```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python Docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)


# Input data files are available in the read-only "../input/" directory
# For example, running this (by clicking run or pressing Shift+Enter) will list all files under the input directory

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

# You can write up to 20GB to the current directory (/kaggle/working/) that gets preserved as output when you create a version using "Save & Run All"
# You can also write temporary files to /kaggle/temp/, but they won't be saved outside of the current session
```

```
/kaggle/input/titanic/train.csv
/kaggle/input/titanic/test.csv
/kaggle/input/titanic/gender_submission.csv
```

```
df_train = pd.read_csv("/kaggle/input/titanic/train.csv")
df_test = pd.read_csv("/kaggle/input/titanic/test.csv")

import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')

print(df_train.shape)
```

```
(891, 12)
```

```
df_train.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

df_train.head()

   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         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

   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

print('---------------The Number of Null values present in a column')
df_train.isnull().sum()

---------------The Number of Null values present in a column

PassengerId      0
Survived         0
```

```
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

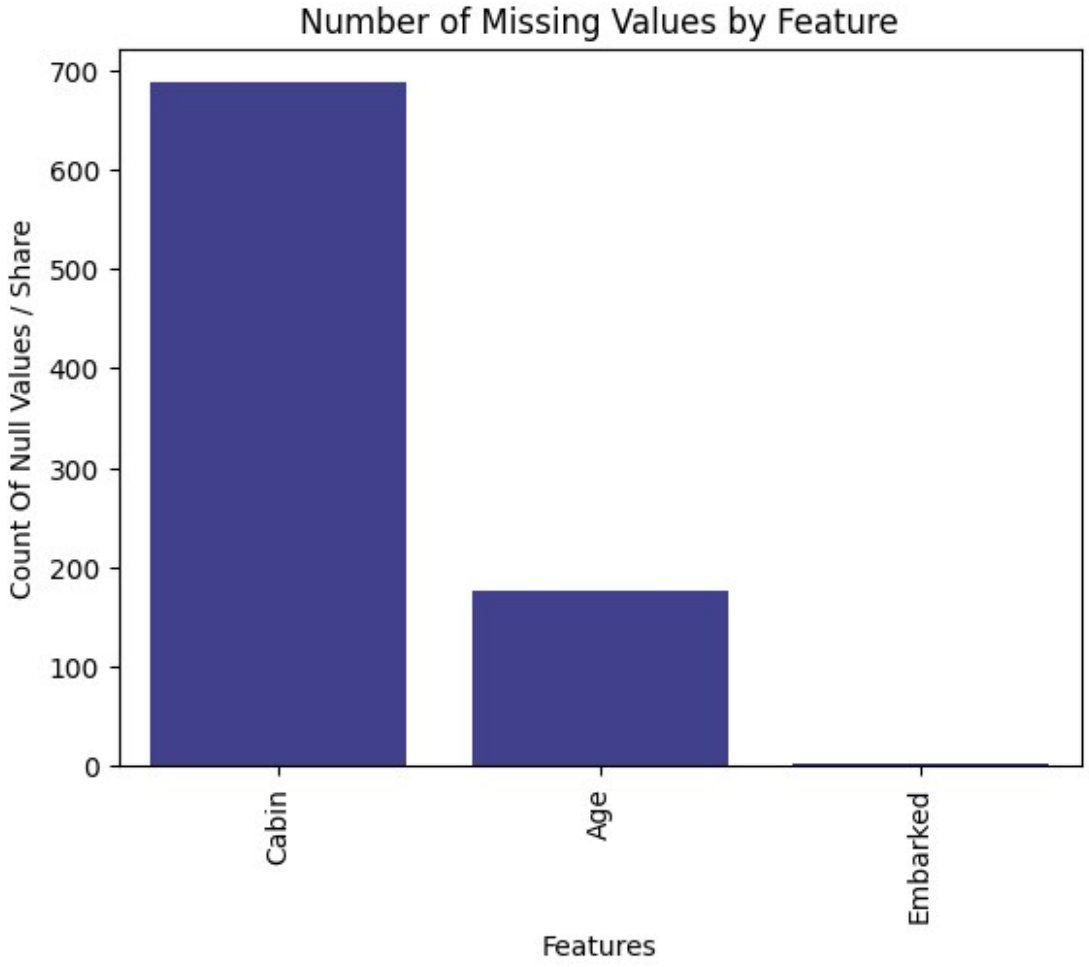
```
df_train.describe().T
```

