1 Import Libraries

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
```

2 Read Data

```
df = pd.read_csv(r"C:\Users\DELL-PC\Downloads\train.csv")

df
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex   Age
SibSp  \
0                              Braund, Mr. Owen Harris    male  22.0
1
1    Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0
1
2                               Heikkinen, Miss. Laina  female  26.0
0
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0
1
4                             Allen, Mr. William Henry    male  35.0
0
..                                                 ...     ...   ...
...
886                              Montvila, Rev. Juozas    male  27.0
0
```

```
887                      Graham, Miss. Margaret Edith  female  19.0
0
888          Johnston, Miss. Catherine Helen "Carrie"  female   NaN
1
889                              Behr, Mr. Karl Howell    male  26.0
0
890                                Dooley, Mr. Patrick    male  32.0
0

     Parch            Ticket     Fare Cabin Embarked
0        0         A/5 21171   7.2500   NaN        S
1        0          PC 17599  71.2833   C85        C
2        0  STON/O2. 3101282   7.9250   NaN        S
3        0            113803  53.1000  C123        S
4        0            373450   8.0500   NaN        S
..     ...               ...      ...   ...      ...
886      0            211536  13.0000   NaN        S
887      0            112053  30.0000   B42        S
888      2        W./C. 6607  23.4500   NaN        S
889      0            111369  30.0000  C148        C
890      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]
```

3 EDA (Exploratory data analysis)

3.1 Understand the data

```
df.info()
```

```
<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
```

3.2 Missing values

```
df.isnull().sum()/len(df)*100
```

```
PassengerId     0.000000
Survived        0.000000
Pclass          0.000000
Name            0.000000
Sex             0.000000
Age            19.865320
SibSp           0.000000
Parch           0.000000
Ticket          0.000000
Fare            0.000000
Cabin          77.104377
Embarked        0.224467
dtype: float64
```

Above the result we can see that In Cabin variable 77 % data are missing and age variable has 20% missing data

```
df = df.drop(["Cabin","Name","PassengerId","Ticket"],axis=1)

df.nunique()
```

```
Survived      2
Pclass        3
Sex           2
Age          88
SibSp         7
Parch         7
Fare        248
Embarked      3
dtype: int64
```

```
df['Age'] = df['Age'].fillna(df['Age'].mean())
```

3.4 Descriptive Statistics

```
df.describe()
```

```
         Survived      Pclass         Age       SibSp       Parch
Fare
count  891.000000  891.000000  891.000000  891.000000  891.000000
891.000000
mean     0.383838    2.308642   29.699118    0.523008    0.381594
32.204208
```

```
std      0.486592    0.836071   13.002015    1.102743    0.806057
49.693429
min      0.000000    1.000000    0.420000    0.000000    0.000000
0.000000
25%      0.000000    2.000000   22.000000    0.000000    0.000000
7.910400
50%      0.000000    3.000000   29.699118    0.000000    0.000000
14.454200
75%      1.000000    3.000000   35.000000    1.000000    0.000000
31.000000
max      1.000000    3.000000   80.000000    8.000000    6.000000
512.329200
```

