```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import pickle

# I will keep the resulting plots
%matplotlib inline

# Enable Jupyter Notebook's intellisense
%config IPCompleter.greedy=True

# We want to see whole content (non-truncated)
pd.set_option('display.max_colwidth', None)


# Correct the URL to point to the raw CSV data
train = pd.read_csv("https://raw.githubusercontent.com/Vignesh106121/Titanic-Machine-Learning-from-Disaster-/main/train.csv")

display(train.head())

print(train.info())
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

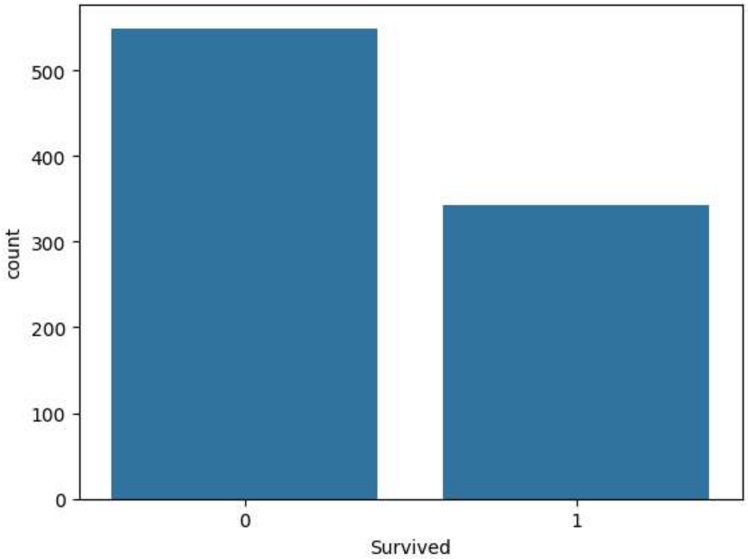
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    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)
```

```
print(train.info())
print(train.describe())
```

```
<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
None
```

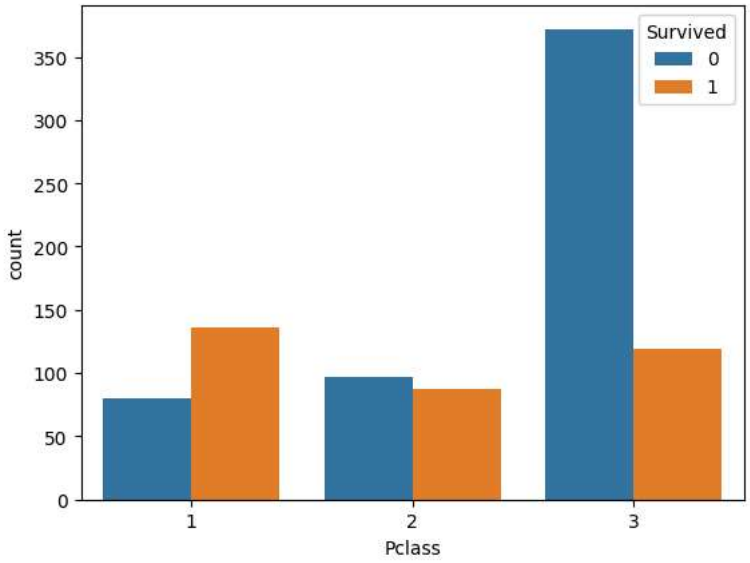
```
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  714.000000  891.000000   
mean    446.000000    0.383838    2.308642   29.699118    0.523008   
std     257.353842    0.486592    0.836071   14.526497    1.102743   
min       1.000000    0.000000    1.000000    0.420000    0.000000   
25%     223.500000    0.000000    2.000000   20.125000    0.000000   
50%     446.000000    0.000000    3.000000   28.000000    0.000000   
75%     668.500000    1.000000    3.000000   38.000000    1.000000   
max     891.000000    1.000000    3.000000   80.000000    8.000000   

            Parch        Fare  
count  891.000000  891.000000  
mean     0.381594   32.204208  
std      0.806057   49.693429  
min      0.000000    0.000000  
25%      0.000000    7.910400  
50%      0.000000   14.454200  
75%      0.000000   31.000000  
max      6.000000  512.329200  
```

```
# Visualize with a countplot
sns.countplot(x="Survived", data=train)
plt.show()

# Print the proportions
print(train["Survived"].value_counts(normalize=True))
```



```
Survived
0    0.616162
1    0.383838
Name: proportion, dtype: float64
```

```
# Visualize with a countplot
sns.countplot(x="Pclass", hue="Survived", data=train)
plt.show()

# Proportion of people survived for each class
print(train["Survived"].groupby(train["Pclass"]).mean())

# How many people we have in each class?
print(train["Pclass"].value_counts())
```



```
Pclass
1    0.629630
2    0.472826
3    0.242363
Name: Survived, dtype: float64
Pclass
3    491
1    216
2    184
Name: count, dtype: int64
```

```
# Display first five rows of the Name column
display(train[["Name"]].head())
```

