In [1]:

```
# #deal with null values
# df_copy['Embarked'] = df_copy['Embarked'].fillna("Unknown")
# df_copy['Age'] = df_copy['Age'].fillna(df_copy['Age'].median())
# df_copy.isnull().sum()

# #df_copy.dropna(axis=1).to_csv("TitanicDropCols.csv",index=False)
# df_copy.to_csv("TitanicHandlingNull.csv", index=False)
```

In [2]:

```
import numpy as np
import pandas as pd
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import os
import git
import dvc.api
import mlflow
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import cross_val_score
from sklearn.metrics import accuracy_score
from sklearn.metrics import mean_squared_log_error
from sklearn.metrics import mean_squared_error
from sklearn.metrics import roc_curve
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
from sklearn.model_selection import GridSearchCV
from sklearn import tree
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.pipeline import Pipeline
from sklearn.svm import SVC
from sklearn.preprocessing import StandardScaler
from sklearn.ensemble import AdaBoostClassifier
from sklearn.discriminant_analysis import QuadraticDiscriminantAnalysis
from sklearn.ensemble import VotingClassifier
import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

In [3]:

```
repo = git.Repo(r"Z:\Workspace\ITi\Data Science in Production\TitanicMlflowProject\.git

def print_repository_info(repo):
    print('Repository description: {}'.format(repo.description))
    print('Repository active branch is {}'.format(repo.active_branch))

    for remote in repo.remotes:
        print('Remote named "{}" with URL "{}"'.format(remote, remote.url))

    print('Last commit for repository is {}.'.format(str(repo.head.commit.hexsha)))
```

```
def print_commit_data(commit, req_ver):

    print('-----')
    print(str(commit.hexsha))
    print("\"{}\" by {} ({})".format(commit.summary, commit.author.name, commit.author.
    print(str(commit.authored_datetime))
    print(str("count: {} and size: {}".format(commit.count(), commit.size)))
    if req_ver in commit.summary:
        return(str(commit.hexsha))
    else :
        return("")
```

In [4]:

```
# check that the repository loaded correctly
if not repo.bare:
    print('Repo at {} successfully loaded.')
    print_repository_info(repo)
    COMMITS_TO_PRINT = 10
```

```
Repo at {} successfully loaded.
Repository description: Unnamed repository; edit this file 'description' to name the rep
ository.
Repository active branch is master
Last commit for repository is 7d1de381f2557667ab2d8b5020e403d3835d0889.
```

In [5]:

```
# create list of commits then print some of them to stdout
commits = list(repo.iter_commits('master'))[:COMMITS_TO_PRINT]
print("----Commits---")
print(commits)
print("length of commits")
print(len(commits))
```

```
----Commits---
[<git.Commit "7d1de381f2557667ab2d8b5020e403d3835d0889">, <git.Commit "18d3dc684514f7172
d305b78908dd46757978dc8">, <git.Commit "a34d822cabadd21381ef5cd02dabca61546384f3">, <gi
t.Commit "a39287a19b38f66edc97a5140d361d53174fc931">, <git.Commit "f9acfe0f60a5f7ba60379
0a29305bd1b262739f7">, <git.Commit "fcd0f075b7c1ece699266f77454b0354925d5b59">]
length of commits
6
```

Required Funtions

In [6]:

```
"""
    Print Information about Data
"""
def PrintInfo(df):
    print("The Shape of the train_dataSet is {}.\n".format(df.shape))
    display(df.head())
    display(df.info())
    display(df.describe().T)
    display(df.isnull().sum())
    display(df.duplicated().sum())
```

In [7]:

```
"""
```

```
    Data Anlysis
"""
def DataAnlysis(df):
    # we need how many people survive according to Pclass
    print(df[['Pclass', 'Survived']].groupby(['Pclass'], as_index=False).mean().sort_va
    print('-'*20)
    # we need how many people survive according to gender
    print(df[['Sex', 'Survived']].groupby(['Sex'], as_index=False).mean().sort_values(b
    print('-'*20)
    # we need how many people survive according to SibSp
    print(df[['SibSp', 'Survived']].groupby(['SibSp'], as_index=False).mean().sort_valu
    print('-'*20)
    # we need how many people survive according to Parch
    print(df[['Parch', 'Survived']].groupby(['Parch'], as_index=False).mean().sort_valu
```

In [8]:

```
"""
    Label Encoding
"""
def labelEncoding(df, categoryCols):
    if 'Embarked' not in df.columns:
        categoryCols.remove('Embarked')
    #Encoding categorical data
    le=LabelEncoder()
    df[categoryCols]=df[categoryCols].apply(le.fit_transform)
    return df
```

In [9]:

```
"""
    Data Visualization
"""
def DataViz(df):
    corr_matrix=df.corr()
    display(corr_matrix['Survived'].sort_values(ascending=False))
    ## some visualization on data
    sns.pairplot(df)
    plt.show()
    fig, ax = plt.subplots(figsize = (18, 12))
    sns.heatmap(df.corr(), cmap ='RdYlGn', linewidths = 0.30, annot = True)
    plt.title("features_correlation",size=20)
    g = sns.FacetGrid(df, col='Survived', height=8.2, aspect=1.6)
    g.map(plt.hist, 'Sex', bins=20)
    g = sns.FacetGrid(df, col='Survived', height=8.2, aspect=1.6)
    g.map(plt.hist, 'Pclass', bins=20)
```

In [10]:

```
"""
    Apply VotingClassifier to predict the output class based on the highest majority of
"""
def VotingCls(models, X_train, X_test, y_train, y_test):
    estimators = [(key,value) for key,value in models.items()]
    classifier = VotingClassifier(estimators=estimators,voting='soft')
    classifier.fit(X_train, y_train)
    class_pred = classifier.predict(X_test)
    accuracies = cross_val_score(classifier, X_df, y_df , cv = 5)

    trainScore = classifier.score(X_train, y_train)
    testScore = classifier.score(X_test, y_test)
    mse = np.sqrt(mean_squared_error ( class_pred , y_test) )
    msle = np.sqrt(mean_squared_log_error ( class_pred , y_test) )

    results = { "TrainScore" : trainScore,
                "TestScore" : testScore,
                "MSE" : mse,
                "MSLE" : msle,
            }

    # plot ROC Curve
    y_pred_prob = classifier.predict_proba(X_test)[:,1]
    fpr, tpr, thresholds = roc_curve(y_test, y_pred_prob)
    plt.figure()
    plt.plot([0, 1], [0, 1], 'k--')
    plt.plot(fpr, tpr, label='classifier')
    plt.xlabel('False Positive Rate')
    plt.ylabel('True Positive Rate')
    plt.title('ROC Curve')
    plt.show()

    return results
```

In [11]:

```
path='Z:/Workspace/ITi/Data Science in Production/TitanicMlflowProject/data/Titanic.csv
repo='Z:/Workspace/ITi/Data Science in Production/TitanicMlflowProject'

# versions="v0" # Original Dataset with null, DO NOT USE !!
versions="v1" # Drop Null Cols
# versions="v2" # Drop Null Rows
# versions="v3" # Impute Null Values With Median.
resource_url2 = dvc.api.get_url(
    path=path,
    repo=repo,
    rev = versions
    )
print('-----')
print(resource_url2)

# read our Data
df = pd.read_csv(resource_url2, sep=',', index_col=False)

PrintInfo(df) # print df info

category_cols=['Sex','Embarked']
df = labelEncoding(df, category_cols) # Label encoding

DataAnlysis(df) # Data Anlysis
DataViz(df) # Data visualization

X_df=df.drop(['PassengerId','Name','Survived','Ticket'], axis=1)
y_df=df['Survived']

X_train, X_test, y_train, y_test =train_test_split(X_df, y_df, test_size=0.2, random_st

models = {'qda': QuadraticDiscriminantAnalysis(),# QuadraticDiscriminantAnalysis Classi
          'ada_clf':AdaBoostClassifier(), # ada Classifier
          'cv':GridSearchCV(estimator=Pipeline([('scaler', StandardScaler()),('knn', KN
          'log':LogisticRegression(penalty = 'l2',solver = 'liblinear', C = 0.25),
         }
results = VotingCls(models, X_train, X_test, y_train, y_test)
```

