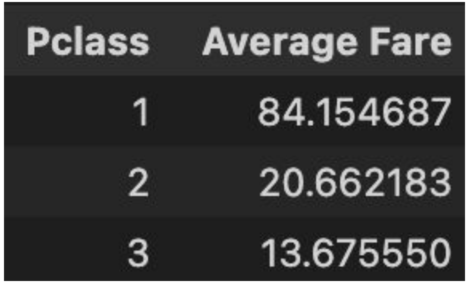


- Highest chance of survival in First Class
- Lowest: Third Class

3) <u>Fare:</u> price tickets ranged from 0.0 to 513 shillings.







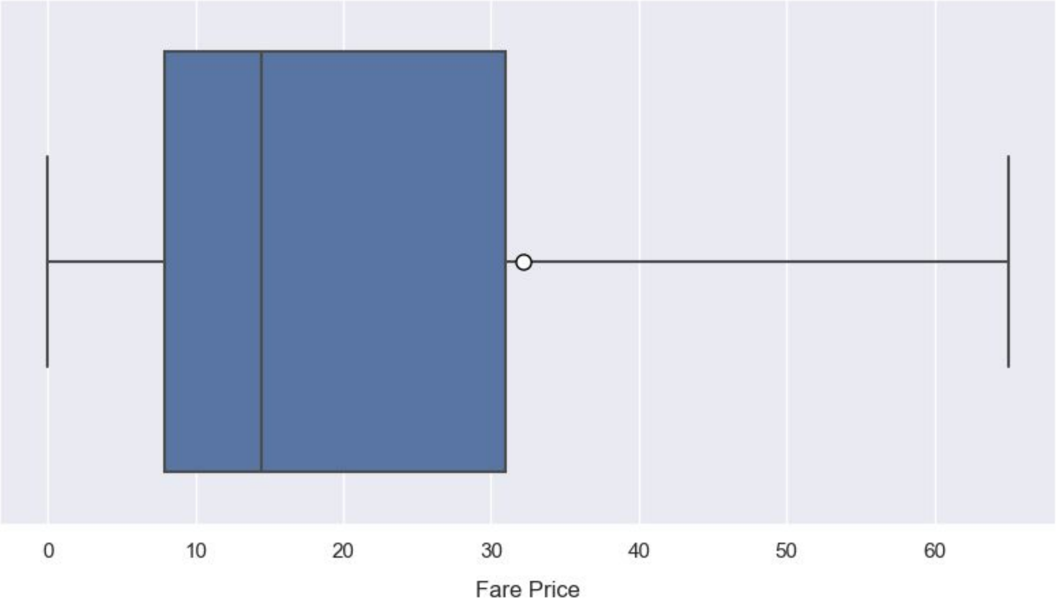
Pclass	Average Fare
1	84.154687
2	20.662183
3	13.675550

Mean: 32 (affected by outliers)