```
              count        mean         std   min       25%       50%
75%  \
PassengerId  891.0  446.000000  257.353842  1.00  223.5000  446.0000
668.5
Survived     891.0    0.383838    0.486592  0.00    0.0000    0.0000
1.0
Pclass       891.0    2.308642    0.836071  1.00    2.0000    3.0000
3.0
Age          714.0   29.699118   14.526497  0.42   20.1250   28.0000
38.0
SibSp        891.0    0.523008    1.102743  0.00    0.0000    0.0000
1.0
Parch        891.0    0.381594    0.806057  0.00    0.0000    0.0000
0.0
Fare         891.0   32.204208   49.693429  0.00    7.9104   14.4542
31.0

                 max
PassengerId  891.0000
Survived       1.0000
Pclass         3.0000
Age           80.0000
SibSp          8.0000
Parch          6.0000
Fare         512.3292
```

```
def missing_data(df):
    total = df.isnull().sum().sort_values(ascending = False)
    percent = (df.isnull().sum() /
df.isnull().count()*100).sort_values(ascending = False)
    ms = pd.concat([total,percent],axis=1, keys=["Total","Percent"])
    ms = ms[ms['Percent']>0]
    figure = sns.barplot(data = ms, x = ms.index , y =
ms['Total'],color='navy',alpha=0.8)
    plt.title("Number of Missing Values by Feature")
    plt.xlabel("Features")
```

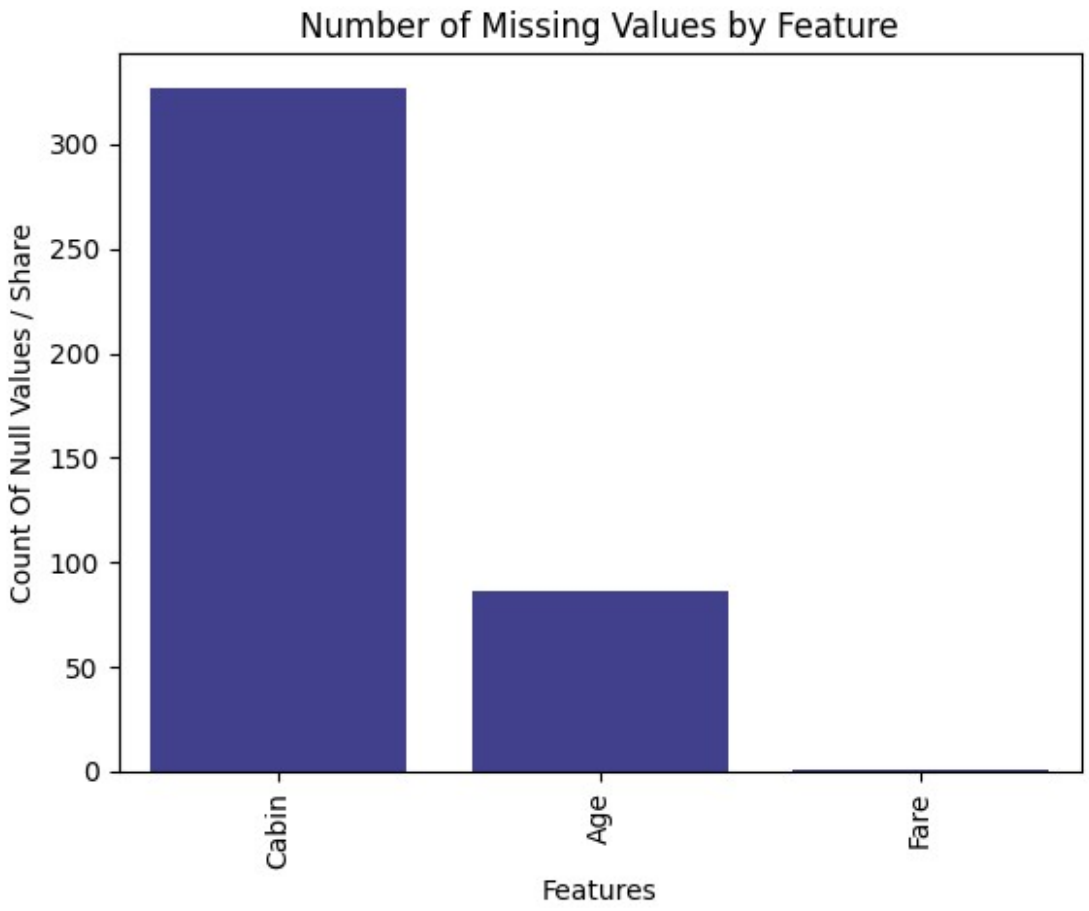
```
    plt.xticks(rotation = 'vertical')
    plt.ylabel("Count Of Null Values / Share")
    return ms