```
remote_server_uri = "http://127.0.0.1:5000" # set to your server URI
mlflow.set_tracking_uri(remote_server_uri)
# Note: on Databricks, the experiment name passed to mlflow_set_experiment must be a
# valid path in the workspace
mlflow.set_experiment("/Titanic_Project")
with mlflow.start_run():
    mlflow.log_param("Requested Version", versions)
    mlflow.log_param("Requested Version path", resource_url2)
    mlflow.log_param("Requested Version Count", len(df))
    mlflow.log_param("Requested Version Train Score", results['TrainScore'])
    mlflow.log_param("Requested Version Test Score", results['TestScore'])
    mlflow.log_param("Requested Version MSE", results['MSE'])
    mlflow.log_param("Requested Version MSLE", results['MSLE'])
```

```
-----
..\..\..\..\..\Data Science in Production\TitanicMlflowProject\remote\a4\987f7257d03b9ba
e431d067cffc1b0
The Shape of the train_dataSet is (891, 9).
```

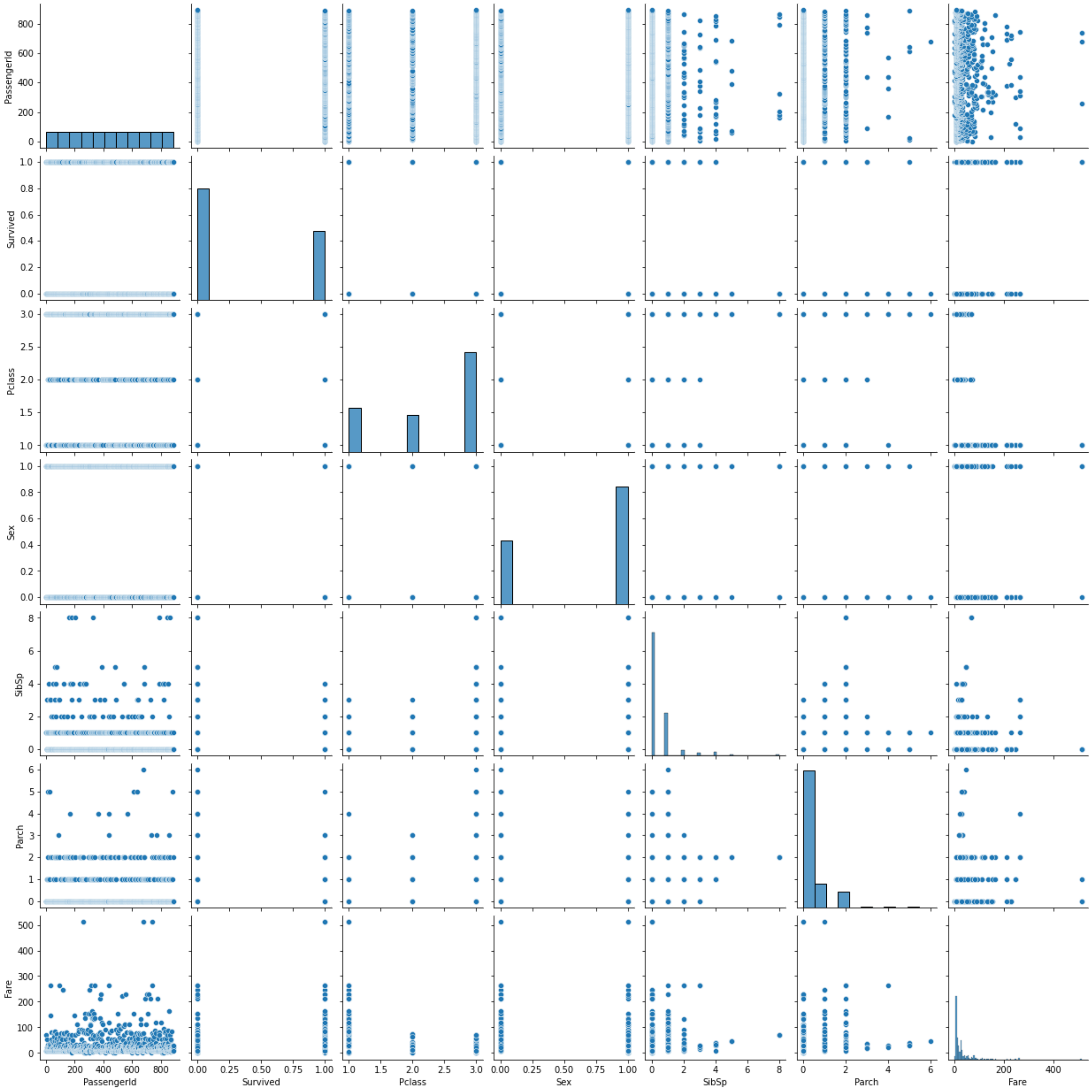
	PassengerId	Survived	Pclass	Name	Sex	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	1	0	A/5 21171	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	1	0	PC 17599	71.2833
2	3	1	3	Heikkinen, Miss. Laina	female	0	0	STON/O2. 3101282	7.9250
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	1	0	113803	53.1000
4	5	0	3	Allen, Mr. William Henry	male	0	0	373450	8.0500

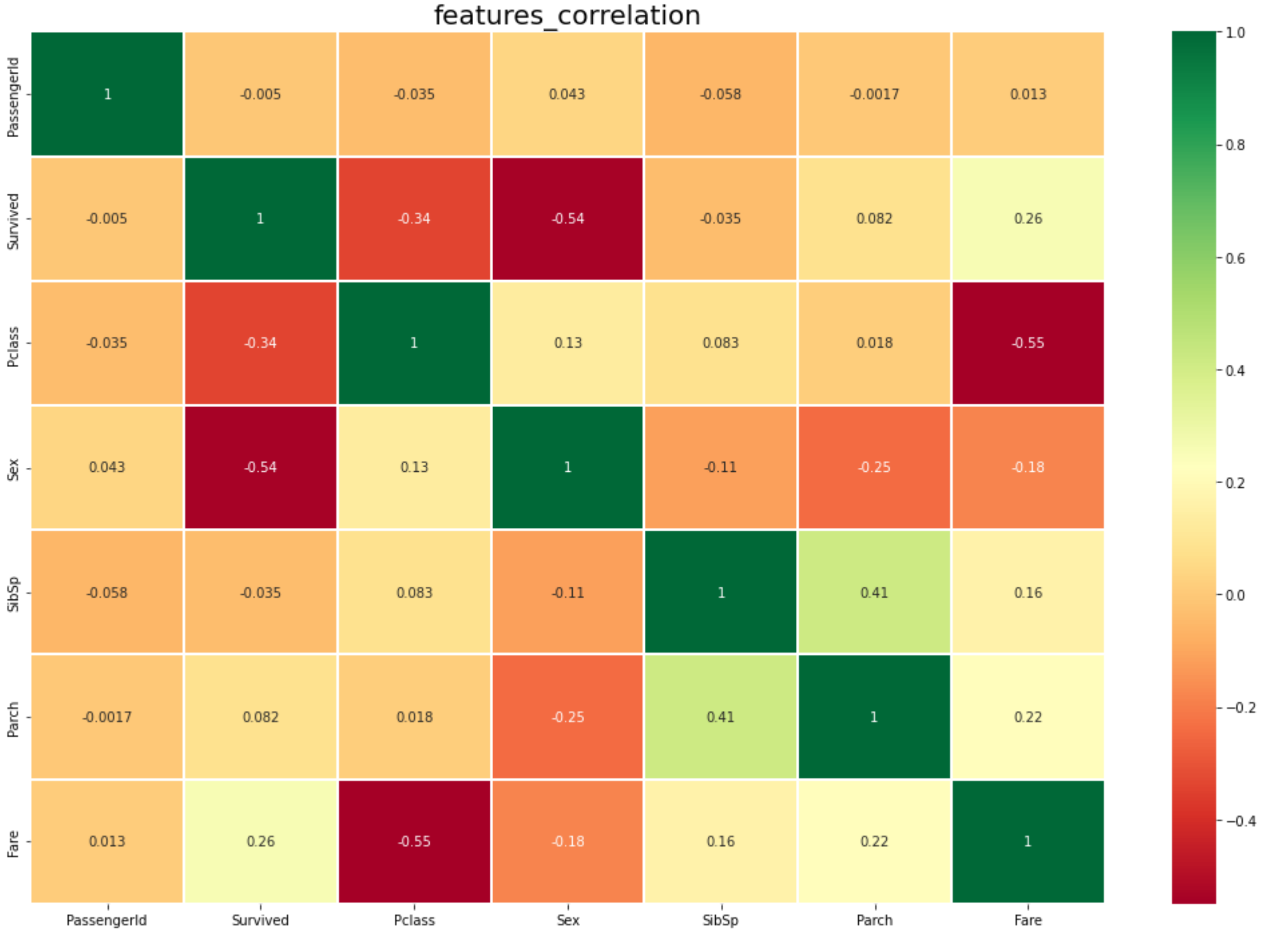
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 9 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   SibSp        891 non-null    int64  
 6   Parch        891 non-null    int64  
 7   Ticket       891 non-null    object 
 8   Fare         891 non-null    float64
dtypes: float64(1), int64(5), object(3)
memory usage: 62.8+ KB
None
```

