TitanicTrain - ChiSquare

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1 Lab 3 - ChiSquare

Dataset: Titanic Train dataset

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[1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
```

Q1. Read the titanic dataset

[2]:
```
df = pd.read_csv("train.csv")
df.head()
```

[2]:

	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 Th…	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

1.1 Data Preprocessing

Q2. Preprocess the data

[3]:
```
df.isnull().sum()
```

[3]:
```
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
```

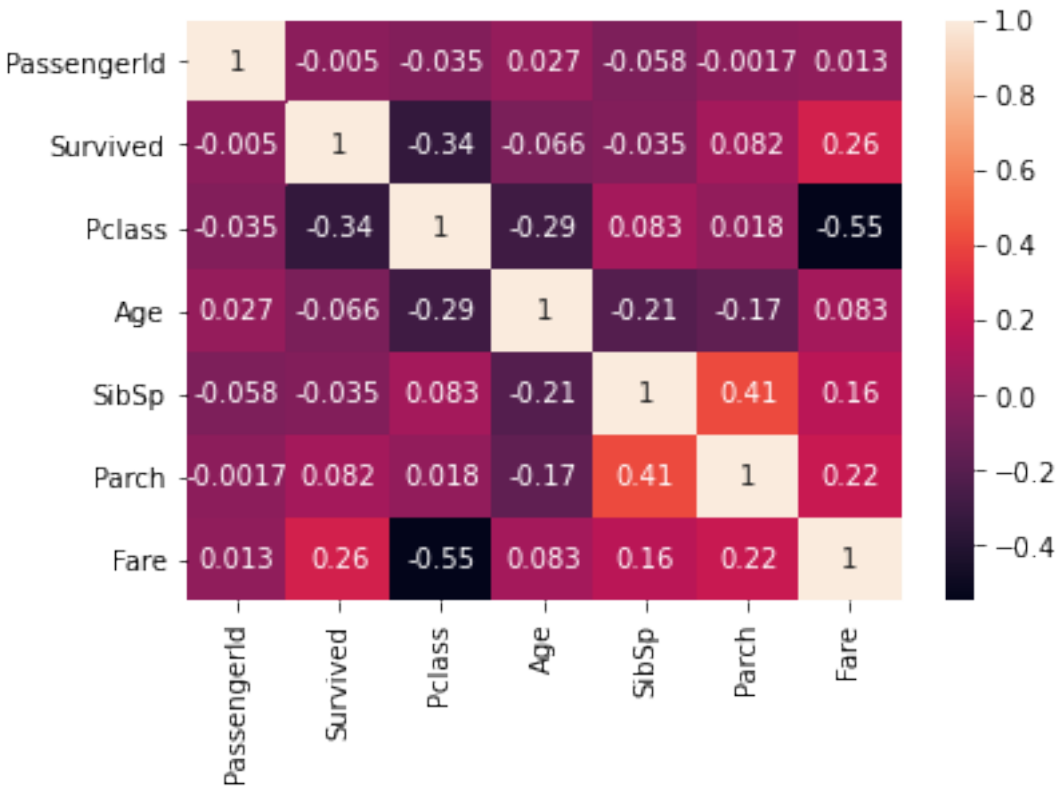
[4]:
```
df['Age'].fillna(method='ffill',inplace=True)
df['Cabin'].fillna(method='bfill',inplace=True)
df['Cabin'].fillna(method='ffill',inplace=True)
df['Embarked'].fillna(method='ffill',inplace=True)
```

[5]:
```
df.isnull().sum()
```

[5]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Cabin          0
Embarked       0
dtype: int64
```

[6]:
```
sns.heatmap(df.corr(),annot=True)
```

[6]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fac21a27850>
```



[7]:
```
df.drop(columns=['PassengerId','Name','Age','Ticket','Fare'], inplace=True)
df.head()
```

[7]:

	Survived	Pclass	Sex	SibSp	Parch	Cabin	Embarked
0	0	3	male	1	0	C85	S
1	1	1	female	1	0	C85	C
2	1	3	female	0	0	C123	S
3	1	1	female	1	0	C123	S
4	0	3	male	0	0	E46	S

[8]:
```
from scipy import stats
```

[9]:
```
df.head()
```

[9]:

	Survived	Pclass	Sex	SibSp	Parch	Cabin	Embarked
0	0	3	male	1	0	C85	S
1	1	1	female	1	0	C85	C
2	1	3	female	0	0	C123	S
3	1	1	female	1	0	C123	S
4	0	3	male	0	0	E46	S

Q3. Count the total number of passengers

[10]:
```
print('Total number of passengers on Titanic: ',len(df))
```