missing_data(df_train)
```

	Total	Percent
Cabin	687	77.104377
Age	177	19.865320
Embarked	2	0.224467



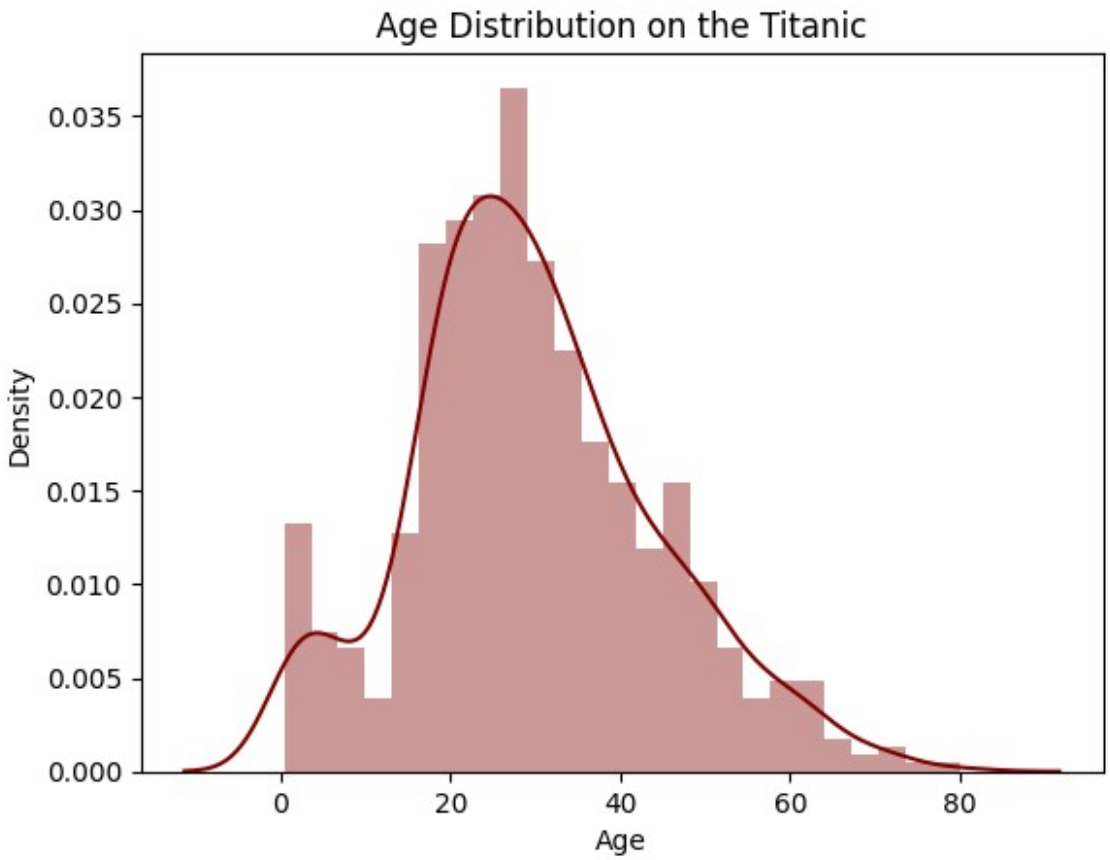

```
missing_data(df_test)
```

	Total	Percent
Cabin	327	78.229665
Age	86	20.574163
Fare	1	0.239234




```
sns.distplot(df_train['Age'],color='maroon',bins=25);
plt.title("Age Distribution on the Titanic")
```

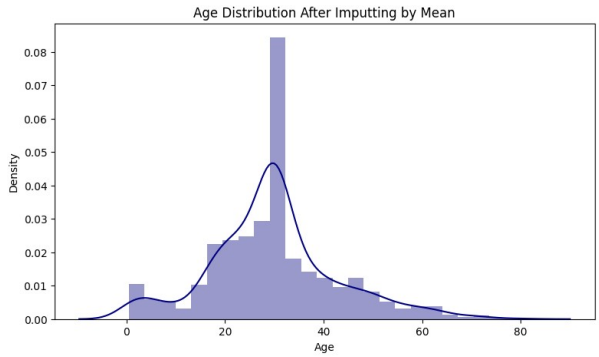
```
Text(0.5, 1.0, 'Age Distribution on the Titanic')
```

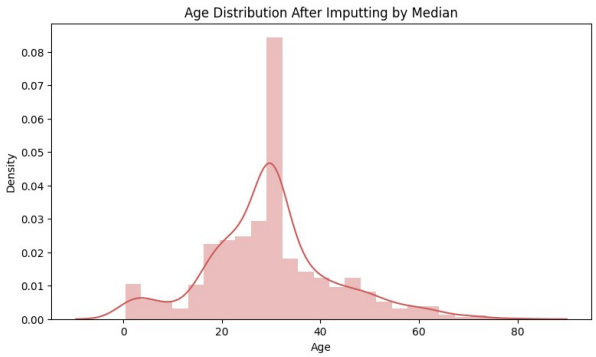



