

ASSIGNMENT 1
CSCI 5930 – Homework 1: Statistical values

Name: Sowmya Mutya
Banner ID: 001303248

1- Find the mean and standard deviation of A.

A = {9,10,11,7,13, 7,4,11,13,10}

Mean:

Mean or average is calculated as sum of all values divided by total number of values.

$$\text{Mean} = \frac{\text{Sum of values}}{\text{Total number of values}}$$

$$\text{Mean} = \frac{(9+10+11+7+13+7+4+11+13+10)}{10}$$

$$\text{Mean} = \frac{95}{10}$$

$$\text{Mean} = 9.5$$

Standard deviation:

The standard deviation is a measure of the amount of variation or dispersion from the mean in a set of values.

$$\sigma = \sqrt{\frac{\sum (x_i - m)^2}{n - 1}}$$

Where σ is standard deviation

m is mean

n is the total number of values in the data

Standard deviation is calculated the following way:

Step1: Calculating mean

$$\text{Mean} = \frac{(9+10+11+7+13+7+4+11+13+10)}{10}$$

Step2: finding deviation from the mean for every value of the data A

$$(9 - 9.5) = -0.5$$

$$(10 - 9.5) = 0.5$$

$$(11 - 9.5) = 1.5$$

$$(7 - 9.5) = -2.5$$

$$(13 - 9.5) = 3.5$$

$$(7 - 9.5) = -2.5$$

$$(4 - 9.5) = -5.5$$

$$(11 - 9.5) = 1.5$$

$$(13 - 9.5) = 3.5$$

$$(10 - 9.5) = 0.5$$

Step3: Square of each deviation from the mean

$$\begin{aligned}
(-0.5)^2 &= 0.25 \\
(0.5)^2 &= 0.25 \\
(1.5)^2 &= 2.25 \\
(-2.5)^2 &= 6.25 \\
(3.5)^2 &= 12.25 \\
(-2.5)^2 &= 6.25 \\
(-5.5)^2 &= 30.25 \\
(1.5)^2 &= 2.25 \\
(3.5)^2 &= 12.25 \\
(0.5)^2 &= 0.25
\end{aligned}$$

Step4: Calculating mean of individual standard deviations

$$\begin{aligned}
&= \frac{(0.25 + 0.25 + 2.25 + 6.25 + 12.25 + 6.25 + 30.25 + 2.25 + 12.25 + 0.25)}{10-1} \\
&= \frac{72.5}{9}
\end{aligned}$$

$$= 8.0555555556$$

Step5: Take square root of the mean of individual standard deviations

$$\sqrt{7.25} = 2.838231061$$

So, the standard deviation of the above data $A = \{9, 10, 11, 7, 13, 7, 4, 11, 13, 10\}$ is approximately 2.84

3- Write a code in Python:

a) Enter vector A of question 1 in Python. Copy the code. (Hint: $A \leftarrow c(2, 4, \dots)$)

Creating a vector using a NumPy array:

Python code:

```
import numpy as np
A=[9,10,11,7,13,7,4,11,13,10]
vector=np.array(A)
print(vector)
```

Output:

```
[9,10,11,7,13,7,4,11,13,10]
```

The above python code converts the array to vector and prints the vector A of the above given data.

b) Find the mean and standard deviation of A. Copy the code.

As we considered standard deviation for a sample we consider it as sample standard deviation. If we have considered total population we would take `sample_std = np.std(vector)` instead of `sample_std = np.std(vector, ddof=1)` in the below python code.

Python code to calculate mean and standard deviation:

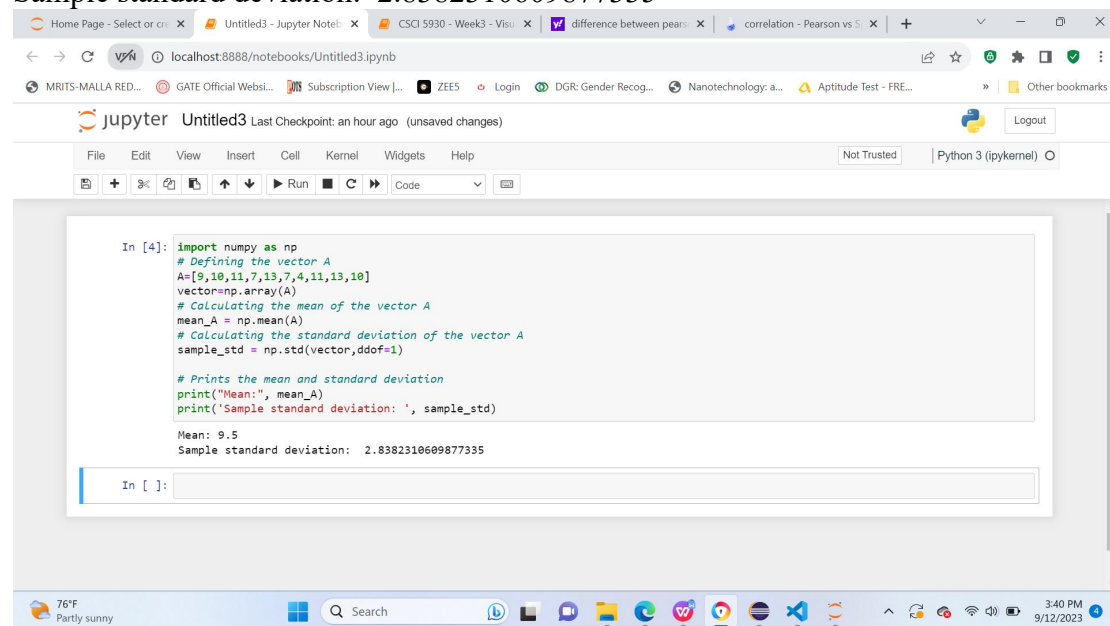
```
import numpy as np
# Defining the vector A
A=[9,10,11,7,13,7,4,11,13,10]
vector=np.array(A)
# Calculating the mean of the vector A
mean_A = np.mean(A)
# Calculating the standard deviation of the vector A
sample_std = np.std(vector, ddof=1)

# Prints the mean and standard deviation
print("Mean:", mean_A)
print('Sample standard deviation: ', sample_std)
```

Output:

Mean: 9.5

Sample standard deviation: 2.8382310609877335



c) Do your results match question 1?

Yes, the results of the question 1 match with the result of above python code.