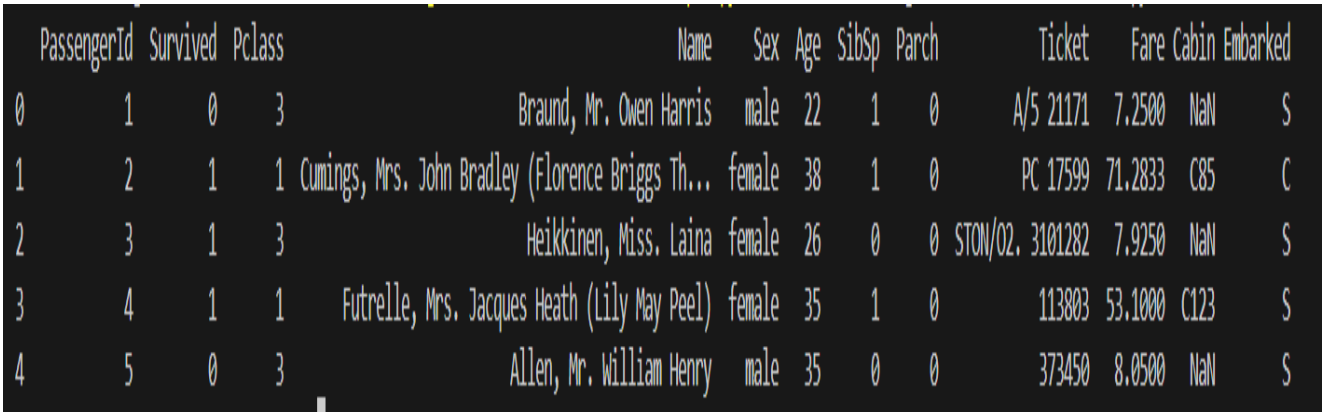
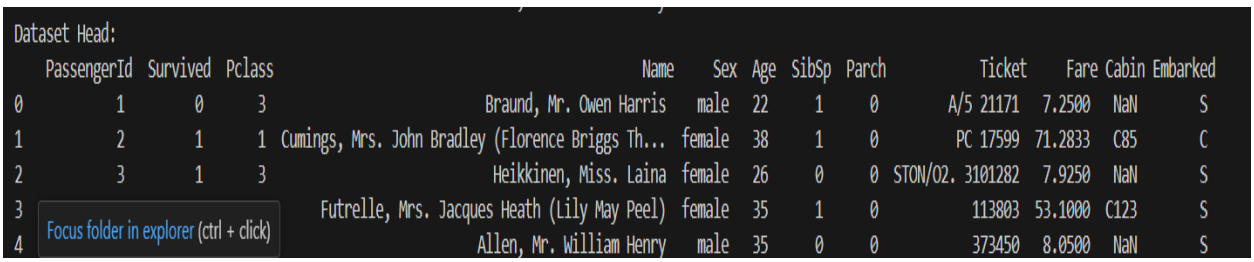
Code

```
import pandas as pd

import numpy as np

from sklearn.model_selection import train_test_split

from sklearn.linear_model import LogisticRegression

from sklearn.ensemble import RandomForestClassifier

from sklearn.metrics import accuracy_score,precision_score,recall_score,f1_score,classification_report

from sklearn.preprocessing import LabelEncoder

import seaborn as sns

import matplotlib.pyplot as plt


#load the dataset

data=pd.read_csv('titanic_sample.csv')

print(data)
```



	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35	0	0	373450	8.0500	NaN	S

```
#explore the dataset

print("Dataset Head:\n",data.head())
```



Dataset Head:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35	0	0	373450	8.0500	NaN	S

#explore the dataset

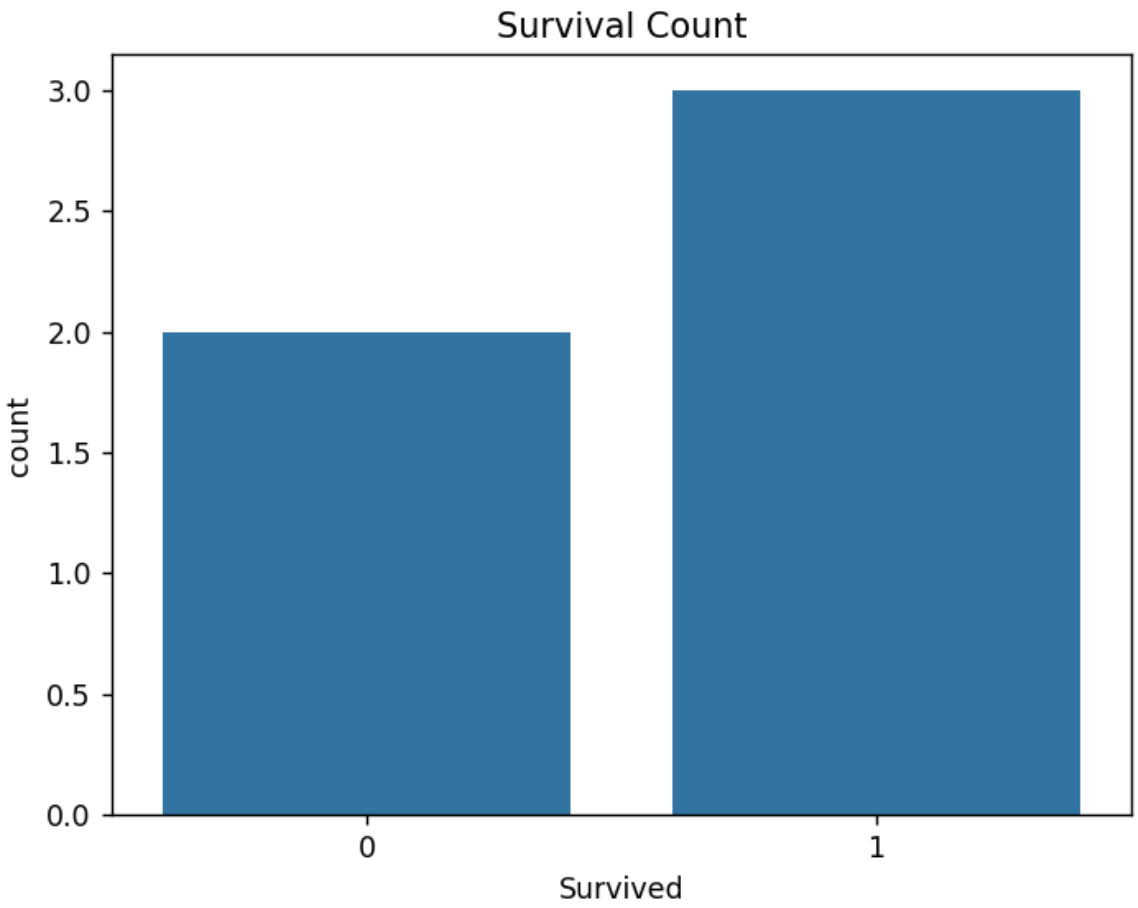
print("\nDataset Info",data.info())

```
RangeIndex: 5 entries, 0 to 4
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  5 non-null      int64
 1   Survived     5 non-null      int64
 2   Pclass       5 non-null      int64
 3   Name         5 non-null      object
 4   Sex          5 non-null      object
 5   Age          5 non-null      int64
 6   SibSp        5 non-null      int64
 7   Parch        5 non-null      int64
 8   Ticket       5 non-null      object
 9   Fare         5 non-null      float64
 10  Cabin        2 non-null      object
 11  Embarked     5 non-null      object
dtypes: float64(1), int64(6), object(5)
memory usage: 612.0+ bytes
```

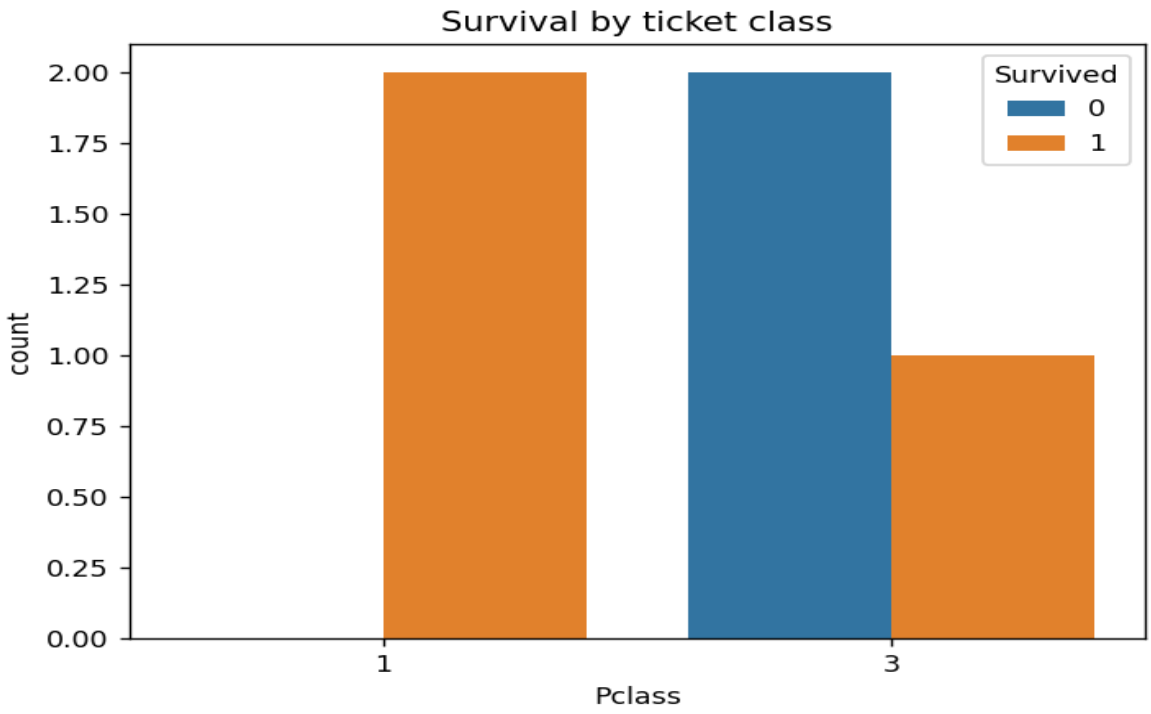
print("\nMissing Values:\n",data.isnull().sum())

```
Missing Values:
 PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Cabin          3
Embarked       0
dtype: int64
```

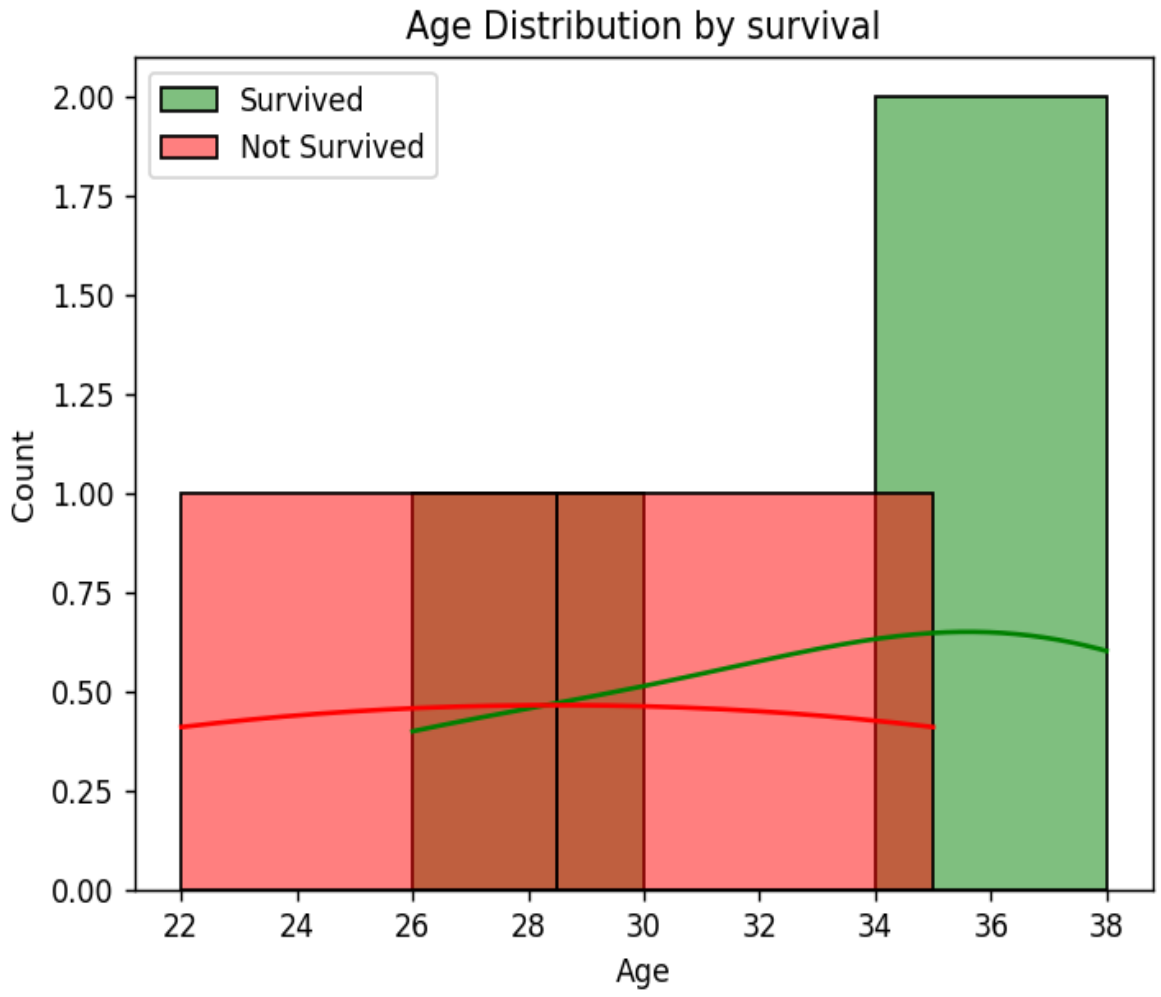
```
#Visualize some features
sns.countplot(x='Survived',data=data)
plt.title('Survival Count')
plt.show()
```



```
sns.countplot(x='Pclass',hue='Survived',data=data)

plt.title('Survival by ticket class')

plt.sho()
```



```
sns.histplot(data[data['Survived']==1]['Age'],kde=True,label='Survived',color='green')
sns.histplot(data[data['Survived']==0]['Age'],kde=True,label='Not Survived',color='red')
plt.legend()
plt.title("Age Distribution by survival")
plt.show()
```