```
df_train_mean = df_train.copy()

mean_age = round(df_train_mean['Age'].mean(),0)
print("The Mean age of Passengers is: ",mean_age)


median_age = round(df_train_mean['Age'].mean(),0)
print("The Median age of Passengers is: ", median_age)
```

```
The Mean age of Passengers is:  30.0
The Median age of Passengers is:  30.0
```

```
plt.figure(figsize=(20,5))

plt.subplot(1,2,1)
sns.distplot(df_train_mean['Age'].fillna(mean_age),color='navy',bins=2
5);
plt.title("Age Distribution After Imputting by Mean");

plt.subplot(1,2,2)
sns.distplot(df_train_mean['Age'].fillna(median_age),color='indianRed'
,bins=25);
plt.title("Age Distribution After Imputting by Median");
```





There is effectively no differene whether or not we impute the missing Age values with either "Mean" & "Median".

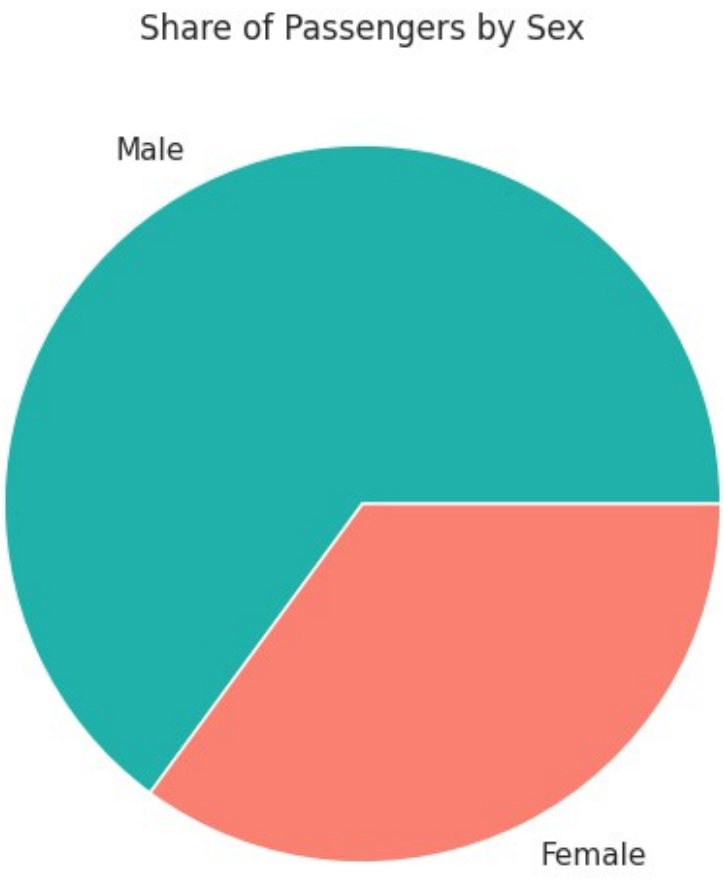
```
df_train['Age'] = df_train['Age'].fillna(median_age)
df_test['Age'] = df_test['Age'].fillna(median_age)


df_test['Fare'] =
df_test['Fare'].fillna(df_test['Fare'].mode().iloc[0])
print('-'*100)
df_test.head()
```

