Probabilty Density Function

- In probability theory, a probability density function (PDF), or density of a continuous random variable, is a function whose value at any given sample (or point) in the sample space (the set of possible values taken by the random variable) can be interpreted as providing a relative likelihood that the value of the random variable would equal that sample

Types: ¶

1. Binomial Distribution
2. Poisson Distribution
3. Normal Distribution (Gaussian Distribution)
4. Bernoulli Distribution
5. Uniform Distribution
6. Exponential Distribution

1. Binomial Distribution

- It is use when there is more than one outcome of the certain experiment.

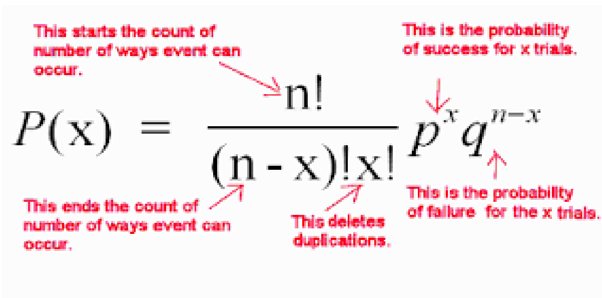
Eg. i. For toss a coin wheather their head or tail. ii. forgiving exam wheather pass or fail.

Here we get only two outcome so it is Binomial Distribution.

- Binomial Distribution is a Discrete Distribution.

It has three parameters:

- n - number of trials.
- p - probability of occurence of each trial (e.g. for toss of a coin 0.5 each).
- size - The shape of the returned array.



Implement Using Python

In [1]:

```
from numpy import random

x = random.binomial(n=10, p=0.5, size=10)

print(x)
```

```
[5 3 5 2 5 4 3 3 6 7]
```

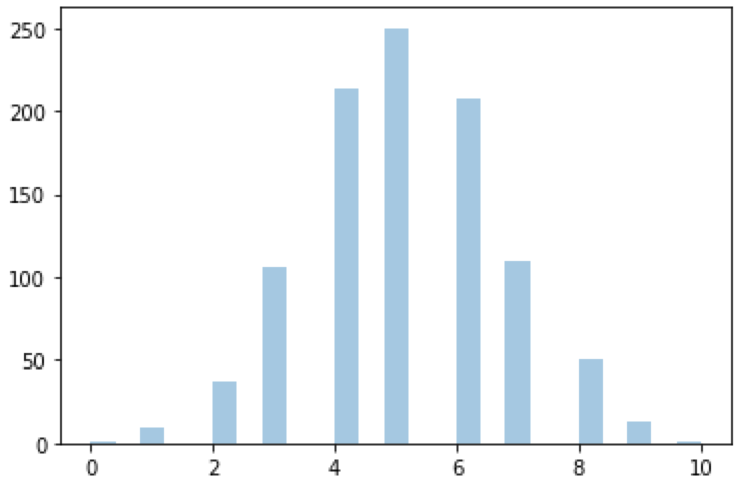
Graph Visualization

In [2]:

```
from numpy import random
import matplotlib.pyplot as plt
import seaborn as sns

sns.distplot(random.binomial(n=10, p=0.5, size=1000), hist=True, kde=False)

plt.show()
```



2. Poisson Distribution

- It is use to find probability in between some time period/ time interval.
- Here we consider some time interval
- event are dependent on interval
- Poisson Distribution is a Discrete Distribution.

Poisson Distribution Formula

$$P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

where

x = 0, 1, 2, 3, ...

λ = mean number of occurrences in the interval

e = Euler's constant $\approx$ 2.71828

It has two parameters:

- lam - rate or known number of occurences
- size - The shape of the returned array.

