EX3

September 22, 2021

0.0.1 Exercise 1

[1]:
```
import scipy.stats as stats
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
from sklearn import *
import plotly.express as px
import matplotlib.ticker as ticker
from matplotlib.ticker import FuncFormatter
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import plotly.io as pio
pio.renderers.default = "notebook+pdf"

# use a gray background
plt.style.use('ggplot')
```

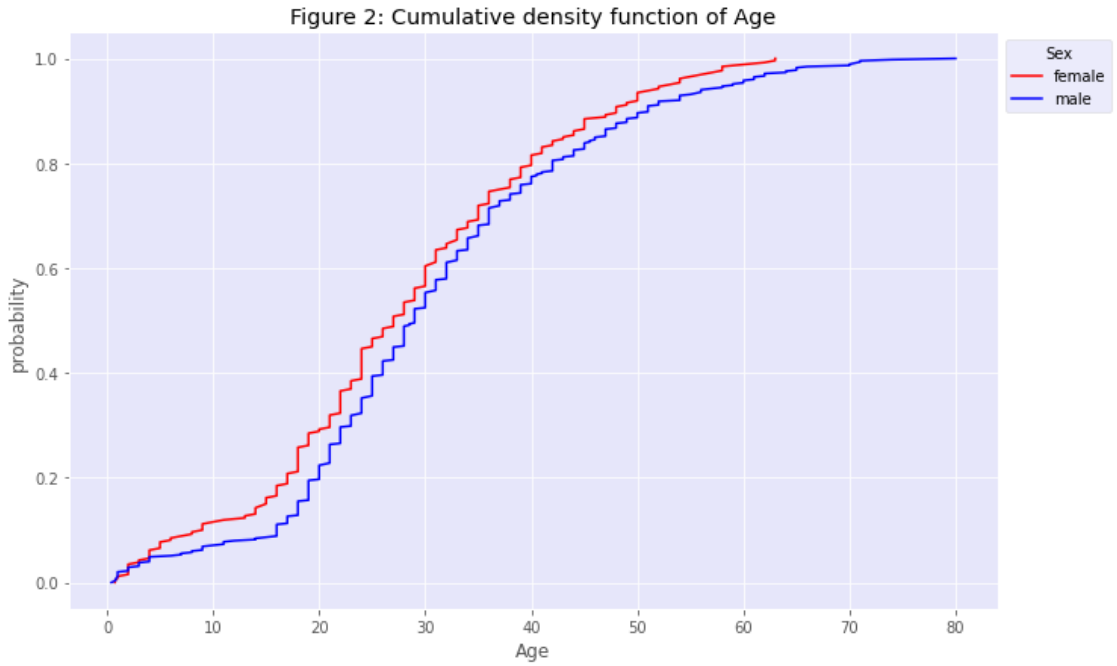
[2]:
```
def millions(x, pos):
    'The two args are the value and tick position'
    return '%1.fK' % (x / 1000)


# Read dara from csv
data = pd.read_csv('salary-Industry.csv')
# Reshape data
cs, oil = [x for _, x in data.groupby(data['Industry'])]




cs_x = np.array(cs.YearsExperience).reshape((-1, 1))
cs_y = np.array(cs.Salary).reshape((-1, 1))
reg_cs = linear_model.LinearRegression()
reg_cs.fit(cs_x, cs_y)
cs_salary_pred = reg_cs.predict(cs_x)
```

```
oil_x = np.array(oil.YearsExperience).reshape((-1, 1))
oil_y = np.array(oil.Salary).reshape((-1, 1))



reg_oil = linear_model.LinearRegression()
reg_oil.fit(oil_x, oil_y)
oil_salary_pred = reg_oil.predict(oil_x)


# Plot outputs



plt.figure(figsize=(12,7))
ax = plt.axes()
plt.grid(True)
ax.set_facecolor("lavender")


plt.scatter(oil_x, oil_y,  color='blue', edgecolors='b', label ='Oil&Gas' )
plt.plot(oil_x, oil_salary_pred, color='blue', linewidth=1)
plt.scatter(cs_x, cs_y,  color='red', edgecolors='black', label = 'CS')
plt.plot(cs_x, cs_salary_pred, color='red', linewidth=1)

formatter = FuncFormatter(millions)
y_ticks = np.arange(0, 500000, 10000)
ax.yaxis.set_major_formatter(formatter)


plt.xlabel("YearsExperience")
plt.ylabel("Salary")
plt.title("Figure 1: Years of Experience vs Salary")
plt.legend(bbox_to_anchor=(1.0, 0.8, 0.3, 0.2), loc='upper left', title =␣
 ↪'Industry', facecolor='lavender')


plt.show()
```