```
df.describe(include='O')
```

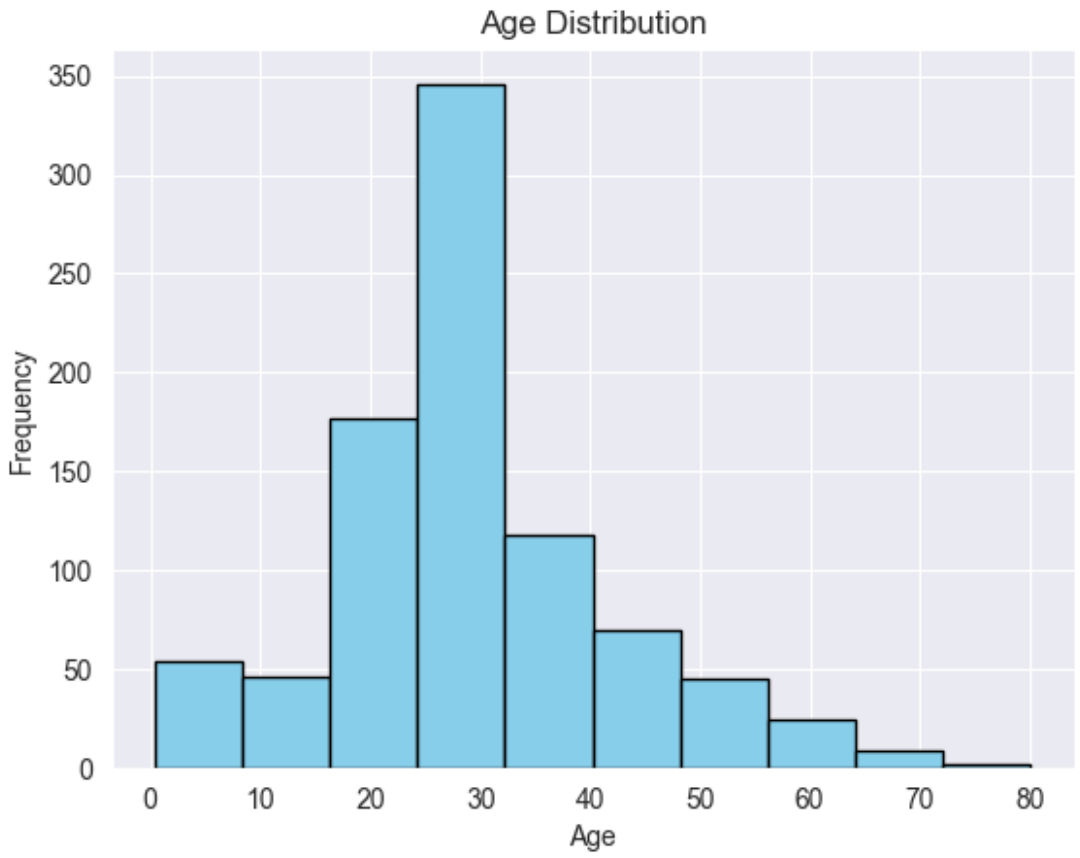
```
         Sex Embarked
count    891      889
unique     2        3
top     male        S
freq     577      644
```

3.5 Visualization of diffrent variable

3.5.1 Univariate analysis

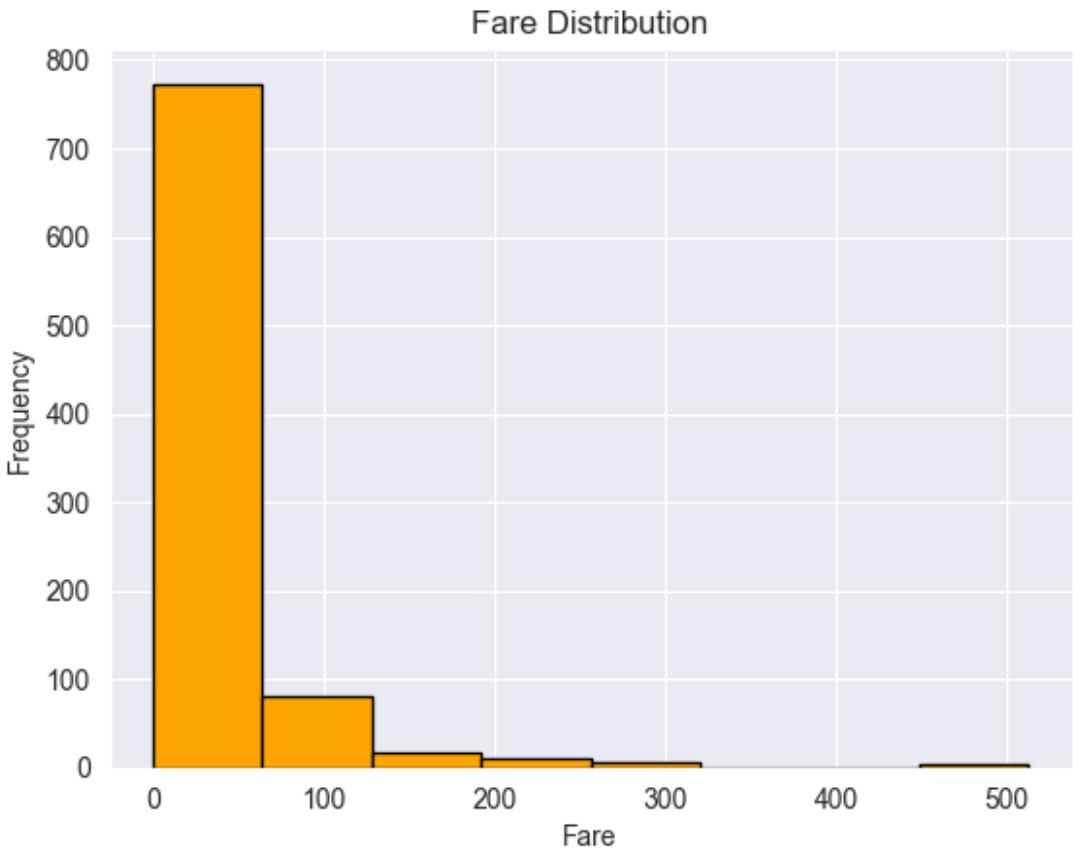
1 distribution of Age variable