Implement Using Python

In [3]:

```
from numpy import random

x = random.poisson(lam=3, size=7)

print(x)
```

```
[0 2 4 0 3 3 1]
```

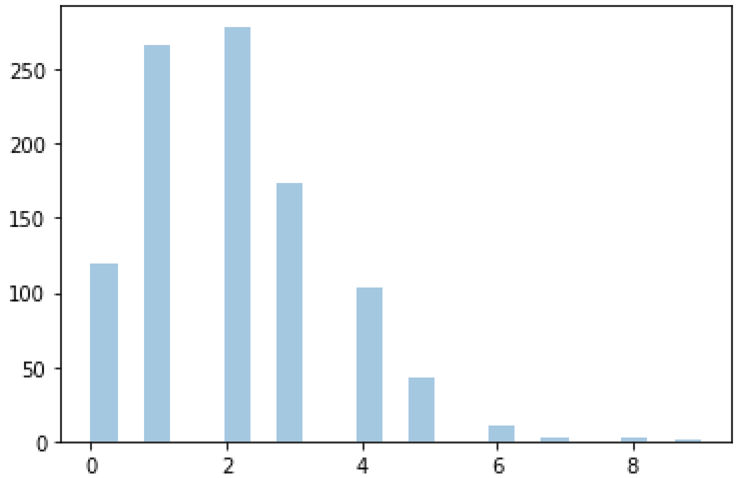
Visualization of Poisson Distribution

In [4]:

```
from numpy import random
import matplotlib.pyplot as plt
import seaborn as sns

sns.distplot(random.poisson(lam=2, size=1000), kde=False)

plt.show()
```



3. Normal (Gaussian) Distribution

- Normal distribution represents the behavior of most of the situations in the universe (That is why it’s called a “normal” distribution. I guess!). The large sum of (small) random variables often turns out to be normally distributed, contributing to its widespread application. Any distribution is known as Normal distribution if it has the following characteristics:

Formula:

$$y = \frac{1}{\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma}$$

μ = Mean

σ = Standard Deviation

$\pi \approx 3.14159$

$e \approx 2.71828$

The Normal Distribution is one of the most important distributions. It is also called the Gaussian Distribution after the German mathematician Carl Friedrich Gauss.

It has three parameters:

- loc - (Mean) where the peak of the bell exists.

- scale - (Standard Deviation) how flat the graph distribution should be.
- size - The shape of the returned array.

Implement Using Python

In [5]:

```
from numpy import random

x = random.normal(loc=1, scale=2, size=(2, 3))

print(x)
```

```
[[-2.20014818  2.67907005  1.34770152]
 [-0.57167294 -0.20407849  2.04919831]]
```

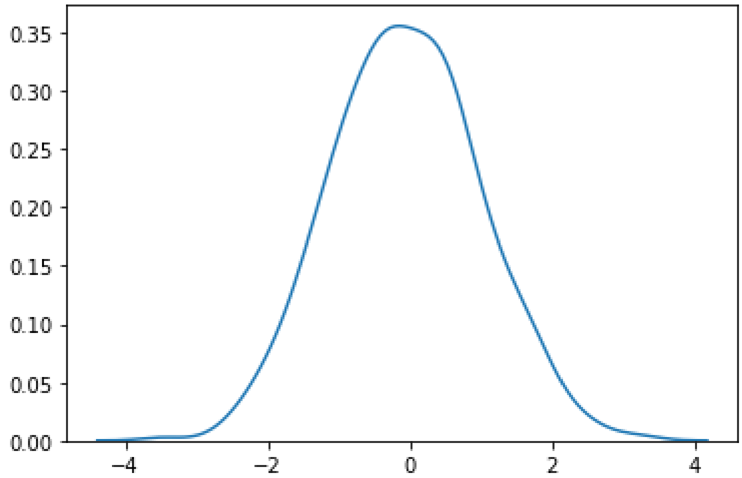
Visualization of Normal Distribution

In [6]:

```
from numpy import random
import matplotlib.pyplot as plt
import seaborn as sns

sns.distplot(random.normal(size=1000), hist=False)

plt.show()
```



here i mention three importatnt distribution if you want to more read these below article

1. https://www.analyticsvidhya.com/blog/2017/09/6-probability-distributions-data-science/ (https://www.analyticsvidhya.com/blog/2017/09/6-probability-distributions-data-science/)
2. https://www.w3schools.com/python/numpy_random_normal.asp (https://www.w3schools.com/python/numpy_random_normal.asp)