	Name
0	Braund, Mr. Owen Harris
1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)
2	Heikkinen, Miss. Laina
3	Futrelle, Mrs. Jacques Heath (Lily May Peel)
4	Allen, Mr. William Henry

```
# Get titles
train["Title"] = train['Name'].str.split(', ', expand=True)[1].str.split('.', expand=True)[0]

# Print title counts
print(train["Title"].value_counts())
```

```
Title
Mr              517
Miss            182
Mrs             125
Master           40
Dr                7
Rev               6
Mlle              2
Major             2
Col               2
the Countess      1
Capt              1
Ms                1
Sir               1
Lady              1
Mme               1
Don               1
Jonkheer          1
Name: count, dtype: int64
```

```
# Print the Surviving rates by title
print(train["Survived"].groupby(train["Title"]).mean().sort_values(ascending=False))
```

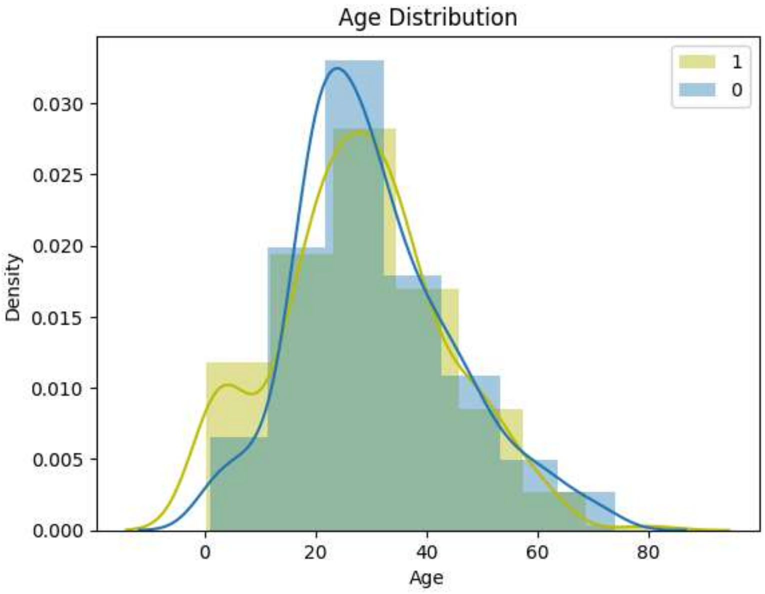
```
Title
the Countess    1.000000
Mlle            1.000000
Sir             1.000000
Ms              1.000000
Lady            1.000000
Mme             1.000000
Mrs             0.792000
Miss            0.697802
Master          0.575000
Col             0.500000
Major           0.500000
Dr              0.428571
Mr              0.156673
Jonkheer        0.000000
Rev             0.000000
Don             0.000000
Capt            0.000000
Name: Survived, dtype: float64
```

```
# Print the missing values in Age column
print(train["Age"].isnull().sum())
```

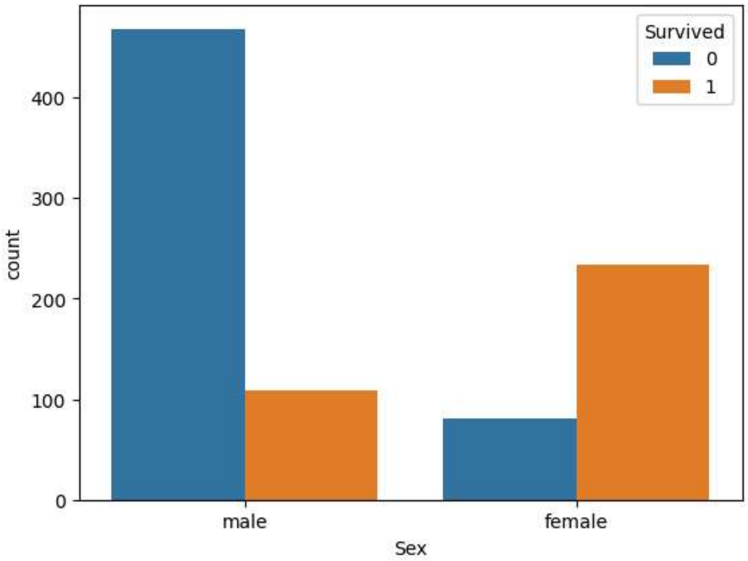
```
177
```

```
# Survived by age
sns.distplot(train[train.Survived==1]["Age"],color="y", bins=7, label="1")

# Death by age
sns.distplot(train[train.Survived==0]["Age"], bins=7, label="0")
plt.legend()
plt.title("Age Distribution")
plt.show()
```

```
<ipython-input-21-af257b24c23f>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(train[train.Survived==1]["Age"],color="y", bins=7, label="1")
<ipython-input-21-af257b24c23f>:5: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(train[train.Survived==0]["Age"], bins=7, label="0")
```



```
# Visualize with a countplot
sns.countplot(x="Sex", hue="Survived", data=train)
plt.show()

# Proportion of people survived for each class
print(train["Survived"].groupby(train["Sex"]).mean())

# How many people we have in each class?
print(train["Sex"].value_counts())
```



```
Sex
female    0.742038
male      0.188908
Name: Survived, dtype: float64
Sex
male      577
female    314
Name: count, dtype: int64
```

```
print(train["SibSp"].value_counts())

print(train["Parch"].value_counts())

train["family_size"] = train["SibSp"] + train["Parch"]

print(train["family_size"].value_counts())

# Proportion of people survived for each class
print(train["Survived"].groupby(train["family_size"]).mean().sort_values(ascending=False))
```

```
SibSp
0    608
1    209
2     28
4     18
3     16
8      7
5      5
Name: count, dtype: int64
Parch
0    678
1    118
2     80
5      5
3      5
4      4
6      1
Name: count, dtype: int64
family_size
0     537
1     161
2     102
3      29
5      22
4      15
6      12
10      7
7       6
Name: count, dtype: int64
family_size
3     0.724138
2     0.578431
1     0.552795
6     0.333333
0     0.303538
4     0.200000
5     0.136364
```

```
7     0.000000
10    0.000000
Name: Survived, dtype: float64
```

```
# Print the first five rows of the Ticket column
print(train["Ticket"].head(15))
```

```
0            A/5 21171
1             PC 17599
2     STON/O2. 3101282
3               113803
4               373450
5               330877
6                17463
7               349909
8               347742
9               237736
10             PP 9549
11              113783
12           A/5. 2151
13              347082
14              350406
Name: Ticket, dtype: object
```

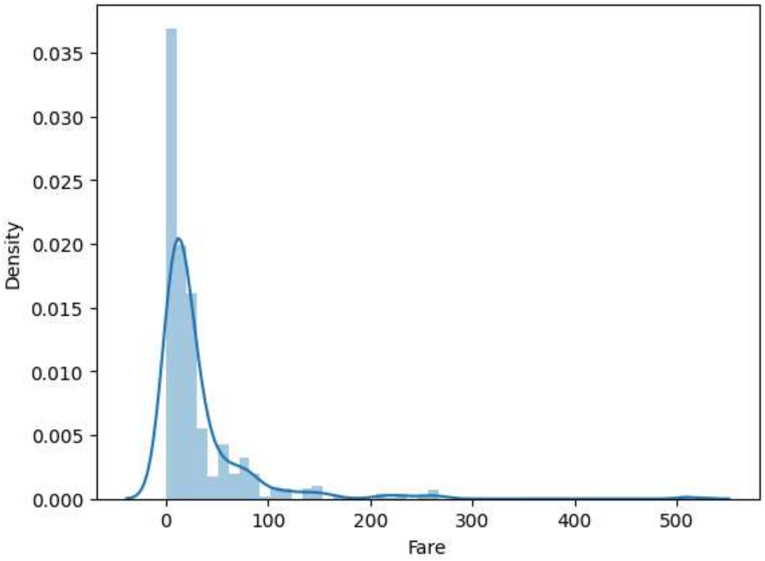
```
# Get first letters of the tickets
train["Ticket_first"] = train["Ticket"].apply(lambda x: str(x)[0])

# Print value counts
print(train["Ticket_first"].value_counts())

# Surviving rates of first letters
print(train.groupby("Ticket_first")["Survived"].mean().sort_values(ascending=False))
```

```
Ticket_first
3    301
2    183
1    146
P     65
S     65
C     47
A     29
W     13
4     10
7      9
F      7
6      6
L      4
5      3
8      2
9      1
Name: count, dtype: int64
Ticket_first
9    1.000000
P    0.646154
1    0.630137
F    0.571429
2    0.464481
C    0.340426
S    0.323077
L    0.250000
3    0.239203
4    0.200000
6    0.166667
W    0.153846
7    0.111111
A    0.068966
5    0.000000
8    0.000000
Name: Survived, dtype: float64
```

```
# We can plot a histogram to see Fare distribution

# Print 3 bins of Fare column
print(pd.cut(train['Fare'], 3).value_counts())

# Plot the histogram
sns.distplot(train["Fare"])
plt.show()
```

```
# Print binned Fares by surviving rate
print(train['Survived'].groupby(pd.cut(train['Fare'], 3)).mean())
```

```
Fare
(-0.512, 170.776]     871
(170.776, 341.553]     17
(341.553, 512.329]      3
Name: count, dtype: int64
<ipython-input-26-e3e2e8558fc7>:7: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(train["Fare"])
```



```
Fare
(-0.512, 170.776]     0.376579
(170.776, 341.553]    0.647059
(341.553, 512.329]    1.000000
Name: Survived, dtype: float64
<ipython-input-26-e3e2e8558fc7>:11: FutureWarning: The default of observed=False is deprecated and will be changed to True in a future v
  print(train['Survived'].groupby(pd.cut(train['Fare'], 3)).mean())
```

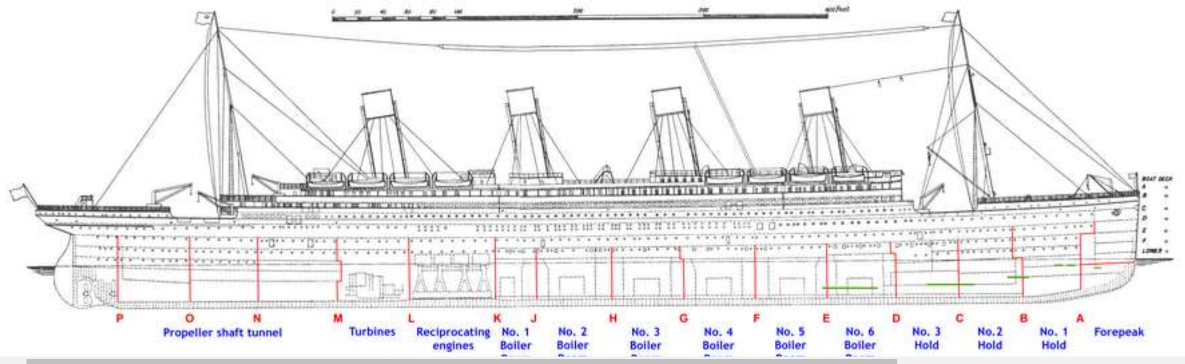
```
from google.colab import files
from IPython.display import Image


uploaded = files.upload()
```

Choose Files titanic.png

- **titanic.png**(image/png) - 172155 bytes, last modified: 9/7/2024 - 100% done

Saving titanic.png to titanic.png

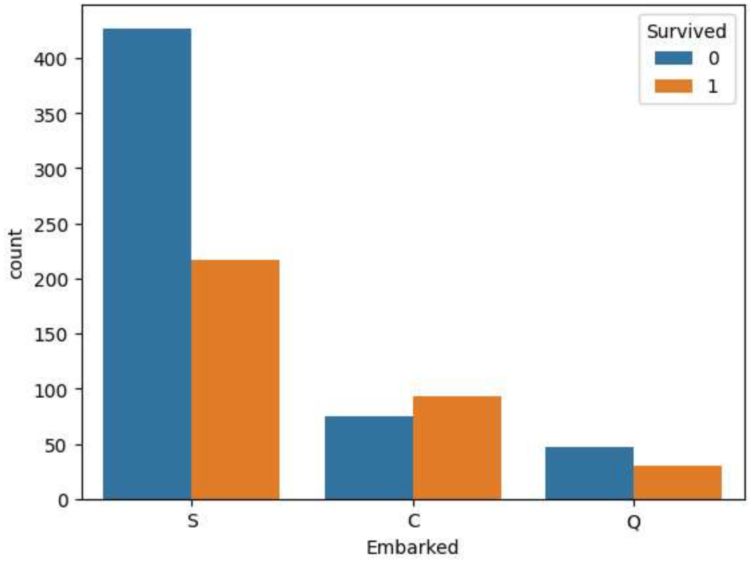
```
Image('titanic.png')
```



```
# Print the unique values in the Cabin column
print(train["Cabin"].unique())

# Get the first letters of Cabins
train["Cabin_first"] = train["Cabin"].apply(lambda x: str(x)[0])

# Print value counts of first letters
print(train["Cabin_first"].value_counts())

# Surviving rate of Cabin first letters
print(train.groupby("Cabin_first")["Survived"].mean().sort_values(ascending=False))
```

```
[nan 'C85' 'C123' 'E46' 'G6' 'C103' 'D56' 'A6' 'C23 C25 C27' 'B78' 'D33'
 'B30' 'C52' 'B28' 'C83' 'F33' 'F G73' 'E31' 'A5' 'D10 D12' 'D26' 'C110'
 'B58 B60' 'E101' 'F E69' 'D47' 'B86' 'F2' 'C2' 'E33' 'B19' 'A7' 'C49'
 'F4' 'A32' 'B4' 'B80' 'A31' 'D36' 'D15' 'C93' 'C78' 'D35' 'C87' 'B77'
 'E67' 'B94' 'C125' 'C99' 'C118' 'D7' 'A19' 'B49' 'D' 'C22 C26' 'C106'
 'C65' 'E36' 'C54' 'B57 B59 B63 B66' 'C7' 'E34' 'C32' 'B18' 'C124' 'C91'
 'E40' 'T' 'C128' 'D37' 'B35' 'E50' 'C82' 'B96 B98' 'E10' 'E44' 'A34'
 'C104' 'C111' 'C92' 'E38' 'D21' 'E12' 'E63' 'A14' 'B37' 'C30' 'D20' 'B79'
 'E25' 'D46' 'B73' 'C95' 'B38' 'B39' 'B22' 'C86' 'C70' 'A16' 'C101' 'C68'
 'A10' 'E68' 'B41' 'A20' 'D19' 'D50' 'D9' 'A23' 'B50' 'A26' 'D48' 'E58'
 'C126' 'B71' 'B51 B53 B55' 'D49' 'B5' 'B20' 'F G63' 'C62 C64' 'E24' 'C90'
 'C45' 'E8' 'B101' 'D45' 'C46' 'D30' 'E121' 'D11' 'E77' 'F38' 'B3' 'D6'
 'B82 B84' 'D17' 'A36' 'B102' 'B69' 'E49' 'C47' 'D28' 'E17' 'A24' 'C50'
 'B42' 'C148']
Cabin_first
n    687
C     59
B     47
D     33
E     32
A     15
F     13
G      4
T      1
Name: count, dtype: int64
Cabin_first
D    0.757576
E    0.750000
B    0.744681
F    0.615385
C    0.593220
G    0.500000
A    0.466667
n    0.299854
T    0.000000
Name: Survived, dtype: float64
```

```
# Make a countplot
sns.countplot(x="Embarked", hue="Survived", data=train)
plt.show()

# Print the value counts
print(train["Embarked"].value_counts())

# Surviving rates of Embarked
print(train["Survived"].groupby(train["Embarked"]).mean())
```



```
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
Embarked
C    0.553571
Q    0.389610
S    0.336957
Name: Survived, dtype: float64
```

```
# Load the train and the test datasets
# Updated URLs to point to the raw CSV data
train = pd.read_csv("https://raw.githubusercontent.com/Vignesh106121/Titanic-Machine-Learning-from-Disaster-/main/train.csv")
test = pd.read_csv("https://raw.githubusercontent.com/Vignesh106121/Titanic-Machine-Learning-from-Disaster-/main/test.csv")

print(test.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(5)
memory usage: 36.0+ KB
None
```

```
# Put the mean into the missing value
test['Fare'].fillna(train['Fare'].mean(), inplace = True)
```

```
from sklearn.impute import SimpleImputer
from sklearn.experimental import enable_iterative_imputer
from sklearn.impute import IterativeImputer

# Imputers
imp_embarked = SimpleImputer(missing_values=np.nan, strategy="most_frequent")
imp_age = IterativeImputer(max_iter=100, random_state=34, n_nearest_features=2)

# Impute Embarked
train["Embarked"] = imp_embarked.fit_transform(train["Embarked"].values.reshape(-1,1)).ravel() #Use ravel() to flatten the array to 1D
test["Embarked"] = imp_embarked.transform(test["Embarked"].values.reshape(-1,1)).ravel() #Use ravel() to flatten the array to 1D

# Impute Age
```

```
train["Age"] = np.round(imp_age.fit_transform(train[["Age"]]))
test["Age"] = np.round(imp_age.transform(test[["Age"]]))


from sklearn.preprocessing import LabelEncoder

# Initialize a Label Encoder
le = LabelEncoder()

# Encode Sex
train["Sex"] = le.fit_transform(train[["Sex"]].values.ravel())