0.0.2 Exercise 2

[3]:
```
d = pd.read_csv('titanic.csv')

df = pd.DataFrame([d.Sex, d.Age]).transpose()
df.dropna(subset=["Age"], inplace=True)

female, male = [x for _, x in df.groupby(df['Sex'])]


# sort the data:
female_age_sorted = np.sort(female.Age)
male_age_sorted = np.sort(male.Age)

# calculate the proportional values of samples
p_female = 1. * np.arange(len(female.Age)) / (len(female.Age) - 1)
p_male = 1. * np.arange(len(male.Age)) / (len(male.Age) - 1)

plt.figure(figsize=(11,7))
ax = plt.axes()
ax.set_facecolor("lavender")

plt.plot(female_age_sorted, p_female, color='red', label='female')
plt.plot(male_age_sorted, p_male, color='blue', label='male')


plt.xlabel('Age')
```

```
plt.ylabel('probability')
plt.title('Figure 2: Cumulative density function of Age')

plt.legend(bbox_to_anchor=(1.0, 0.8, 0.3, 0.2), loc='upper left', title =␣
↪'Sex', facecolor='lavender')

plt.show()
```



Read off (and write in your answer to this problem) the median and the 25% quantile for male, female passengers.

Sex	Median[1]	25% quantile[2]
Female	25-27	18-19
Male	29-30	20-22

By reading off from the plot:

- [1] point at the curve where we have (probability) 0.5
- [2] point at the curve where we have (probability) 0.25

0.0.3 Exercise 3

[4]:
```
titanic= pd.read_csv('titanic.csv')

import plotly.express as px
df = titanic
df['Class'] = df['Pclass'].astype('category')

df['Survived'] = df['Survived'].astype('category')
fig = px.box(df, x="Fare", y="Class", points="all")
fig.update_layout(title = 'Figure 3: Boxplot with displaying the underlying␣
 ↪data')
fig.show()



summary = df.groupby(by=["Survived", "Pclass"]).count()
s = pd.DataFrame()
s['Passengers']= summary.PassengerId
s['Status']= (["Dead","Dead","Dead","Survived","Survived","Survived"])

s['Class']= ["1","2","3","1","2","3"]

fig = px.bar(s, x="Status", y="Passengers", color="Class",
             hover_data=['Passengers'], barmode = 'stack', labels=("Survived",␣
 ↪"Dead"), color_discrete_sequence=px.colors.qualitative.Safe)
fig.update_layout(title = 'Figure 4: Stacked barplot presenting dead (0) and␣
 ↪survived (1) passengers according to the class')
fig.show()
```