```
----------------------------------------------------------------------------
------------------------------
```

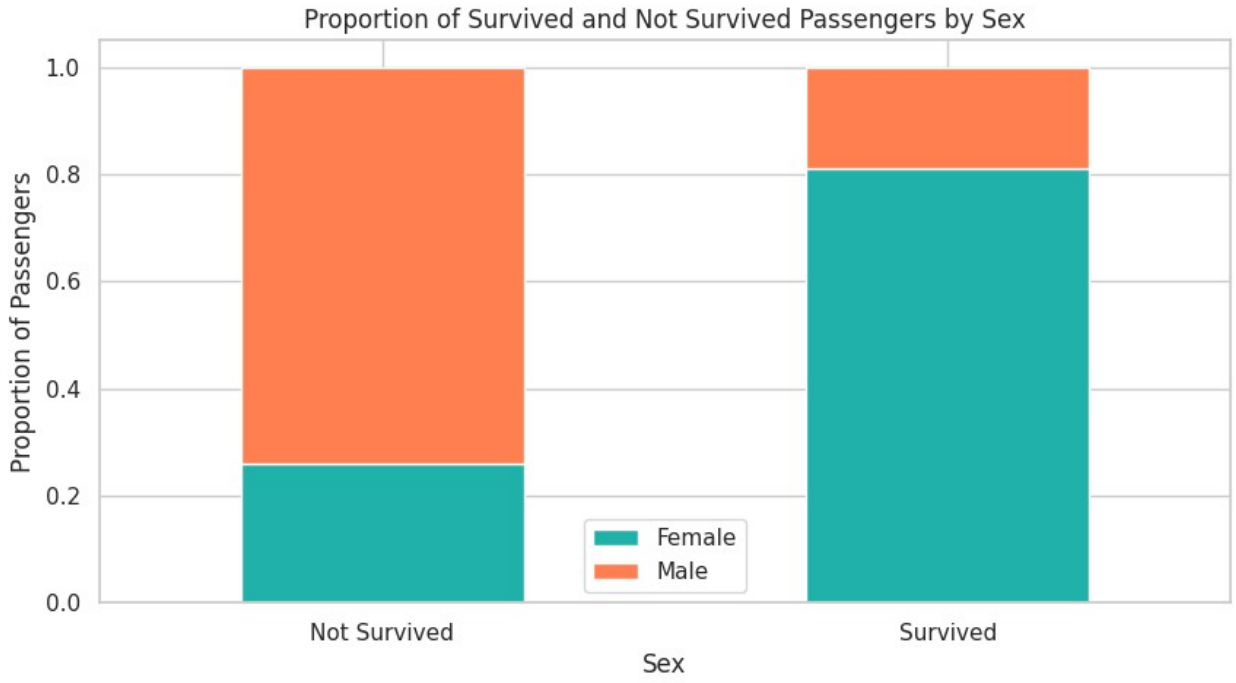
```
   PassengerId  Pclass                                          Name
Sex  \
0          892       3                              Kelly, Mr. James
male
1          893       3              Wilkes, Mrs. James (Ellen Needs)
female
2          894       2                    Myles, Mr. Thomas Francis
male
3          895       3                              Wirz, Mr. Albert
male
4          896       3  Hirvonen, Mrs. Alexander (Helga E Lindqvist)
female

    Age  SibSp  Parch   Ticket     Fare Cabin Embarked
0  34.5      0      0   330911   7.8292   NaN        Q
1  47.0      1      0   363272   7.0000   NaN        S
2  62.0      0      0   240276   9.6875   NaN        Q
3  27.0      0      0   315154   8.6625   NaN        S
4  22.0      1      1  3101298  12.2875   NaN        S
```

```
print('-'*100)
df_train.isna().sum()
```

```
----------------------------------------------------------------------
------------------------------

PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64


df_test['Fare'].fillna(df_test['Fare'].dropna().median(),
inplace=True)

df_train = df_train.dropna(subset=['Embarked'])
print('-'*70)
print("-------Number of Null Values in the Emabraked col:
",df_train['Embarked'].isnull().sum())

----------------------------------------------------------------------
-------Number of Null Values in the Emabraked col:  0

#Let's check the male to female ratio on the Titanic
sns.set(style="whitegrid")
labels = ['Male','Female']
plt.figure(figsize = (6, 6))
colors = ['lightSeaGreen','salmon']
plt.pie(df_train['Sex'].value_counts(), labels = labels,colors=colors)
plt.title("Share of Passengers by Sex");
```




```
# Let's plot the sex and Survived plot
sex_counts = df_train.groupby('Sex')
['Survived'].value_counts(normalize=True).unstack(fill_value=0)
fig, ax = plt.subplots(figsize=(10, 5))
sex_counts.plot(kind='bar', stacked=True, color=['lightSeaGreen',
'coral'], ax=ax)
custom_labels = ['Female', 'Male']
plt.legend(custom_labels)
handles, labels = ax.get_legend_handles_labels()
plt.ylabel('Proportion of Passengers')
plt.title('Proportion of Survived and Not Survived Passengers by Sex')
plt.xticks([1, 0], ['Survived', 'Not Survived'],rotation=0)
plt.show()
```




