TitanicTest - ChiSquare

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1 Lab 3 - ChiSquare

Dataset: Titanic Test 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("test.csv")
df.head()
```

[2]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S

1.1 Data Preprocessing

Q2. Preprocess the data

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

[3]:
```
PassengerId      0
Pclass           0
Name             0
Sex              0
Age             86
SibSp            0
Parch            0
Ticket           0
Fare             1
Cabin          327
Embarked         0
dtype: int64
```

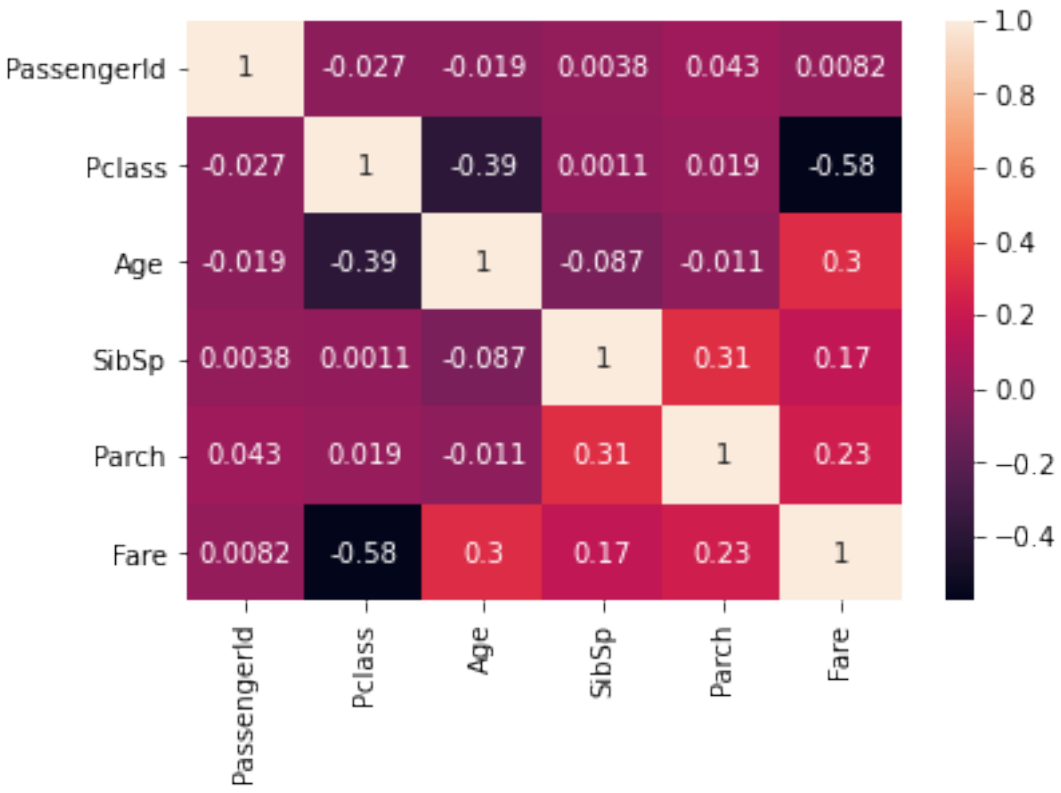
[4]:
```
df['Age'].fillna(method='ffill',inplace=True)
df['Cabin'].fillna(method='bfill',inplace=True)
df['Cabin'].fillna(method='ffill',inplace=True)
df['Embarked'].fillna(method='ffill',inplace=True)
```

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

[5]:
```
PassengerId    0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           1
Cabin          0
Embarked       0
dtype: int64
```

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

[6]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f2a22474f90>
```



[7]:
```
df.drop(columns=['PassengerId','Name','Age','Ticket','Fare'], inplace=True)
df1 = df.copy()
df1.head()
```

[7]:

	Pclass	Sex	SibSp	Parch	Cabin	Embarked
0	3	male	0	0	B45	Q
1	3	female	1	0	B45	S
2	2	male	0	0	B45	Q
3	3	male	0	0	B45	S
4	3	female	1	1	B45	S

