In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import warnings
warnings.filterwarnings("ignore")
%matplotlib inline
```

In [3]:
```
#load the dataset
#dataset used https://www.kaggle.com/competitions/titanic/data
data = pd.read_csv('train.csv')
```

In [4]:
```
data
```

Out[4]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2500 |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2833 |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9250 |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1000 |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0500 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **886** | 887 | 0 | 2 | Montvila, Rev. Juozas | male | 27.0 | 0 | 0 | 211536 | 13.0000 |
| **887** | 888 | 1 | 1 | Graham, Miss. Margaret Edith | female | 19.0 | 0 | 0 | 112053 | 30.0000 |
| **888** | 889 | 0 | 3 | Johnston, Miss. Catherine Helen "Carrie" | female | NaN | 1 | 2 | W./C. 6607 | 23.4500 |
| **889** | 890 | 1 | 1 | Behr, Mr. Karl Howell | male | 26.0 | 0 | 0 | 111369 | 30.0000 |
| **890** | 891 | 0 | 3 | Dooley, Mr. Patrick | male | 32.0 | 0 | 0 | 370376 | 7.7500 |

891 rows × 12 columns

In [5]:
```
data.head()
```

Out[5]:

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

In [6]:
```
data.head(10)
```

Out[6]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2500 | I |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2833 | |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9250 | I |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1000 | C |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0500 | I |
| **5** | 6 | 0 | 3 | Moran, Mr. James | male | NaN | 0 | 0 | 330877 | 8.4583 | I |
| **6** | 7 | 0 | 1 | McCarthy, Mr. Timothy J | male | 54.0 | 0 | 0 | 17463 | 51.8625 | |
| **7** | 8 | 0 | 3 | Palsson, Master. Gosta Leonard | male | 2.0 | 3 | 1 | 349909 | 21.0750 | I |
| **8** | 9 | 1 | 3 | Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg) | female | 27.0 | 0 | 2 | 347742 | 11.1333 | I |
| **9** | 10 | 1 | 2 | Nasser, Mrs. Nicholas (Adele Achem) | female | 14.0 | 1 | 0 | 237736 | 30.0708 | I |

In [7]:
```
data.tail()
```

Out[7]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **886** | 887 | 0 | 2 | Montvila, Rev. Juozas | male | 27.0 | 0 | 0 | 211536 | 13.00 | NaN |
| **887** | 888 | 1 | 1 | Graham, Miss. Margaret Edith | female | 19.0 | 0 | 0 | 112053 | 30.00 | B42 |
| **888** | 889 | 0 | 3 | Johnston, Miss. Catherine Helen "Carrie" | female | NaN | 1 | 2 | W./C. 6607 | 23.45 | NaN |
| **889** | 890 | 1 | 1 | Behr, Mr. Karl Howell | male | 26.0 | 0 | 0 | 111369 | 30.00 | C148 |
| **890** | 891 | 0 | 3 | Dooley, Mr. Patrick | male | 32.0 | 0 | 0 | 370376 | 7.75 | NaN |

In [8]:
```
data.tail(10)
```

Out[8]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare |
|---|---|---|---|---|---|---|---|---|---|---|
| **881** | 882 | 0 | 3 | Markun, Mr. Johann | male | 33.0 | 0 | 0 | 349257 | 7.8958 |
| **882** | 883 | 0 | 3 | Dahlberg, Miss. Gerda Ulrika | female | 22.0 | 0 | 0 | 7552 | 10.5167 |
| **883** | 884 | 0 | 2 | Banfield, Mr. Frederick James | male | 28.0 | 0 | 0 | C.A./SOTON 34068 | 10.5000 |
| **884** | 885 | 0 | 3 | Sutehall, Mr. Henry Jr | male | 25.0 | 0 | 0 | SOTON/OQ 392076 | 7.0500 |
| **885** | 886 | 0 | 3 | Rice, Mrs. William (Margaret Norton) | female | 39.0 | 0 | 5 | 382652 | 29.1250 |
| **886** | 887 | 0 | 2 | Montvila, Rev. Juozas | male | 27.0 | 0 | 0 | 211536 | 13.0000 |
| **887** | 888 | 1 | 1 | Graham, Miss. Margaret Edith | female | 19.0 | 0 | 0 | 112053 | 30.0000 |
| **888** | 889 | 0 | 3 | Johnston, Miss. Catherine Helen "Carrie" | female | NaN | 1 | 2 | W./C. 6607 | 23.4500 |
| **889** | 890 | 1 | 1 | Behr, Mr. Karl Howell | male | 26.0 | 0 | 0 | 111369 | 30.0000 |
| **890** | 891 | 0 | 3 | Dooley, Mr. Patrick | male | 32.0 | 0 | 0 | 370376 | 7.7500 |

In [9]:
```
# Data Preprocessing