	count	mean	std	min	25%	50%	75%	max
PassengerId	891.0	446.000000	257.353842	1.0	223.5000	446.0000	668.5	891.0000

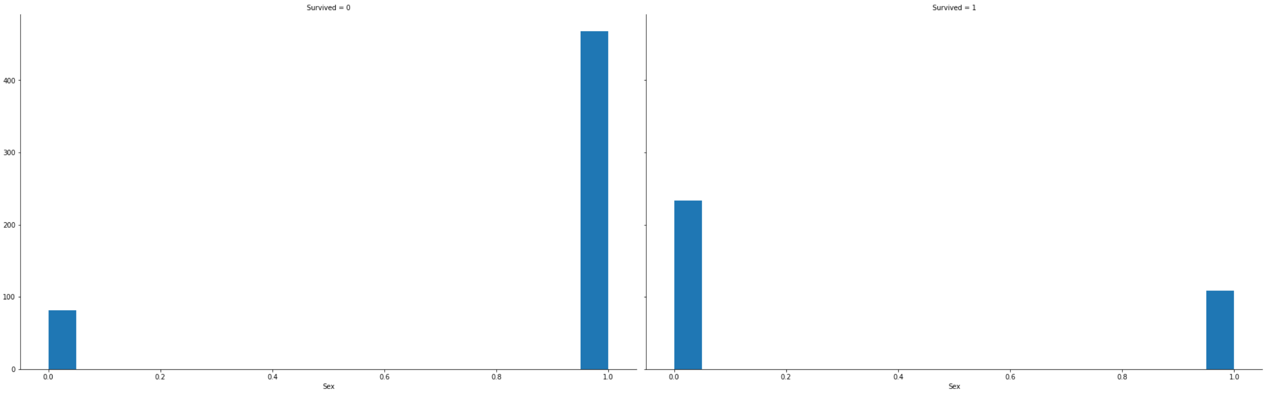
	count	mean	std	min	25%	50%	75%	max
Survived	891.0	0.383838	0.486592	0.0	0.0000	0.0000	1.0	1.0000
Pclass	891.0	2.308642	0.836071	1.0	2.0000	3.0000	3.0	3.0000
SibSp	891.0	0.523008	1.102743	0.0	0.0000	0.0000	1.0	8.0000
Parch	891.0	0.381594	0.806057	0.0	0.0000	0.0000	0.0	6.0000
Fare	891.0	32.204208	49.693429	0.0	7.9104	14.4542	31.0	512.3292