```
Total number of passengers on Titanic:  891
```

Q4. Count the number of passengers who survived

[11]:
```
print('Total number of passengers who survived: ',len(df[df['Survived'] == 1]))
```

```
Total number of passengers who survived:  342
```

Q5. Measure the percentage of passengers who survived the sinking ship

[12]:
```
print('Percentage of passengers who survived: ',((len(df[df['Survived'] == 1]) /
 ↪ len(df))*100))
```

```
Percentage of passengers who survived:  38.38383838383838
```

Q6. Count the number of passengers based on gender

[13]:
```
print('Number of male passengers: ',len(df[df['Sex']=='male']))
print('Number of female passengers: ',len(df[df['Sex']=='female']))
```

```
Number of male passengers:  577
Number of female passengers:  314
```

1.2 Chi-squared analysis

[14]:
```
pd.crosstab(df['Survived'], df['Sex'],margins=True)
```

[14]:

Sex	female	male	All
Survived			
0	81	468	549
1	233	109	342
All	314	577	891

[15]:
```
data = pd.crosstab(df['Survived'], df['Sex'])
data
```

[15]:

Sex	female	male
Survived		
0	81	468
1	233	109

[16]:
```
print('Percentage of male survivors: ', ((data['male'][1])/(data['male'][1] +␣
 ↪data['female'][1]) * 100))
print('Percentage of female survivors: ', ((data['female'][1])/(data['male'][1]␣
 ↪+ data['female'][1]) * 100))
```

```
Percentage of male survivors:  31.871345029239766
Percentage of female survivors:  68.12865497076024
```

Q7. Run a chi-square test for the following hypothesis

Hypothesis: The proportion of females onboard who survived the sinking of the Titanic was higher than the proportion of males onboard who survived the sinking of the Titanic.

[17]:
```
hypothesis = 'The proportion of females onboard who survived the sinking of the␣
↪Titanic was higher than the proportion of males onboard who survived the␣
↪sinking of the Titanic.'
```

[18]:
```
data['female'] = (data['female']/(data.sum().sum()))*100
data['male'] = (data['male']/(data.sum().sum()))*100
data
```

[18]:
```
Sex          female       male
Survived
0          9.090909  76.440449
1         26.150393  17.803438
```

[19]:
```
chiStats = stats.chi2_contingency(data)
chiStats
```

[19]:
```
(32.57576723451966,
 1.1463517582471743e-08,
 1,
 array([[23.27861928, 62.25273879],
        [11.96268263, 31.99114809]]))
```

[20]:
```
criticalValue = stats.chi2.ppf(q=0.95, df = chiStats[2])
```

[21]:
```
print('Critical value     = ',criticalValue)
print('Chi squared        = ',chiStats[0])
print('P value            = ',chiStats[1])
print('Degree of freedom  = ',chiStats[2])
print('Expected cross tab = \n',chiStats[3])
```

```
Critical value     =  3.841458820694124
Chi squared        =  32.57576723451966
P value            =  1.1463517582471743e-08
Degree of freedom  =  1
Expected cross tab =
 [[23.27861928 62.25273879]
 [11.96268263 31.99114809]]
```

Q8. Inference based on test

[22]:
```
if chiStats[0] < criticalValue:
    print('At 0.95 level of confidence, we reject the hypothesis:\n',␣
 ↪hypothesis)
else:
    print('At 0.95 level of confidence, we accept the hypothesis:\n',␣
 ↪hypothesis)
```

```
At 0.95 level of confidence, we accept the hypothesis:
 The proportion of females onboard who survived the sinking of the Titanic was
higher than the proportion of males onboard who survived the sinking of the
Titanic.
```

[23]:
```
# df.to_csv('train1.csv', index = False)
```