#display information about data set
data.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
```

In [10]:
```
data.columns
```

Out[10]:
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'],
      dtype='object')
```

In [11]:
```
data.describe()
```

Out[11]:

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare |
|---|---|---|---|---|---|---|---|
| **count** | 891.000000 | 891.000000 | 891.000000 | 714.000000 | 891.000000 | 891.000000 | 891.000000 |
| **mean** | 446.000000 | 0.383838 | 2.308642 | 29.699118 | 0.523008 | 0.381594 | 32.204208 |
| **std** | 257.353842 | 0.486592 | 0.836071 | 14.526497 | 1.102743 | 0.806057 | 49.693429 |
| **min** | 1.000000 | 0.000000 | 1.000000 | 0.420000 | 0.000000 | 0.000000 | 0.000000 |
| **25%** | 223.500000 | 0.000000 | 2.000000 | 20.125000 | 0.000000 | 0.000000 | 7.910400 |
| **50%** | 446.000000 | 0.000000 | 3.000000 | 28.000000 | 0.000000 | 0.000000 | 14.454200 |
| **75%** | 668.500000 | 1.000000 | 3.000000 | 38.000000 | 1.000000 | 0.000000 | 31.000000 |
| **max** | 891.000000 | 1.000000 | 3.000000 | 80.000000 | 8.000000 | 6.000000 | 512.329200 |

In [12]:
```
data.describe(include='all')
```

Out[12]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch |
|---|---|---|---|---|---|---|---|---|
| **count** | 891.000000 | 891.000000 | 891.000000 | 891 | 891 | 714.000000 | 891.000000 | 891.000000 |
| **unique** | NaN | NaN | NaN | 891 | 2 | NaN | NaN | NaN |
| **top** | NaN | NaN | NaN | Braund, Mr. Owen Harris | male | NaN | NaN | NaN |
| **freq** | NaN | NaN | NaN | 1 | 577 | NaN | NaN | NaN |
| **mean** | 446.000000 | 0.383838 | 2.308642 | NaN | NaN | 29.699118 | 0.523008 | 0.381594 |
| **std** | 257.353842 | 0.486592 | 0.836071 | NaN | NaN | 14.526497 | 1.102743 | 0.806057 |
| **min** | 1.000000 | 0.000000 | 1.000000 | NaN | NaN | 0.420000 | 0.000000 | 0.000000 |
| **25%** | 223.500000 | 0.000000 | 2.000000 | NaN | NaN | 20.125000 | 0.000000 | 0.000000 |
| **50%** | 446.000000 | 0.000000 | 3.000000 | NaN | NaN | 28.000000 | 0.000000 | 0.000000 |
| **75%** | 668.500000 | 1.000000 | 3.000000 | NaN | NaN | 38.000000 | 1.000000 | 0.000000 |
| **max** | 891.000000 | 1.000000 | 3.000000 | NaN | NaN | 80.000000 | 8.000000 | 6.000000 |