```
plt.hist(df.Age, bins=10, color='skyblue', edgecolor='black')
plt.title('Age Distribution')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.show()
```



2 Distribution of Fare

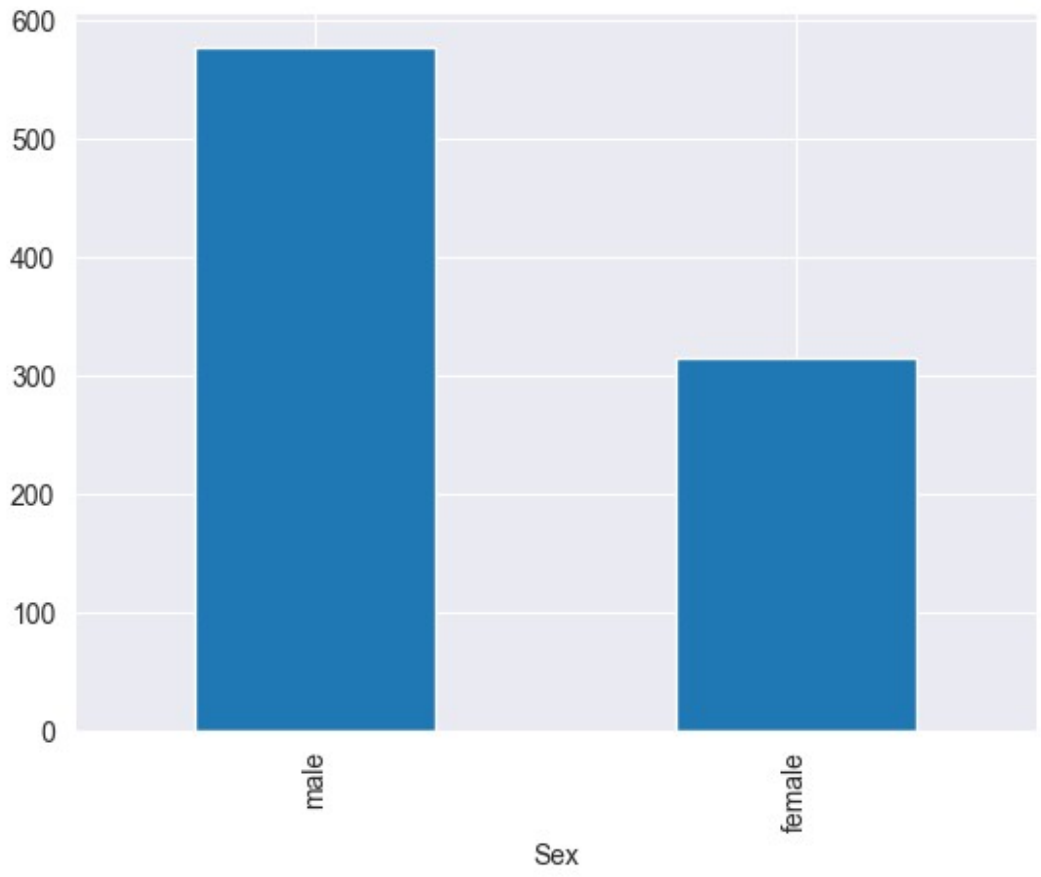
```
plt.hist(df.Fare, bins=8, color='Orange', edgecolor='black')
plt.title('Fare Distribution')
plt.xlabel('Fare')
plt.ylabel('Frequency')
plt.show()
```



3 Distribution of "sex" variable

```
df["Sex"].value_counts().plot(kind="bar")
```

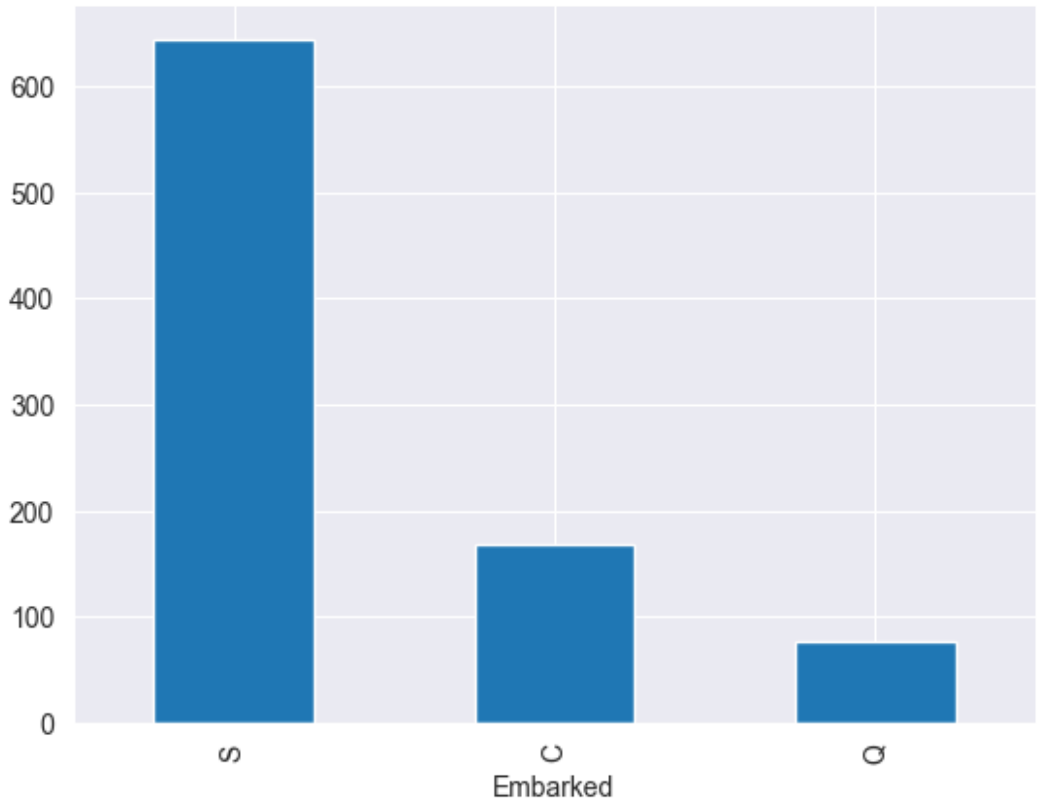
```
<Axes: xlabel='Sex'>
```



4 distribution of "Embarked" Variable