Figure 3: Boxplot with displaying the underlying data

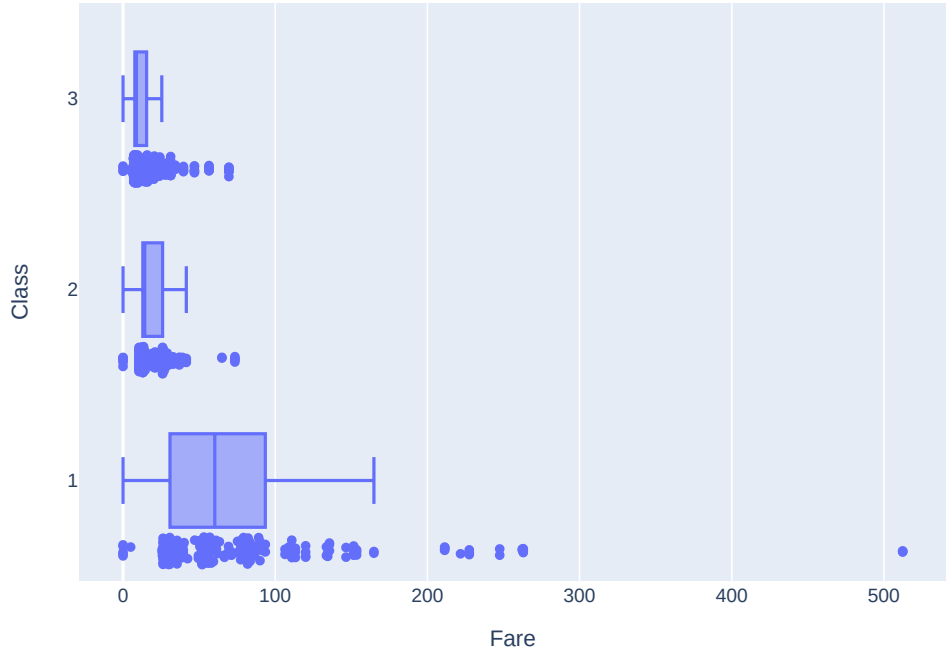


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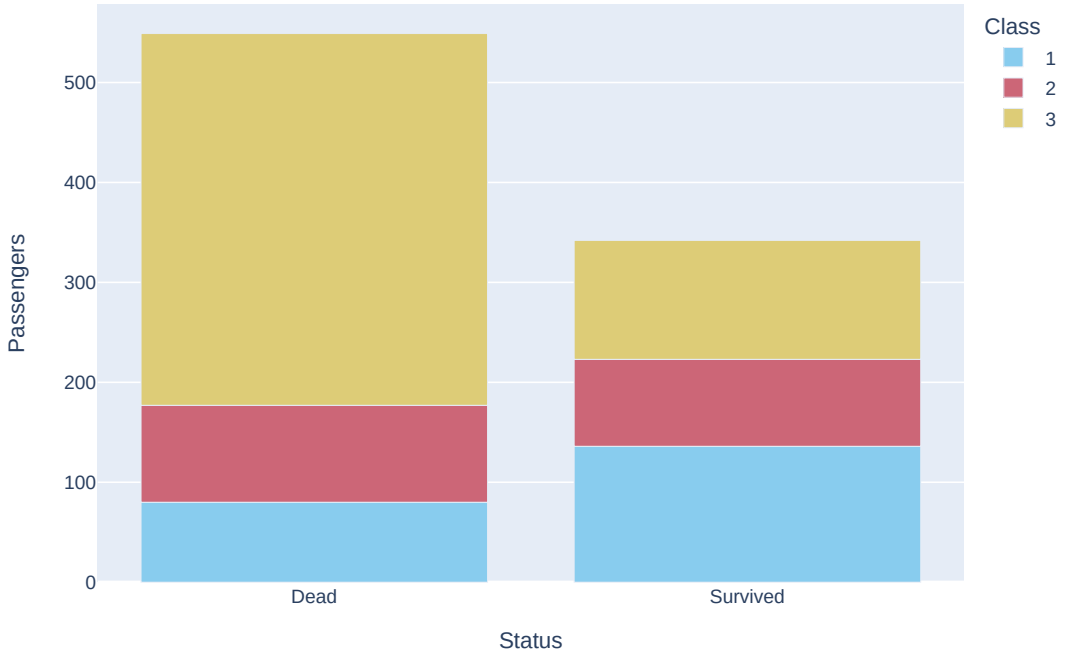
Figure 4: Stacked barplot presenting dead (0) and survived (1) passengers according to t



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Questions

- Whether having a cheaper ticket increases or decreases the probability of survival
- How strong the effect is(i.e. how much does it increase or decrease the probability)

Figure 3 represents how ticket price varry withing 3 classes. We see that class 3 is more expensice comparing it to class 1 and 2. Nevertheles there are some outliers in out dataset.

According to Figure 4 which represents passengers who surrvived and dead according to the class they were in. Out of over 500 who have died 372 passengers were in class 3, whereas there were only 119 who surrvived. Comparing it to class 1 there is huge disproportion and thus it proves that beeing in class 1 increased the chance of survival. Class 2 has not so huge disproportion since statistisc are almost equal.