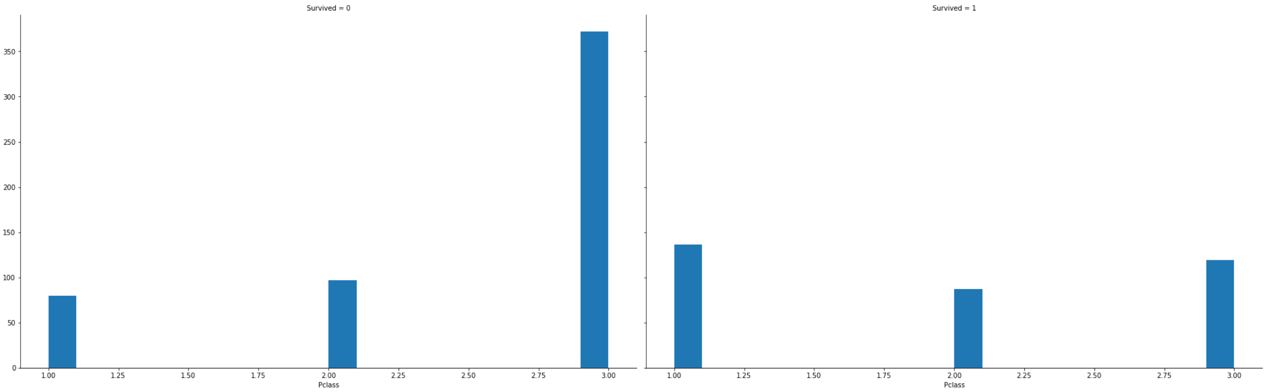
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
SibSp          0
Parch          0
Ticket         0
Fare           0
dtype: int64
0
   Pclass  Survived
0       1  0.629630
1       2  0.472826
2       3  0.242363
--------------------
   Sex  Survived
0    0  0.742038
1    1  0.188908
--------------------
   SibSp  Survived
1      1  0.535885
2      2  0.464286
0      0  0.345395
3      3  0.250000
4      4  0.166667
5      5  0.000000
6      8  0.000000
--------------------
   Parch  Survived
3      3  0.600000
1      1  0.550847
2      2  0.500000
0      0  0.343658
5      5  0.200000
4      4  0.000000
6      6  0.000000
Survived       1.000000
Fare           0.257307
Parch          0.081629
PassengerId   -0.005007
SibSp         -0.035322
Pclass        -0.338481
Sex           -0.543351
Name: Survived, dtype: float64
```

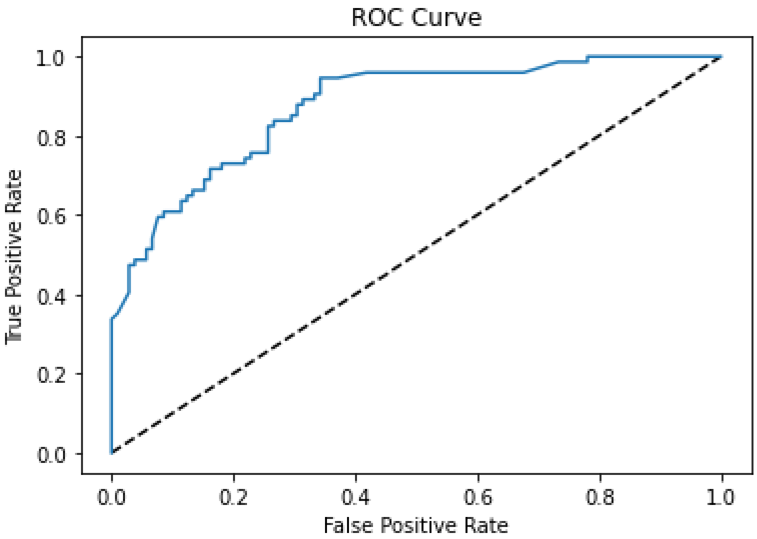

PassengerId
800
600
400
200
0
Survived
1.0
0.8
0.6
0.4
0.2
0.0
Pclass
3.0
2.5
2.0
1.5
1.0
Sex
1.0
0.8
0.6
0.4
0.2
0.0
SibSp
8
6
4
2
0
Parch
6
5
4
3
2
1
0
Fare
500
400
300
200
100
0
0 200 400 600 800
PassengerId
0.00 0.25 0.50 0.75 1.00
Survived
1.0 1.5 2.0 2.5 3.0
Pclass
0.00 0.25 0.50 0.75 1.00
Sex
0 2 4 6 8
SibSp
0 2 4 6
Parch
0 200 400
Fare



	PassengerId	Survived	Pclass	Sex	SibSp	Parch	Fare
PassengerId	1	-0.005	-0.035	0.043	-0.058	-0.0017	0.013
Survived	-0.005	1	-0.34	-0.54	-0.035	0.082	0.26
Pclass	-0.035	-0.34	1	0.13	0.083	0.018	-0.55
Sex	0.043	-0.54	0.13	1	-0.11	-0.25	-0.18
SibSp	-0.058	-0.035	0.083	-0.11	1	0.41	0.16
Parch	-0.0017	0.082	0.018	-0.25	0.41	1	0.22
Fare	0.013	0.26	-0.55	-0.18	0.16	0.22	1






ROC Curve
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0

```
In [ ]:
```