```
df["Embarked"].value_counts().plot(kind="bar")
```

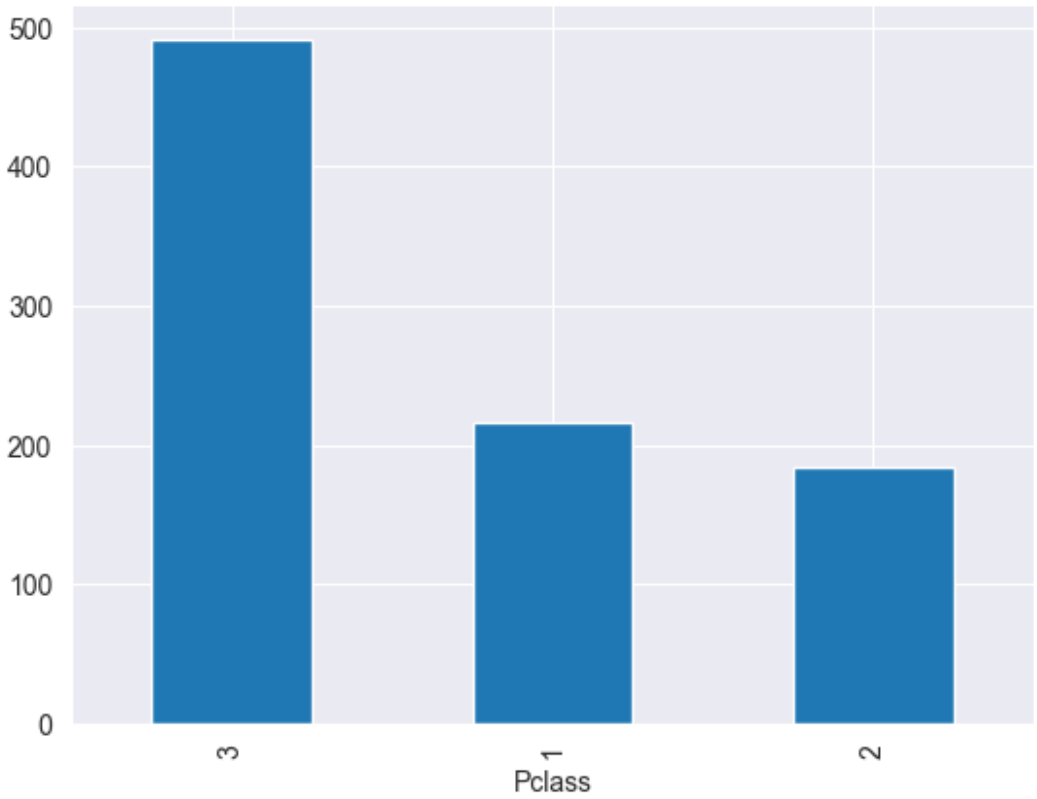
```
<Axes: xlabel='Embarked'>
```



5 Distributon of "Pclass" Variable

```
df["Pclass"].value_counts().plot(kind="bar")
```

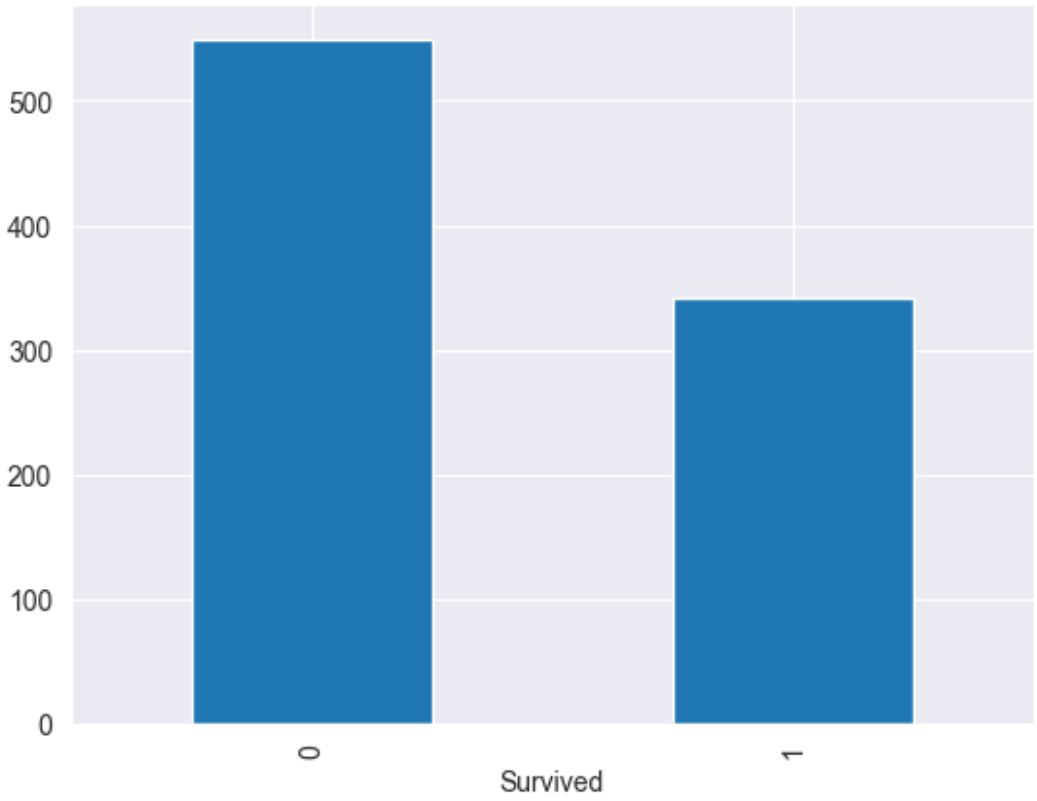
```
<Axes: xlabel='Pclass'>
```



6 Distribution of Survived variable

```
df["Survived"].value_counts().plot(kind="bar")
df["Survived"].value_counts()
```

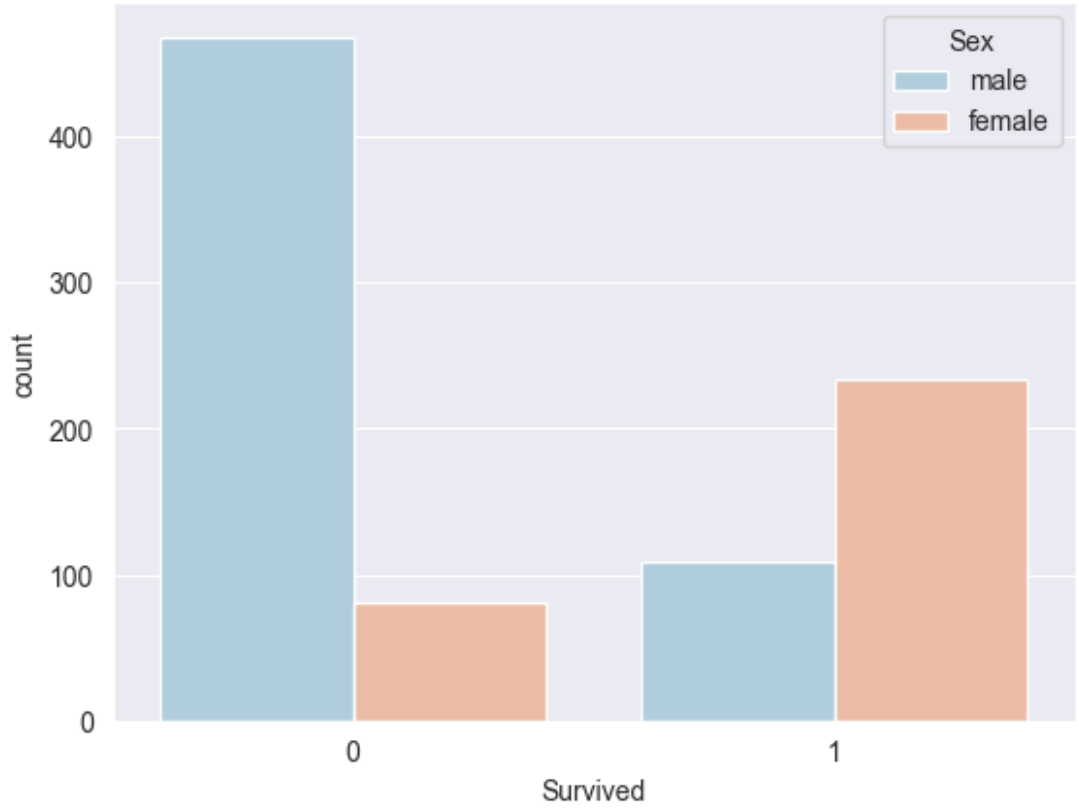
```
Survived
0    549
1    342
Name: count, dtype: int64
```



3.5.2 Bivariate analysis