test["Sex"] = le.fit_transform(test[["Sex"]].values.ravel())

# Family Size
train["Fsize"] = train["SibSp"] + train["Parch"]
test["Fsize"] = test["SibSp"] + test["Parch"]

# Ticket first letters
train["Ticket"] = train["Ticket"].apply(lambda x: str(x)[0])
test["Ticket"] = test["Ticket"].apply(lambda x: str(x)[0])

# Cabin first letters
train["Cabin"] = train["Cabin"].apply(lambda x: str(x)[0])
test["Cabin"] = test["Cabin"].apply(lambda x: str(x)[0])


train["Title"] = train['Name'].str.split(', ', expand=True)[1].str.split('.', expand=True)[0]
test["Title"] = test['Name'].str.split(', ', expand=True)[1].str.split('.', expand=True)[0]


# Group the family_size column
def assign_passenger_label(family_size):
    if family_size == 0:
        return "Alone"
    elif family_size <=3:
        return "Small_family"
    else:
        return "Big_family"

# Group the Ticket column
def assign_label_ticket(first):
    if first in ["F", "1", "P", "9"]:
        return "Ticket_high"
    elif first in ["S", "C", "2"]:
        return "Ticket_middle"
    else:
        return "Ticket_low"

# Group the Title column
def assign_label_title(title):
    if title in ["the Countess", "Mlle", "Lady", "Ms", "Sir", "Mme", "Mrs", "Miss", "Master"]:
        return "Title_high"
    elif title in ["Major", "Col", "Dr"]:
        return "Title_middle"
    else:
        return "Title_low"

# Group the Cabin column
def assign_label_cabin(cabin):
    if cabin in ["D", "E", "B", "F", "C"]:
        return "Cabin_high"
    elif cabin in ["G", "A"]:
        return "Cabin_middle"
    else:
        return "Cabin_low"


# Family size
train["Fsize"] = train["Fsize"].apply(assign_passenger_label)
test["Fsize"] = test["Fsize"].apply(assign_passenger_label)

# Ticket
train["Ticket"] = train["Ticket"].apply(assign_label_ticket)
test["Ticket"] = test["Ticket"].apply(assign_label_ticket)

# Title
train["Title"] = train["Title"].apply(assign_label_title)
test["Title"] = test["Title"].apply(assign_label_title)
```

```
# Cabin
train["Cabin"] = train["Cabin"].apply(assign_label_cabin)
test["Cabin"] = test["Cabin"].apply(assign_label_cabin)


train = pd.get_dummies(columns=["Pclass", "Embarked", "Ticket", "Cabin","Title", "Fsize"], data=train, drop_first=True)
test = pd.get_dummies(columns=["Pclass", "Embarked", "Ticket", "Cabin", "Title", "Fsize"], data=test, drop_first=True)


target = train["Survived"]
train.drop(["Survived", "SibSp", "Parch", "Name", "PassengerId"], axis=1, inplace=True)
test.drop(["SibSp", "Parch", "Name","PassengerId"], axis=1, inplace=True)


display(train.head())
display(test.head())

print(train.info())
print(test.info())
```

	Sex	Age	Fare	Pclass_2	Pclass_3	Embarked_Q	Embarked_S	Ticket_Ticket_low	Ticket_Ticket_middle	Cabin_Cabin_low	Cabin_Cabi
0	1	22.0	7.2500	False	True	False	True	True	False	True	
1	0	38.0	71.2833	False	False	False	False	False	False	False	
2	0	26.0	7.9250	False	True	False	True	False	True	True	
3	0	35.0	53.1000	False	False	False	True	False	False	False	

```
from sklearn.model_selection import train_test_split

# Select the features and the target
X = train.values
y = target.values

# Split the data info training and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=34, stratify=y)
```

5 1 27.0 8.6625 False True False True True False True

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Assuming train and target variables are defined from previous code

# Select the features and the target
X = train.values
y = target.values

# Split the data info training and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=34, stratify=y)

# Instantiate and train the model (replace with your actual model parameters if needed)
rf_best = RandomForestClassifier(random_state=42)
rf_best.fit(X_train, y_train)
```