In [13]:
```
data.shape
```

Out[13]:
```
(891, 12)
```

In [14]:
```
data.dtypes
```

Out[14]:
```
PassengerId      int64
Survived         int64
Pclass           int64
Name            object
Sex             object
Age            float64
SibSp            int64
Parch            int64
Ticket          object
Fare           float64
Cabin           object
Embarked        object
dtype: object
```

In [15]:
```
data.index
```

Out[15]:
```
RangeIndex(start=0, stop=891, step=1)
```

In [16]:
```
# Check The Missing Value in data using pandas isnull()
data.isnull()
```

Out[16]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Er |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False | True | |
| **1** | False | False | False | False | False | False | False | False | False | False | False | |
| **2** | False | False | False | False | False | False | False | False | False | False | True | |
| **3** | False | False | False | False | False | False | False | False | False | False | False | |
| **4** | False | False | False | False | False | False | False | False | False | False | True | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| **886** | False | False | False | False | False | False | False | False | False | False | True | |
| **887** | False | False | False | False | False | False | False | False | False | False | False | |
| **888** | False | False | False | False | False | True | False | False | False | False | True | |
| **889** | False | False | False | False | False | False | False | False | False | False | False | |
| **890** | False | False | False | False | False | False | False | False | False | False | True | |

891 rows × 12 columns

In [17]:
```
data.isnull().any()
```

Out[17]:
```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age             True
SibSp          False
Parch          False
Ticket         False
Fare           False
Cabin           True
Embarked        True
dtype: bool
```

In [18]:
```
data.isnull().sum()
```

Out[18]:
```
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
```

In [19]:
```
data['Age'].fillna(data['Age'].mean(),inplace=True)
```

In [20]:
```
data.isnull().sum()
```

Out[20]:
```
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
```

## Visualization

In [21]:
```
data['Name']
```

Out[21]:
```
0                                Braund, Mr. Owen Harris
1      Cumings, Mrs. John Bradley (Florence Briggs Th...
2                                 Heikkinen, Miss. Laina
3           Futrelle, Mrs. Jacques Heath (Lily May Peel)
4                               Allen, Mr. William Henry
                              ...
886                               Montvila, Rev. Juozas
887                        Graham, Miss. Margaret Edith
888            Johnston, Miss. Catherine Helen "Carrie"
889                               Behr, Mr. Karl Howell
890                                 Dooley, Mr. Patrick
Name: Name, Length: 891, dtype: object
```

In [22]:
```
data['Sex'].value_counts()
```

Out[22]:
```
male      577
female    314
Name: Sex, dtype: int64
```

In [23]:
```
data['Ticket'].value_counts()
```

Out[23]:
```
347082      7
CA. 2343    7
1601        7
3101295     6
CA 2144     6
           ..
9234        1
19988       1
2693        1
PC 17612    1
370376      1
Name: Ticket, Length: 681, dtype: int64
```

In [24]:
```
data['Cabin'].value_counts()
```

Out[24]:
```
B96 B98        4
G6             4
C23 C25 C27    4
C22 C26        3
F33            3
              ..
E34            1
C7             1
C54            1
E36            1
C148           1
Name: Cabin, Length: 147, dtype: int64
```

In [25]:
```
data['Embarked'].value_counts()
```

Out[25]:
```
S    644
C    168
Q     77
Name: Embarked, dtype: int64
```

In [26]:
```
def fun1(value):
    if (value == "male"):
        return 1
    else:
        return 0
```

In [27]:
```
def fun2(value):
    if (value == 'S'):
        return 0
    elif (value == 'C'):
        return 1
    elif (value == 'Q'):
        return 2
    else:
        return 0
```

In [28]:
```
data["Sex"] = data["Sex"].apply(fun1)
```

In [29]:
```
data["Embarked"] = data["Embarked"].apply(fun2)
```

In [30]:
```
data.isnull().sum()
```

Out[30]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         0
dtype: int64
```

In [31]:
```
data.columns
```

Out[31]:
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'],
      dtype='object')
```