```
combined_data = [df_train, df_test]
# Create a familysize as a new feature
for dataset in combined_data:
    dataset['FamilySize'] = dataset['SibSp'] + dataset['Parch'] + 1

# Create a bin for the age of the all names
for dataset in combined_data:
    dataset['Age_Bin'] = pd.cut(dataset['Age'],bins=[0,12,20,40,120],
labels=['Child','Teenager','Adult','Elder'])

# Create a Fare bin as a feature
for dataset in combined_data:
    dataset['Fare_Bin'] =
pd.cut(dataset['Fare'],bins=[0.0,7.91,14.45,31,120,550],
labels=['Low_Fare','Median_Fare','Average_Fare','High_Fare','Upper_Cla
ss_Fare'],include_lowest=True)

df_train.isnull().sum()
```

```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
Ticket           0
Fare             0
```

```
Cabin          687
Embarked         0
FamilySize       0
Age_Bin          0
Fare_Bin         0
dtype: int64
```

```
df_train['Fare_Bin'].value_counts()
```

```
Fare_Bin
Average_Fare        229
Low_Fare            223
Median_Fare         217
High_Fare           182
Upper_Class_Fare     38
Name: count, dtype: int64
```

```
df_train[df_train['Fare_Bin'].isna()]
```

```
Empty DataFrame
Columns: [PassengerId, Survived, Pclass, Name, Sex, Age, SibSp, Parch,
Ticket, Fare, Cabin, Embarked, FamilySize, Age_Bin, Fare_Bin]
Index: []
```

```
df_train = df_train
df_test = df_test
```

```
df_train.head()
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         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

   Parch            Ticket     Fare Cabin Embarked  FamilySize Age_Bin
\
```

```
0      0         A/5 21171   7.2500   NaN        S           2   Adult

1      0          PC 17599  71.2833   C85        C           2   Adult

2      0  STON/O2. 3101282   7.9250   NaN        S           1   Adult

3      0            113803  53.1000  C123        S           2   Adult

4      0            373450   8.0500   NaN        S           1   Adult


      Fare_Bin
0     Low_Fare
1    High_Fare
2  Median_Fare
3    High_Fare
4  Median_Fare

df_test.head()

   PassengerId  Pclass                                          Name
Sex  \
0          892       3                              Kelly, Mr. James
male
1          893       3              Wilkes, Mrs. James (Ellen Needs)
female
2          894       2                      Myles, Mr. Thomas Francis
male
3          895       3                              Wirz, Mr. Albert
male
4          896       3  Hirvonen, Mrs. Alexander (Helga E Lindqvist)
female

    Age  SibSp  Parch   Ticket     Fare Cabin Embarked  FamilySize
Age_Bin  \
0  34.5      0      0   330911   7.8292   NaN        Q           1
Adult
1  47.0      1      0   363272   7.0000   NaN        S           2
Elder
2  62.0      0      0   240276   9.6875   NaN        Q           1
Elder
3  27.0      0      0   315154   8.6625   NaN        S           1
Adult
4  22.0      1      1  3101298  12.2875   NaN        S           3
Adult