Median: 14

Range: 0 to 513

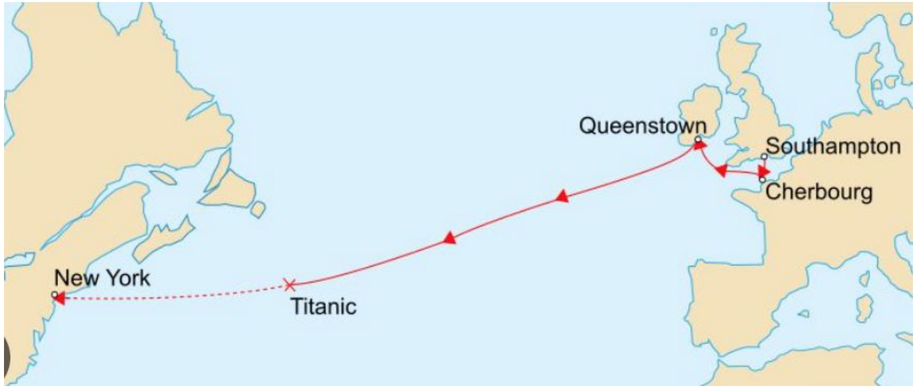
->separating into bins for histogram

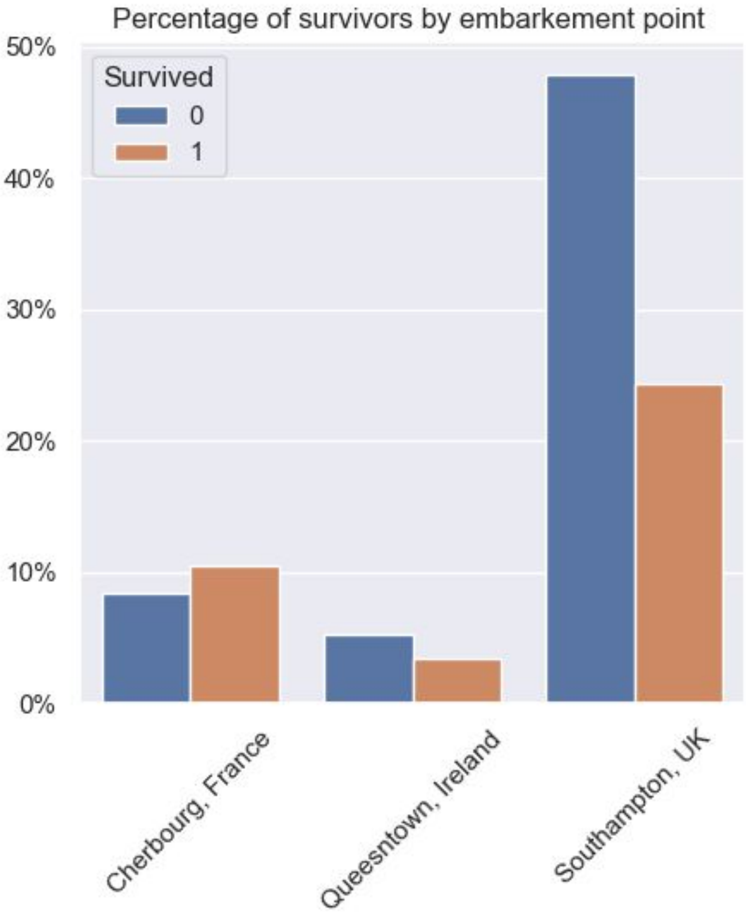


4) **Embarked:** 3 ports to embark from

- Highest survival:

  Boarding from France

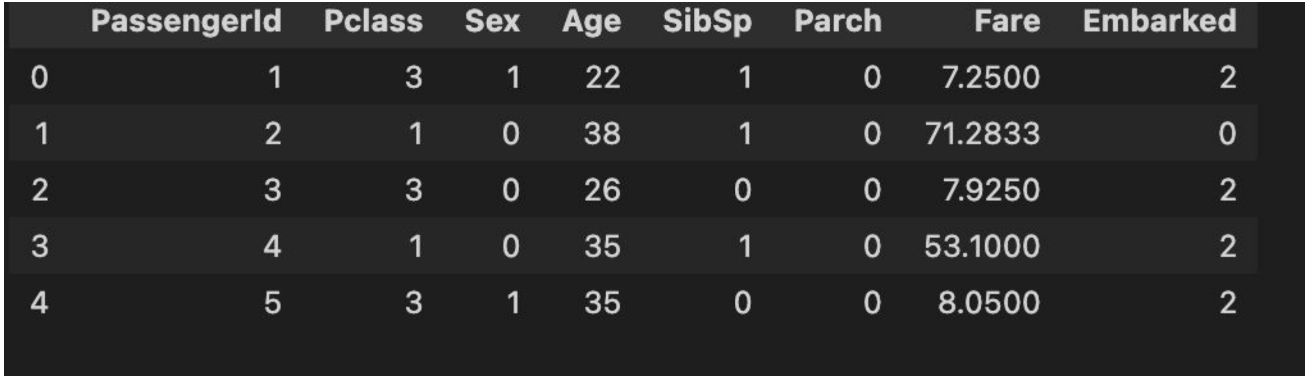




Building Logistic Regression Model -> cleaning

- Dropped ‘Name’ and ‘Ticket’ : words
- Dropped ‘Cabin’ as 77% Nan
- Replaced all missing values of ‘Sex’,’Fare’ with its median and ‘Embarked’ with its mode
- One-hot encoding for ‘Sex’ and ‘Embarked’