[8]:
```
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from scipy import stats
```

[9]:
```
le = LabelEncoder()
df1['Sex'] = le.fit_transform(df1['Sex'])
df1['Cabin'] = le.fit_transform(df1['Cabin'])
df1['Embarked'] = le.fit_transform(df1['Embarked'])
```

[10]:
```
df1.head()
```

[10]:

	Pclass	Sex	SibSp	Parch	Cabin	Embarked
0	3	1	0	0	12	1
1	3	0	1	0	12	2
2	2	1	0	0	12	1
3	3	1	0	0	12	2
4	3	0	1	1	12	2

[11]:
```
train = pd.read_csv('train1.csv')
train.head()
```

[11]:

	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

[12]:
```
le = LabelEncoder()
train['Sex'] = le.fit_transform(train['Sex'])
train['Cabin'] = le.fit_transform(train['Cabin'])
train['Embarked'] = le.fit_transform(train['Embarked'])
```

[13]:
```
X_train = train.drop(columns=['Survived'])
y_train = train['Survived']
```

1.2 Prediction using Random Forest

[14]:
```
rf = RandomForestClassifier().fit(X_train,y_train)
y_test = rf.predict(df1)
```

[15]:
```
df['Survived'] = y_test
df.head()
```

[15]:

	Pclass	Sex	SibSp	Parch	Cabin	Embarked	Survived
0	3	male	0	0	B45	Q	0
1	3	female	1	0	B45	S	1
2	2	male	0	0	B45	Q	0
3	3	male	0	0	B45	S	0
4	3	female	1	1	B45	S	1

Q3. Count the total number of passengers

[16]:
```
print('Total number of passengers on Titanic: ',len(df))
```

```
Total number of passengers on Titanic:  418
```

Q4. Count the number of passengers who survived

[17]:
```
print('Total number of passengers who survived: ',len(df[df['Survived'] == 1]))
```

```
Total number of passengers who survived:  155
```

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

[18]:
```
print('Percentage of passengers who survived: ',((len(df[df['Survived'] == 1]) /
 ↪ len(df))*100))
```

```
Percentage of passengers who survived:  37.08133971291866
```

Q6. Count the number of passengers based on gender

[19]:
```
print('Number of male passengers: ',len(df[df['Sex']=='male']))
print('Number of female passengers: ',len(df[df['Sex']=='female']))
```

```
Number of male passengers:  266
Number of female passengers:  152
```

1.3 Chi-squared analysis

[20]:
```
pd.crosstab(df['Survived'], df['Sex'],margins=True)
```

[20]:

Sex	female	male	All
Survived			
0	32	231	263
1	120	35	155
All	152	266	418

[21]:
```
data = pd.crosstab(df['Survived'], df['Sex'])
data
```

[21]:

Sex	female	male
Survived		
0	32	231
1	120	35

[22]:
```
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:  22.58064516129032
Percentage of female survivors:  77.41935483870968
```

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.

[23]:
```
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.'
```

[24]:
```
data['female'] = (data['female']/(data.sum().sum()))*100
data['male'] = (data['male']/(data.sum().sum()))*100
data
```

[24]:

Sex	female	male
Survived		
0	7.655502	76.398076
1	28.708134	11.575466

[25]:
```
chiStats = stats.chi2_contingency(data)
chiStats
```

[25]:
```
(47.88560093830486,
 4.5182775371807816e-12,
 1,
 array([[24.58229949, 59.47127867],
        [11.78133687, 28.50226312]]))
```

[26]:
```
criticalValue = stats.chi2.ppf(q=0.95, df = chiStats[2])
```

[27]:
```
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        =  47.88560093830486
P value            =  4.5182775371807816e-12
Degree of freedom  =  1
Expected cross tab =
 [[24.58229949 59.47127867]
 [11.78133687 28.50226312]]
```

Q8. Inference based on test

[28]:
```
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.