      Fare_Bin
0     Low_Fare
1     Low_Fare
2  Median_Fare
```

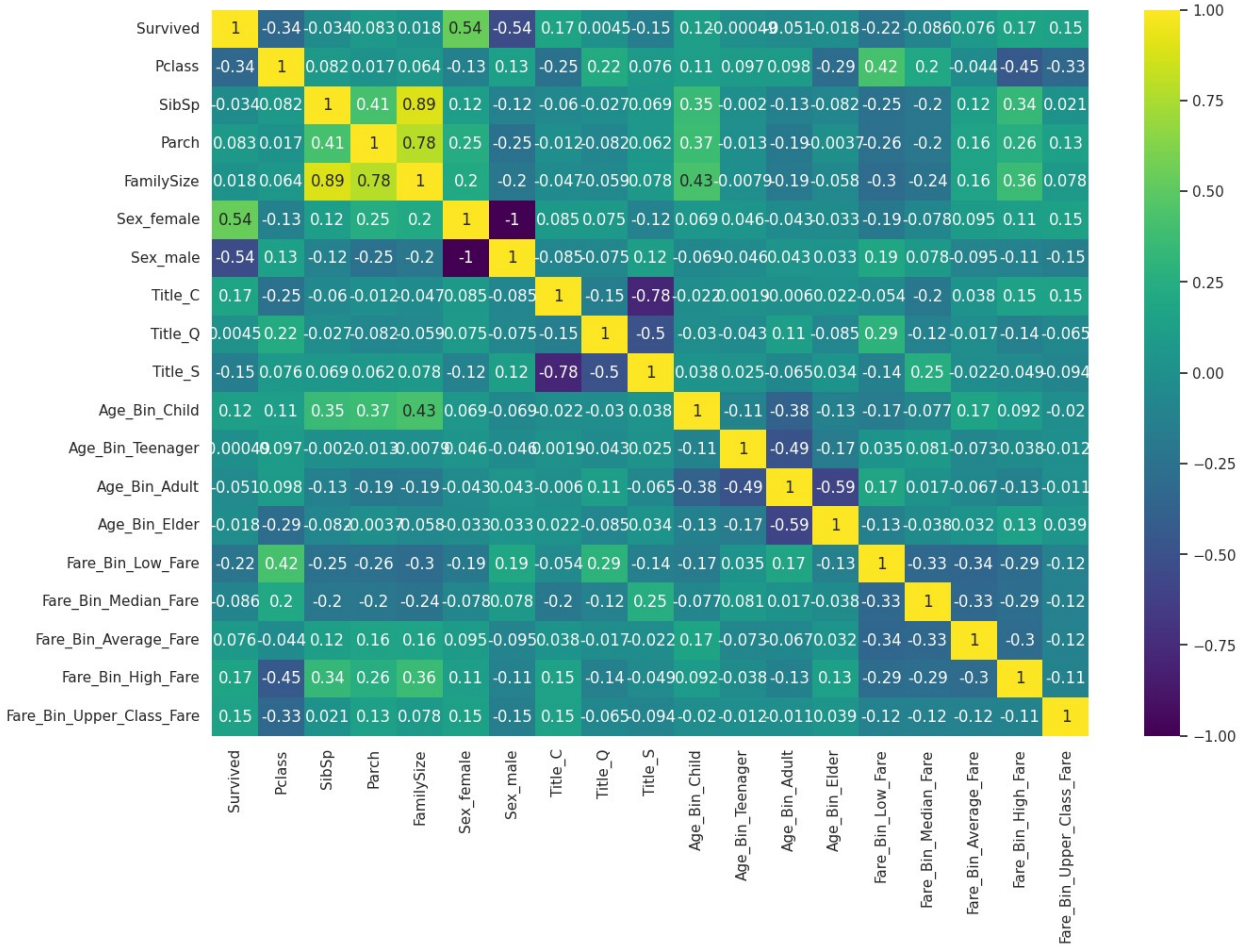
```
3  Median_Fare
4  Median_Fare
```

```
all_dat = [df_train, df_test]
drop_columns = ['Age','Fare','Name','Cabin','Ticket','PassengerId']

for dataset in all_dat:
    for column in drop_columns:
        if column in dataset.columns:
            dataset.drop(column, axis=1, inplace=True)

df_train.head()
```

```
   Survived  Pclass     Sex  SibSp  Parch Embarked  FamilySize Age_Bin
\
0         0       3    male      1      0        S           2   Adult

1         1       1  female      1      0        C           2   Adult

2         1       3  female      0      0        S           1   Adult

3         1       1  female      1      0        S           2   Adult

4         0       3    male      0      0        S           1   Adult


      Fare_Bin
0     Low_Fare
1    High_Fare
2  Median_Fare
3    High_Fare
4  Median_Fare
```

```
df_train = pd.get_dummies(df_train, columns =
['Sex','Embarked','Age_Bin','Fare_Bin'],dtype=int,prefix=['Sex','Title
','Age_Bin','Fare_Bin'])

df_test = pd.get_dummies(df_test, columns =
['Sex','Embarked','Age_Bin','Fare_Bin'],dtype=int,prefix=['Sex','Title
','Age_Bin','Fare_Bin'])

corr = df_train.corr()
plt.figure(figsize=(15,10))
sns.heatmap(data=corr,annot=True,cmap='viridis')
```

```
<Axes: >
```




```
from sklearn.model_selection import train_test_split # Inorder to
split the data
from sklearn.ensemble import RandomForestClassifier # For our
prediction
from sklearn.metrics import accuracy_score #Accuracy Scoring
from sklearn.metrics import confusion_matrix
from sklearn.model_selection import cross_val_score #Score Evaluation
from sklearn.model_selection import cross_val_predict #Predction
Scoring
from sklearn.model_selection import KFold

df_train.head()
```

```
   Survived  Pclass  SibSp  Parch  FamilySize  Sex_female  Sex_male
Title_C  \
0         0       3      1      0           2           0         1
0
1         1       1      1      0           2           1         0
1
2         1       3      0      0           1           1         0
0
```