#data cleaning

#fill missing Age values with the median

```
data['Age'].fillna(data['Age'].median(),inplace=True)
```

```
print(data['Age'])
```

```
  data['Age'].fillna(data['Age'].median(),inplace=True)
0    22
1    38
2    26
3    35
4    35
Name: Age, dtype: int64
```

#filling missing Embarked values with the mode

```
data['Embarked'].fillna(data['Embarked'].mode()[0],inplace=True)
```

```
print(data['Embarked'])
```

```
  data['Embarked'].fillna(data['Embarked'].mode()[0],inplace=True)
0    S
1    C
2    S
3    S
4    S
Name: Embarked, dtype: object
```

#drop cabin(too many missin values)

```
data.drop('Cabin',axis=1,inplace=True)
```

```
print(data.drop)
```

```
<bound method DataFrame.drop of    PassengerId  Survived  Pclass                                                Name     Sex  Age  SibSp  Parch            Ticket     Fare Embarked>
0            1         0       3                             Braund, Mr. Owen Harris    male   22      1      0         A/5 21171   7.2500        S
1            2         1       1  Cumings, Mrs. John Bradley (Florence Briggs Th...  female   38      1      0          PC 17599  71.2833        C
2            3         1       3                              Heikkinen, Miss. Laina  female   26      0      0  STON/O2. 3101282   7.9250        S
3            4         1       1        Futrelle, Mrs. Jacques Heath (Lily May Peel)  female   35      1      0            113803  53.1000        S
4            5         0       3                            Allen, Mr. William Henry    male   35      0      0            373450   8.0500        S>
```

#Drop irrelevant features

```
data.drop(['Name','Ticket','PassengerId'],axis=1,inplace=True)
print(data.drop)
```

```
<bound method DataFrame.drop of     Survived  Pclass     Sex  Age  SibSp  Parch     Fare Embarked
0          0       3    male   22      1      0   7.2500        S
1          1       1  female   38      1      0  71.2833        C
2          1       3  female   26      0      0   7.9250        S
3          1       1  female   35      1      0  53.1000        S
4          0       3    male   35      0      0   8.0500        S>
```

#Encode categorical variables

```
encoder=LabelEncoder()
data['Sex']=encoder.fit_transform(data['Sex'])
data['Embarked']=encoder.fit_transform(data['Embarked'])
print(data['Sex'])
print(data['Embarked'])
```

```
0    1
1    0
2    0
3    0
4    1
Name: Sex, dtype: int64
0    1
1    0
2    1
3    1
4    1
Name: Embarked, dtype: int64
```

#Feature Engineering

#Create familySize feature

```
data['FamilySize']=data['SibSp'] + data['Parch'] +1

print(data['FamilySize'])

data.drop(['SibSp','Parch'],axis=1,inplace=True)

print(data.drop)
```

```
<bound method DataFrame.drop of    Survived  Pclass  Sex  Age     Fare  Embarked  FamilySize
0         0       3    1   22   7.2500         1           2
1         1       1    0   38  71.2833         0           2
2         1       3    0   26   7.9250         1           1
3         1       1    0   35  53.1000         1           2
4         0       3    1   35   8.0500         1           1>
```

