Report

```
[ ] import numpy as np
    import matplotlib.pyplot as plt
    import seaborn as sb
    import pandas as pd
    import scipy.stats as st
    import statistics as stats
```

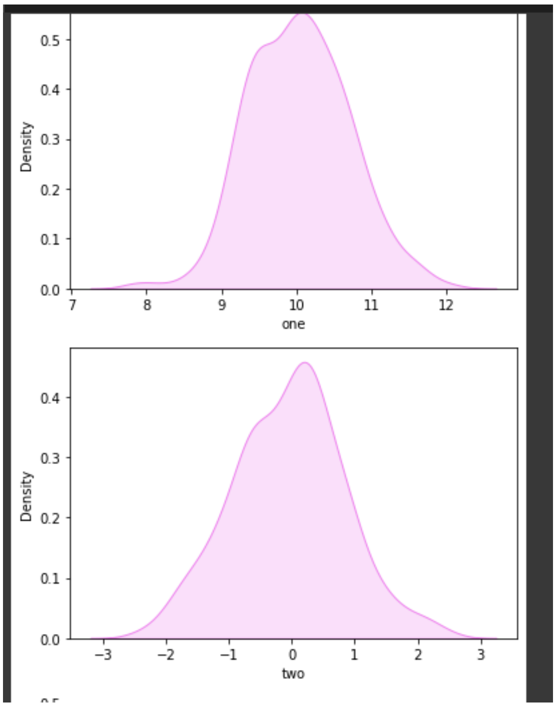
Importing required libraries

```
[ ] data = pd.read_csv("dataset.csv")
    col = ['index','one', 'two', 'three', 'four', 'five', 'six', 'seven', 'eight', 'nine', 'ten']
```

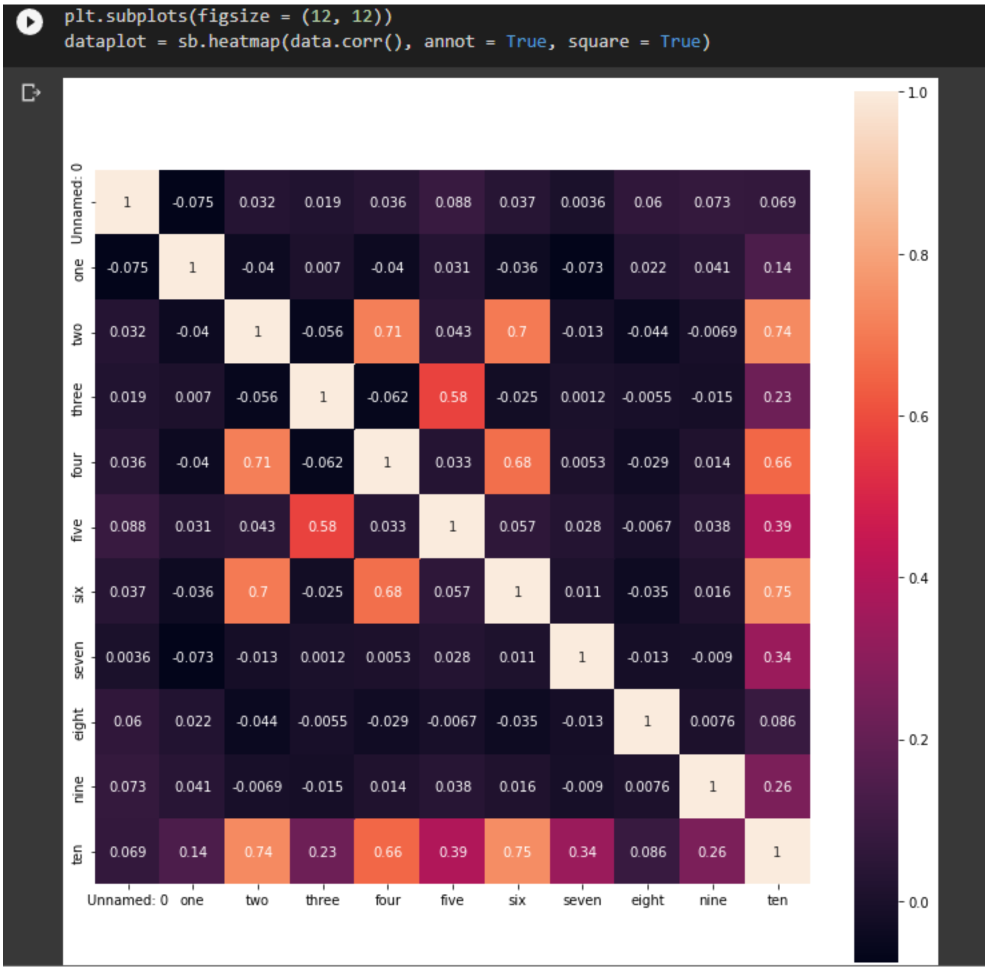
Reading sample data from csv file for each experiment

```
[56] for i in range(1, 11):
       sb.kdeplot(data[col[i]], fill = True,color='violet')
       plt.show()
```

Plotting all the 11 distributions of the given dataset which is given as columns in the given dataset



Then, I've plotted the heatmap taking all the given different types of distributions in the dataset.



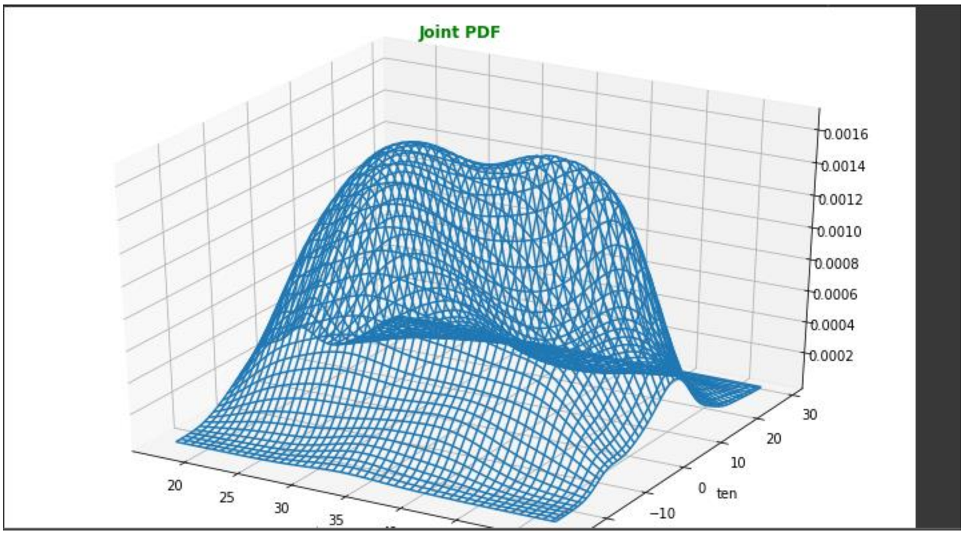
Then, for fitting the gaussian kernel, I've specified a 'meshgrid' which will use 100

points interpolation on each axis.

I've fitted the gaussian kernel using the "scipy's gaussian_kde" method and then,

plotted the kernel with annotated contours.

```python
for i in range(1,11):
  for j in range(i+1,11):
    x = data[col[i]]
    y = data[col[j]]

    dx = (max(x)-min(x))/12
    dy = (max(y)-min(y))/12
    xmin = min(x) - dx
    xmax = max(x) + dx
    ymin = min(y) - dy
    ymax = max(y) + dy

    xx, yy = np.mgrid[xmin:xmax:100j, ymin:ymax:100j]
    positions = np.vstack([xx.ravel(), yy.ravel()])
    values = np.vstack([x, y])
    kernel = st.gaussian_kde(values)
    f = np.reshape(kernel(positions).T, xx.shape)

    fig = plt.figure(figsize=(12,8))
    ax = plt.axes(projection='3d')
    w = ax.plot_wireframe(xx, yy, f)
    ax.set_xlabel(col[i])
    ax.set_ylabel(col[j])
    ax.set_title('Joint PDF', loc = 'center', fontweight = "bold", color = "green");
    plt.show()

    fig = plt.figure(figsize=(10, 6))
    plt.title('CORRELATION between {} and {}'.format(col[i], col[j]), fontweight = "bold", color = "black")
    plt.scatter(x,y)

    plt.plot(np.unique(x), np.poly1d(np.polyfit(x, y, 1))(np.unique(x)), color='pink')

    plt.xlabel(col[i])
    plt.ylabel(col[j])

    plt.show()
```



Then, finally, I've used "Chebyshev's Inequality" to result out the probability of each random variable being 2.6 times farther than the standard mean.

```
[59] deviation = [-1]
     mean = [-1]

     k = 2.6

     for i in range(1, 11):
       deviation.append(stats.stdev(data[col[i]]))
       mean.append(stats.mean(data[col[i]]))

     for i in range(1, 11):
       temp = 0
       for j in range(len(data[col[i]])):
         x = data[col[i]][j]
         if ((x - mean[i]) >= k*deviation[i]) or ((mean[i]-x) >= k*deviation[i]):
           temp = temp + 1
       print(temp/len(data[col[i]]))
```

```
0.014
0.008
0.014
0.012
0.008
0.002
0.02
0.0
0.02
0.01
```