```
sns.set_style('darkgrid')
sns.countplot(x='Survived',hue='Sex',data=df,palette='RdBu_r')
```

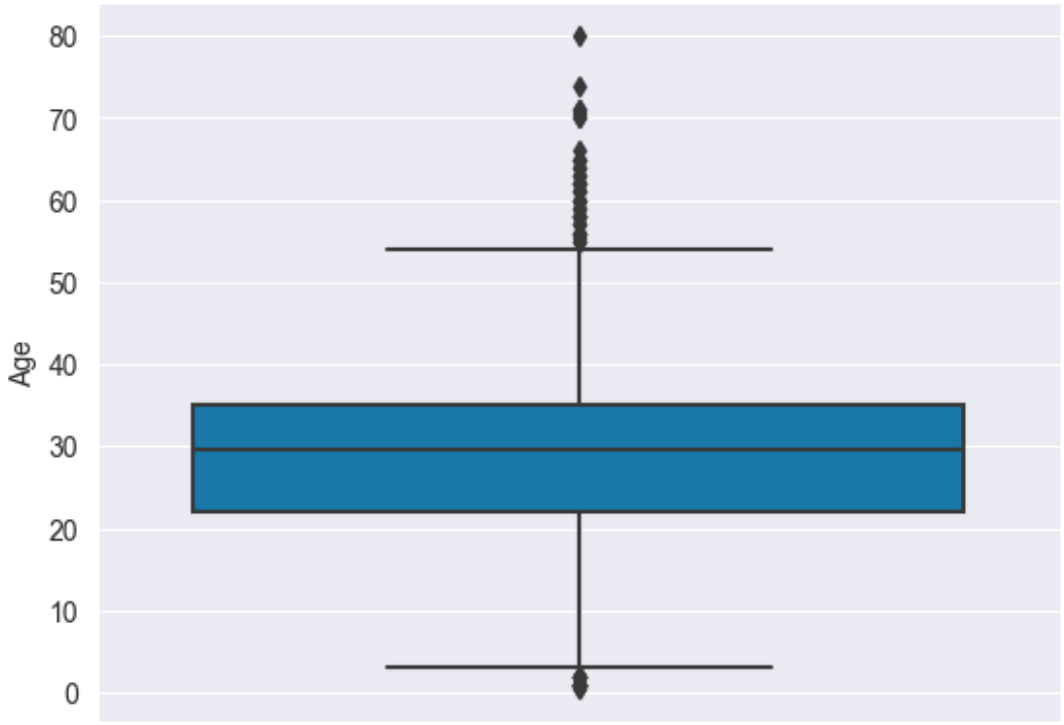
```
<Axes: xlabel='Survived', ylabel='count'>
```



4 Data preprocessing

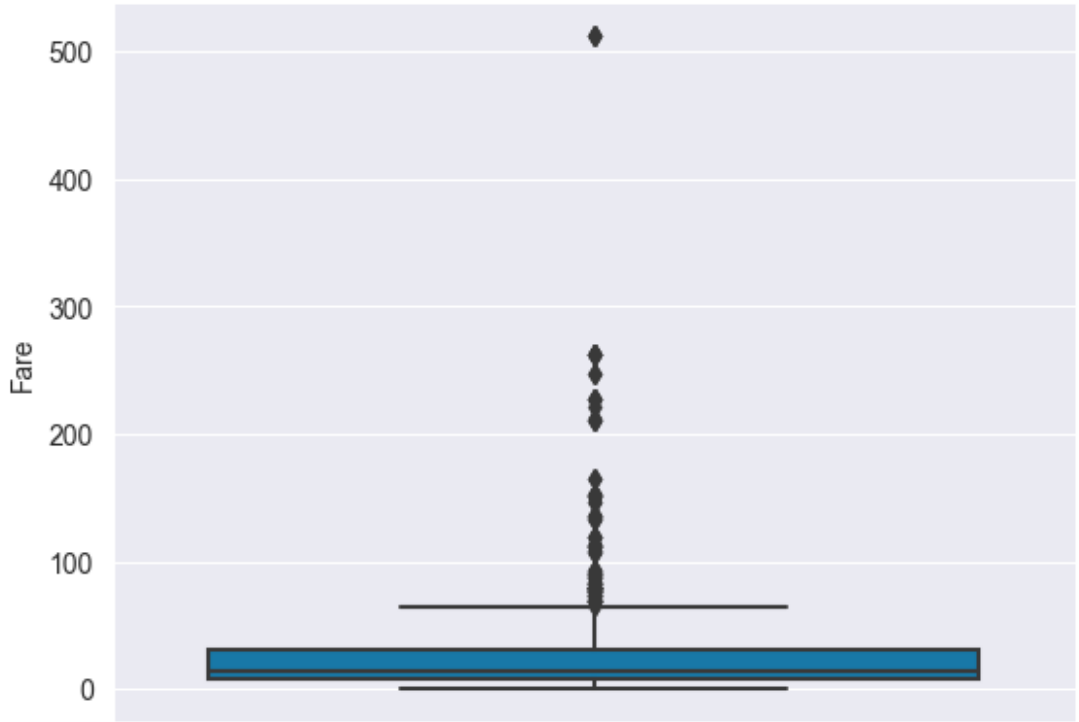
```
sns.boxplot(y='Age',data=df,palette='winter')
```

```
<Axes: ylabel='Age'>
```




```
sns.boxplot(y='Fare',data=df,palette='winter')
```

```
<Axes: ylabel='Fare'>
```



```
Q1 = df['Fare'].quantile(0.25)
Q3 = df['Fare'].quantile(0.75)
IQR = Q3 - Q1
df = df[~((df['Fare'] < Q1 - 1.5 * IQR) | (df['Fare'] > Q3 + 1.5 *
IQR))]

Q1 = df['Age'].quantile(0.25)
Q3 = df['Age'].quantile(0.75)
IQR = Q3 - Q1
df = df[~((df['Age'] < Q1 - 1.5 * IQR) | (df['Age'] > Q3 + 1.5 *
IQR))]
```

Encoding

```
df1 = pd.get_dummies(df,drop_first=True,dtype=int)

df1
```

```
     Survived  Pclass        Age  SibSp  Parch     Fare  Sex_male
Embarked_Q  \
0           0       3  22.000000      1      0   7.2500         1
0
2           1       3  26.000000      0      0   7.9250         0
0
3           1       1  35.000000      1      0  53.1000         0
0
4           0       3  35.000000      0      0   8.0500         1
0
5           0       3  29.699118      0      0   8.4583         1
1
..        ...     ...        ...    ...    ...      ...       ...
...
886         0       2  27.000000      0      0  13.0000         1
0
887         1       1  19.000000      0      0  30.0000         0
0
888         0       3  29.699118      1      2  23.4500         0
0
889         1       1  26.000000      0      0  30.0000         1
0
890         0       3  32.000000      0      0   7.7500         1
1

     Embarked_S
0             1
2             1
3             1
4             1
5             0
..          ...
```

```
886           1
887           1
888           1
889           0
890           0

[708 rows x 9 columns]
```

```
X = df1.drop('Survived',axis=1)
Y = df1["Survived"]

from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test =train_test_split(X, Y, train_size =
0.70 , random_state=42)

x_train.shape,x_test.shape
```

```
((495, 8), (213, 8))
```

```
y_train.value_counts()
```

```
Survived
0    340
1    155
Name: count, dtype: int64
```

```
from imblearn.combine import SMOTETomek
sampling = SMOTETomek()

X_train_os, Y_train_os = sampling.fit_resample(x_train, y_train)

Y_train_os.value_counts()
```

```
Survived
1    319
0    319
Name: count, dtype: int64
```

Logistic Regression

```
from sklearn.linear_model import LogisticRegression
LOR =LogisticRegression()

lor_model = LOR.fit(X_train_os,Y_train_os)
```

```
C:\Users\DELL-PC\anaconda3\lib\site-packages\sklearn\linear_model\
_logistic.py:460: ConvergenceWarning: lbfgs failed to converge
(status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.
```

```
Increase the number of iterations (max_iter) or scale the data as
shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:

https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(
```

```
lor_y_predict = lor_model.predict(x_test)
```

```
from sklearn.metrics import
confusion_matrix,classification_report,roc_curve,precision_score,recal
l_score,roc_auc_score
from sklearn.metrics import accuracy_score
```

```
accuracy = accuracy_score(y_test,lor_y_predict)
accuracy
```

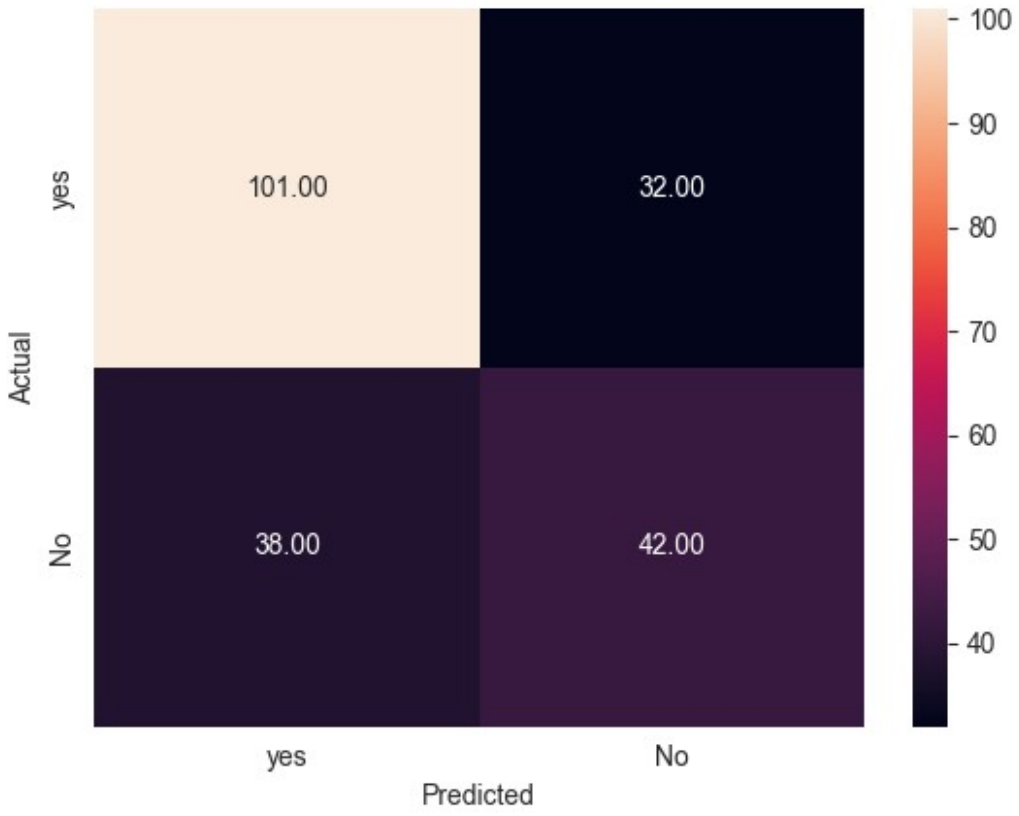
```
0.6713615023474179
```