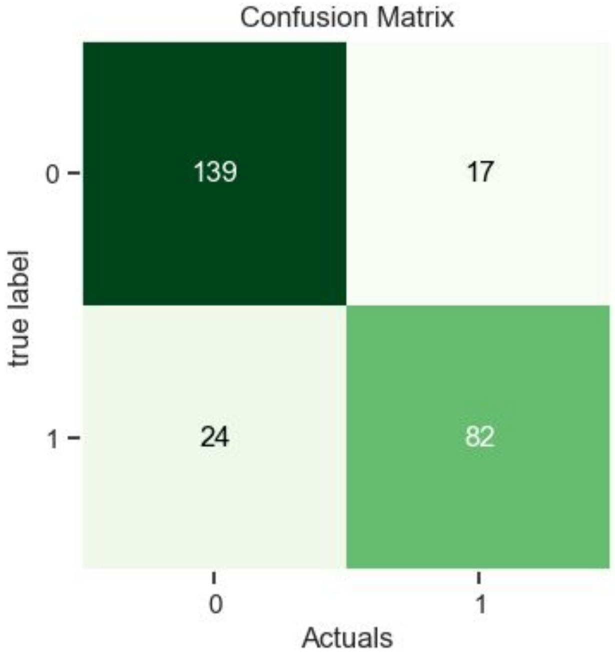
Clean data:

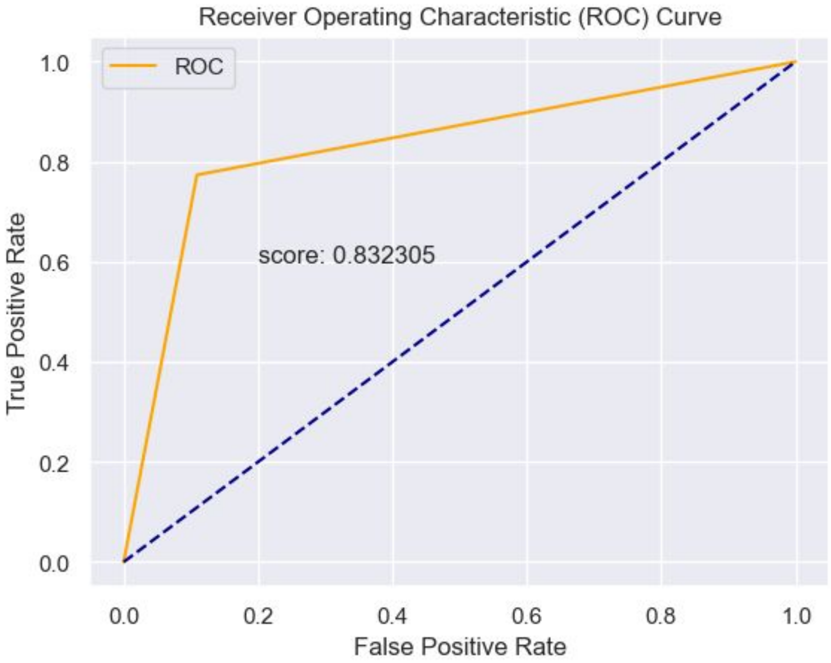


	PassengerId	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	1	3	1	22	1	0	7.2500	2
1	2	1	0	38	1	0	71.2833	0
2	3	3	0	26	0	0	7.9250	2
3	4	1	0	35	1	0	53.1000	2
4	5	3	1	35	0	0	8.0500	2

Evaluation of model

Accuracy score: 0.8435





Conclusion

- Our logistic regression model's accuracy is at 84%.

- There are room for improvements therefore there could be further cleaning such as converting age into classes.

Appendix

Github

Week 6

Date: 09/06/2023