```
3          1       1      1      0            2            1          0
0
4          0       3      0      0            1            0          1
0

   Title_Q  Title_S  Age_Bin_Child  Age_Bin_Teenager  Age_Bin_Adult  \
0        0        1              0                 0              1
1        0        0              0                 0              1
2        0        1              0                 0              1
3        0        1              0                 0              1
4        0        1              0                 0              1

   Age_Bin_Elder  Fare_Bin_Low_Fare  Fare_Bin_Median_Fare  \
0              0                  1                     0
1              0                  0                     0
2              0                  0                     1
3              0                  0                     0
4              0                  0                     1

   Fare_Bin_Average_Fare  Fare_Bin_High_Fare
Fare_Bin_Upper_Class_Fare
0                      0                   0
0
1                      0                   1
0
2                      0                   0
0
3                      0                   1
0
4                      0                   0
0
```

```
feat_train = df_train.drop('Survived',axis=1)
target_train = df_train['Survived']

test_X  = df_test.copy()
#test_X  = df_test.drop("PassengerId", axis=1).copy()
#X_test  = test_df.drop("PassengerId", axis=1).copy()

X_train, X_test, y_train, y_test = train_test_split(feat_train,
target_train,test_size=0.2,random_state=42)

X_train.shape, X_test.shape, y_train.shape, y_test.shape
```

```
((711, 18), (178, 18), (711,), (178,))
```

```
# Let's create a class for our model
model = RandomForestClassifier(n_estimators=300,
criterion="gini",random_state=42)

# Let's now fit our model
```

```
model.fit(X_train,y_train)

#model.fit(X_train,y_train)

model.score(X_test,y_test)
```

```
0.7752808988764045
```

```
predictions = model.predict(X_test)

#Let's now check the Accuracy of our model
round(accuracy_score(predictions,y_test)*100,2)
```

```
77.53
```

```
kfold = KFold(n_splits=10)
result =
cross_val_score(model,feat_train,target_train,cv=10,scoring='accuracy'
)
print(round(result.mean()*100,2))
```

```
82.23
```

```
for i in range(2,20):
    print(i)
    y_pred = cross_val_predict(model,feat_train,target_train,cv=i)
    print('--------------The Accuracy of the
model----------------------------')
    print('The accuracy of the RFC
is',round(accuracy_score(y_pred,target_train)*100,2))
```

```
2
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 79.75
3
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 79.87
4
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 80.31
5
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 81.55
6
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.11
7
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 81.89
```

```
8
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.45
9
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.23
10
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.23
11
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.34
12
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.79
13
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.34
14
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.68
15
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 83.01
16
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.79
17
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.56
18
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.0
19
--------------The Accuracy of the model----------------------------
The accuracy of the RFC is 82.56
```

```
from sklearn.model_selection import GridSearchCV

# Let's create a new class to hold another model
modell = RandomForestClassifier()
n_estim = range(100,1000,100)
param_grid = {"n_estimators": [300]}
#Let's create a function where it croos validates with different
n_estimators
modell_rfc = GridSearchCV(modell, param_grid=param_grid,
cv=17,scoring="accuracy",n_jobs=4,verbose=1)

modell_rfc.fit(X_train,y_train)
```

```
#Let's chech what the best score is as well as it's estimator
print(modell_rfc.best_score_)
modell_rfc.best_estimator_
```

```
Fitting 17 folds for each of 1 candidates, totalling 17 fits
0.8340848534535764
```

```
RandomForestClassifier(n_estimators=300)
```

```
#modell = RandomForestClassifier()
#random_forest_classifier = RandomForestClassifier(n_estimators=300,
random_state=42)


random_forest_classifier.fit(X_train,y_train)

random_forest_classifier.score(X_test,y_test)
```

```
---------------------------------------------------------------------------
-----
NameError                                 Traceback (most recent call
last)
Cell In[42], line 5
      1 #modell = RandomForestClassifier()
      2 #random_forest_classifier =
RandomForestClassifier(n_estimators=300, random_state=42)
----> 5 random_forest_classifier.fit(X_train,y_train)
      7 random_forest_classifier.score(X_test,y_test)

NameError: name 'random_forest_classifier' is not defined
```

```
test_X

#test_X  = df_test.drop("PassengerId", axis=1).copy()
predictions_final = random_forest_classifier.predict(test_X)

submission_df = pd.DataFrame({
        "PassengerId": df_test["PassengerId"],
        "Survived": predictions_final})

submission_df.to_csv('test1.csv')
```