#split the data into features and target

```
x=data.drop('Survived',axis=1)

print(x)

y=data['Survived']

print(y)
```

```
   Pclass  Sex  Age     Fare  Embarked  FamilySize
0       3    1   22   7.2500         1           2
1       1    0   38  71.2833         0           2
2       3    0   26   7.9250         1           1
3       1    0   35  53.1000         1           2
4       3    1   35   8.0500         1           1
0    0
1    1
2    1
3    1
4    0
Name: Survived, dtype: int64
```

#train-test split

x_train, x_test, y_train, y_test=train_test_split(x,y,test_size=0.2,random_state=42)

print(x_train,x_test,y_train,y_test)

```
     Pclass  Sex  Age     Fare  Embarked  FamilySize
4         3    1   35   8.050         1           1
2         3    0   26   7.925         1           1
0         3    1   22   7.250         1           2
3         1    0   35  53.100         1           2    Pclass  Sex  Age     Fare  Embarked  FamilySize
1         1    0   38  71.2833         0           2 4    0
2    1
0    0
3    1
Name: Survived, dtype: int64 1    1
Name: Survived, dtype: int64
```

#Build and train models

#Logistic Regression

log_reg=LogisticRegression(max_iter=1000)

print(log_reg)

log_reg.fit(x_train,y_train)

print(log_reg.fit)

```
LogisticRegression(max_iter=1000)
<bound method LogisticRegression.fit of LogisticRegression(max_iter=1000)>
```

#Random Forest

rf=RandomForestClassifier(random_state=42)

rf.fit(x_train,y_train)

print(rf)

print(rf.fit)

```
RandomForestClassifier(random_state=42)
<bound method BaseForest.fit of RandomForestClassifier(random_state=42)>
```

from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, classification_report

from sklearn.ensemble import RandomForestClassifier

from sklearn.linear_model import LogisticRegression

Assume x_train, x_test, y_train, y_test are already defined

Define models

log_reg = LogisticRegression(random_state=42)

print(log_reg)

rf = RandomForestClassifier(random_state=42)

print(rf)

```
LogisticRegression(random_state=42)
RandomForestClassifier(random_state=42)
```

```
# Train models
log_reg.fit(x_train, y_train)
rf.fit(x_train, y_train)

# Evaluate models
models = {'Logistic Regression': log_reg, 'Random Forest': rf}
for name, model in models.items():
    y_pred = model.predict(x_test)
    print(f"\n{name} Metrics:")
    print("Accuracy:", accuracy_score(y_test, y_pred))
    print("Precision:", precision_score(y_test, y_pred))
    print("Recall:", recall_score(y_test, y_pred))
    print("F1 Score:", f1_score(y_test, y_pred))
    print("\nClassification Report:\n", classification_report(y_test, y_pred))

# Optimization: Tune Random Forest
tuned_rf = RandomForestClassifier(n_estimators=100, max_depth=5, random_state=42)
tuned_rf.fit(x_train, y_train)
y_pred_tuned = tuned_rf.predict(x_test)  # Predict on x_test, not x_train

print("\nTuned Random Forest Metrics:")
print("Accuracy:", accuracy_score(y_test, y_pred_tuned))
print("Precision:", precision_score(y_test, y_pred_tuned))
print("Recall:", recall_score(y_test, y_pred_tuned))
print("F1 Score:", f1_score(y_test, y_pred_tuned))
```

```
Logistic Regression Metrics:
Accuracy: 1.0
Precision: 1.0
Recall: 1.0
F1 Score: 1.0

Classification Report:
              precision    recall  f1-score   support

           1       1.00      1.00      1.00         1

    accuracy                           1.00         1
   macro avg       1.00      1.00      1.00         1
weighted avg       1.00      1.00      1.00         1


Random Forest Metrics:
Accuracy: 1.0
Precision: 1.0
Recall: 1.0
F1 Score: 1.0

Classification Report:
              precision    recall  f1-score   support

           1       1.00      1.00      1.00         1

    accuracy                           1.00         1
   macro avg       1.00      1.00      1.00         1
weighted avg       1.00      1.00      1.00         1


Tuned Random Forest Metrics:
Accuracy: 1.0
Precision: 1.0
Recall: 1.0
F1 Score: 1.0
```