In [32]:
```
data = data.drop("Cabin", axis=1)
```

In [33]:
```
data.columns
```

Out[33]:
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Embarked'],
      dtype='object')
```

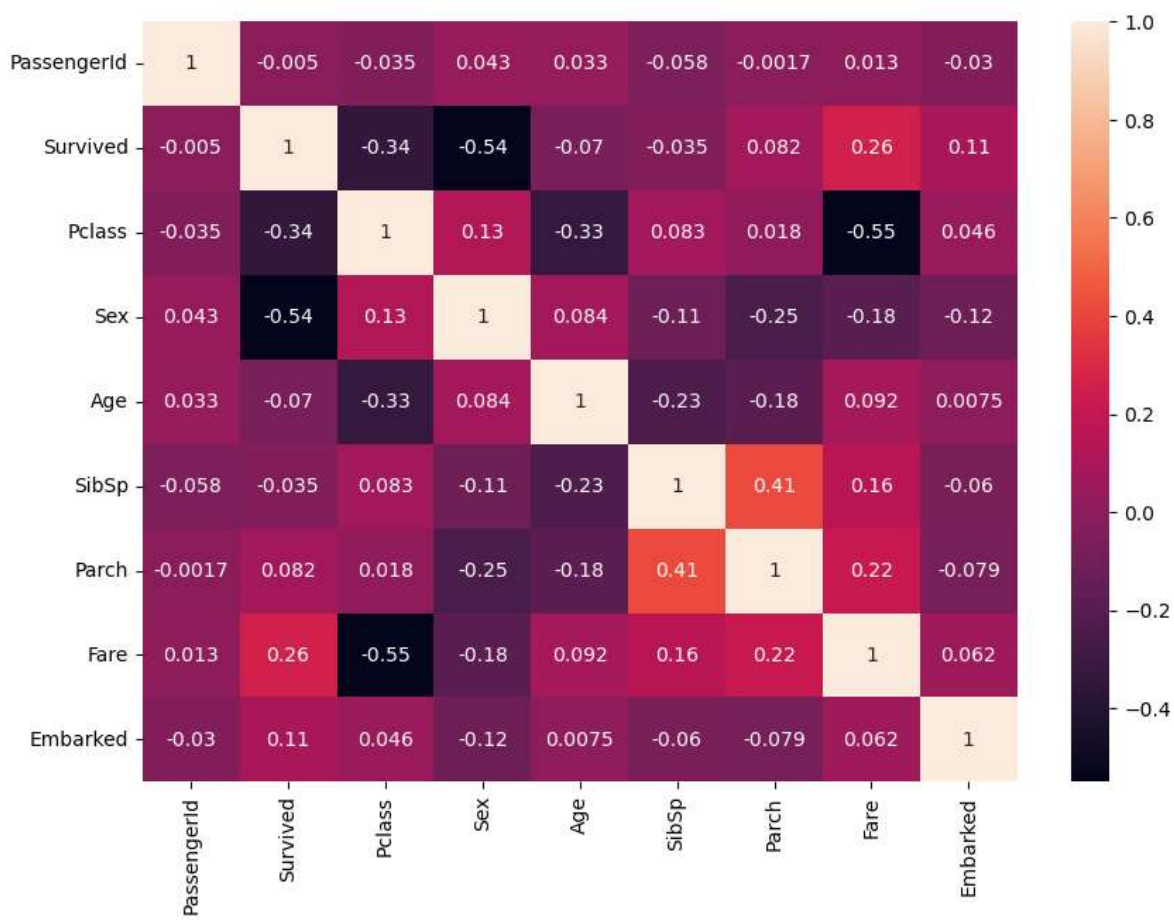
In [34]:
```
data.isnull().sum()
```

Out[34]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

In [35]:
```
data.shape
```

Out[35]:
```
(891, 11)
```

In [37]:
```
#Age has a lot of null values and is one of the attributes we need to use.
plt.figure(figsize=(10,7))
sns.heatmap(data.corr(), annot=True)
plt.show()
```



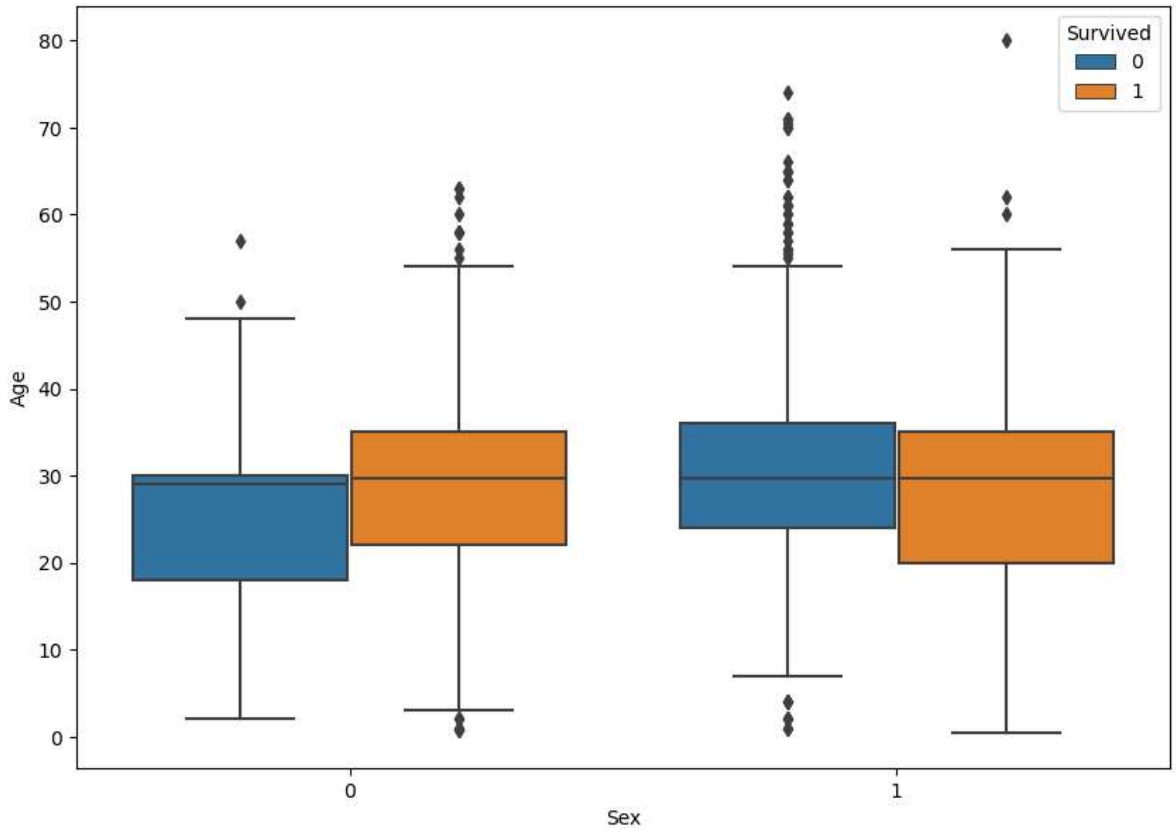
In [38]:
```
#From the above corealtion matrix we can see that the attribute 'Age' is not h
#This means we can randomly fill in the missing data for 'Age' within the vali
```

In [40]:
```
px.box(data["Sex"], data["Age"], color=data["Survived"])
```

In [43]:
```
# Assuming you have a DataFrame named `data` with columns "Sex", "Age", and "S

# Create a boxplot with "Sex" on the x-axis, "Age" on the y-axis, and "Survive
plt.figure(figsize=(10, 7))
box = sns.boxplot(x="Sex", y="Age", hue="Survived", data=data)

# Display the plot
plt.show()
```




In [ ]: