Pattern Recognition

the first task:

1-what is random.seed() function in NumPy?

the solution

The numpy.random.seed() function is used to set the seed for the pseudo-random number generator algorithm in Python. The pseudo-random number generator algorithm performs some predefined operations on the seed and produces a pseudo-random number in the output. The seed acts as a starting point for the algorithm. A pseudo-random number is a number that appears random, but it actually isn't. In fact, computers are incapable of generating a truly random number because computers are deterministic and consistently follow a given set of instructions. The idea behind this is that we will always get the same set of random numbers for the same seed on any machine.

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example:

```
import numpy as np

np.random.seed(1)

array = np.random.rand(5)

np.random.seed(1)

array2 = np.random.rand(5)

print(array)

print(array2)
```

the output:

[4.17022005e-01 7.20324493e-01 1.14374817e-04 3.02332573e-01

1.46755891e-01]

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2- what is the Mean ,Median,Mode,Variance,and Standard deviation, Gaussian distribution?

Mean: is the average of a data set

$$\text{mean} = \overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Median: is the middle of the set of numbers, If the size of the data set *n* is odd the median is the value at position *p* where:

$$p = \frac{n+1}{2}$$

$$\tilde{x} = x_p$$

If *n* is even the median is the average of the values at positions *p* and *p* + 1 where:

$$p = \frac{n}{2}$$

$$\tilde{x} = \frac{x_p + x_{p+1}}{2}$$

Mode: Mode is the value or values in the data set that occur most frequently. For the data set **1**, **1**, 2, 5, **6**, **6**, 9 the mode is 1 and 6.

Variance: statistical measurement of the spread between numbers in a data set. More specifically, variance measures how far each number in the set is from the mean and thus from every other number in the set

$$\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$$

Standard deviation: The Standard Deviation is a measure of how spread-out numbers are .

The formula is the square root of the Variance.

$$\sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n-1}}$$

Gaussian distribution: is a bell-shaped curve, and it is assumed that during any measurement values will follow a normal distribution with an equal number of measurements above and below the mean value.