```
def CM(Actual,Predicted) :
    cm = sns.heatmap(confusion_matrix(Actual,Predicted),annot =
True ,fmt = '.2f',xticklabels=['yes','No'],yticklabels=['yes','No'])
    plt.xlabel('Predicted')
    plt.ylabel('Actual')
    return cm

def ROC_Curve(Actual,Predicted):
    fpr,tpr,thresholds = roc_curve(Actual,Predicted)
    roc = plt.plot(fpr,tpr)
    plt.xlabel('False Possitive Rate')
    plt.ylabel('True Possitive Rate')
    plt.title('ROC CURVE')
    plt.show()
    return roc

CM(y_test,lor_y_predict)
```

```
<Axes: xlabel='Predicted', ylabel='Actual'>
```



Decision Tree

```
from sklearn.tree import DecisionTreeClassifier
DT = DecisionTreeClassifier(criterion =
'gini',min_samples_split=10,max_depth=5)

dt_model = DT.fit(X_train_scl,Y_train_os)

dt_y_pred = dt_model.predict(X_test_scl)

print(classification_report(y_test,dt_y_pred))
```

```
              precision    recall  f1-score   support

           0       0.82      0.66      0.73       133
           1       0.58      0.76      0.66        80

    accuracy                           0.70       213
   macro avg       0.70      0.71      0.69       213
weighted avg       0.73      0.70      0.70       213
```

```
accuracy = accuracy_score(y_test,dt_y_pred)
accuracy
```

```
0.6995305164319249
```

```
from sklearn.model_selection import GridSearchCV
dt_param = [{'criterion':
['gini','entropy'],'min_samples_split':range(7,20),'max_depth':range(1
,5)}]
dt_gs =
GridSearchCV(DecisionTreeClassifier(),dt_param,cv=10,scoring='accuracy
')
dt_gs.fit(X_train_scl,Y_train_os)
```

```
GridSearchCV(cv=10, estimator=DecisionTreeClassifier(),
             param_grid=[{'criterion': ['gini', 'entropy'],
                          'max_depth': range(1, 5),
                          'min_samples_split': range(7, 20)}],
             scoring='accuracy')
```

```
dt_gs.best_params_
```

```
{'criterion': 'gini', 'max_depth': 4, 'min_samples_split': 7}
```

```
dt_gs.best_score_
```

```
0.7534722222222223
```

Random forest

```
from sklearn.ensemble import RandomForestClassifier

RF = RandomForestClassifier(n_estimators = 200 , criterion = 'gini' ,
max_depth = 4 , min_samples_split = 13)

RF_model = RF.fit(X_train_scl,Y_train_os)

RF_y_pred = RF_model.predict(X_test_scl)

print(classification_report(y_test,RF_y_pred))
```

```
              precision    recall  f1-score   support

           0       0.82      0.68      0.74       133
           1       0.58      0.75      0.66        80

    accuracy                           0.70       213
   macro avg       0.70      0.71      0.70       213
weighted avg       0.73      0.70      0.71       213
```

```
accuracy = accuracy_score(y_test,RF_y_pred)

accuracy
```

```
0.704225352112676
```

```
rf_tun =
[{'min_samples_split':range(5,20),'n_estimators':range(1,10),'max_depth':[5,10,15]}]
gs_rf = GridSearchCV(RandomForestClassifier(),rf_tun,cv = 10,scoring = 'accuracy')
gs_rf.fit(X_train_scl,Y_train_os)
```

```
GridSearchCV(cv=10, estimator=RandomForestClassifier(),
             param_grid=[{'max_depth': [5, 10, 15],
                          'min_samples_split': range(5, 20),
                          'n_estimators': range(1, 10)}],
             scoring='accuracy')
```

```
gs_rf.best_params_
```

```
{'max_depth': 15, 'min_samples_split': 6, 'n_estimators': 7}
```

```
gs_rf.best_score_
```

```
0.8023809523809524
```