



# Poisson Distribution

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## Poisson Distribution

Poisson Distribution is a *Discrete Distribution*.

It estimates how many times an event can happen in a specified time. e.g. If someone eats twice a day what is the probability he will eat thrice?

It has two parameters:

**lam** - rate or known number of occurrences e.g. 2 for above problem.

**size** - The shape of the returned array.

## Example

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Generate a random 1x10 distribution for occurrence 2:

```
from numpy import random  
  
x = random.poisson(lam=2, size=10)  
  
print(x)
```

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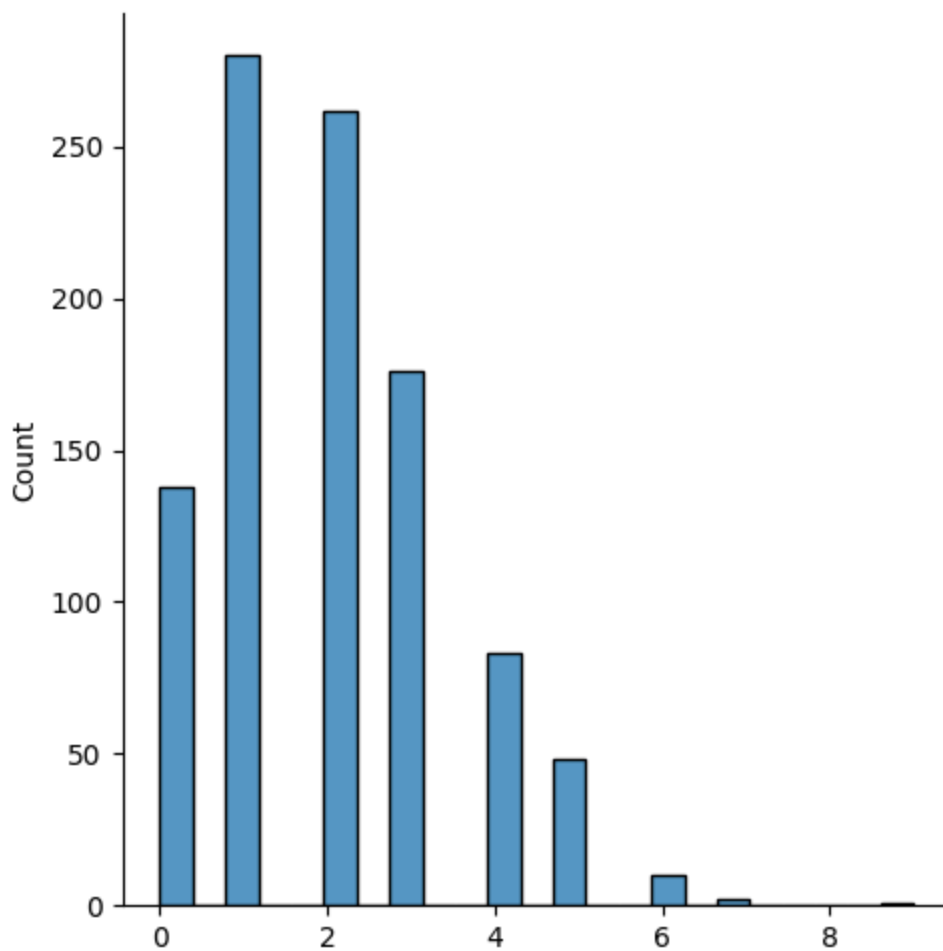
## Example

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

sns.displot(random.poisson(lam=2, size=1000))

plt.show()
```

## Result





# Difference Between Normal and Poisson Distribution

Normal distribution is continuous whereas poisson is discrete.

But we can see that similar to binomial for a large enough poisson distribution it will become similar to normal distribution with certain std dev and mean.

## Example

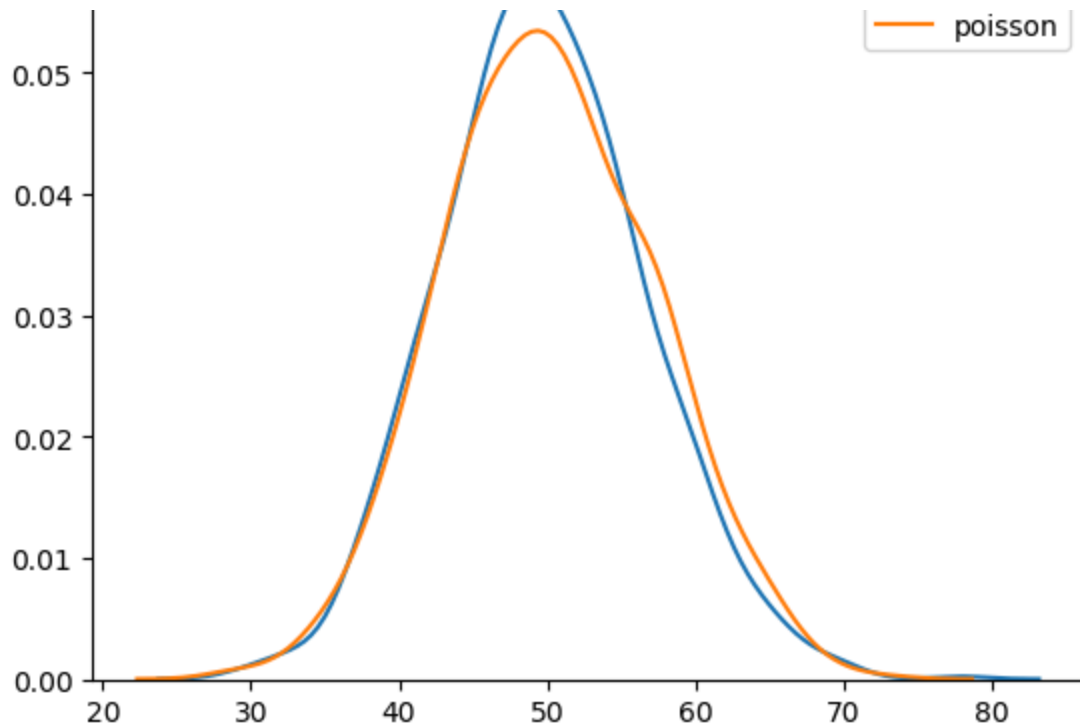
```
from numpy import random
import matplotlib.pyplot as plt
import seaborn as sns

data = {
    "normal": random.normal(loc=50, scale=7, size=1000),
    "poisson": random.poisson(lam=50, size=1000)
}

sns.displot(data, kind="kde")

plt.show()
```

## Result

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## Difference Between Binomial and Poisson Distribution

Binomial distribution only has two possible outcomes, whereas poisson distribution can have unlimited possible outcomes.

But for very large  $n$  and near-zero  $p$  binomial distribution is near identical to poisson distribution such that  $n * p$  is nearly equal to  $\lambda$ .

### Example

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

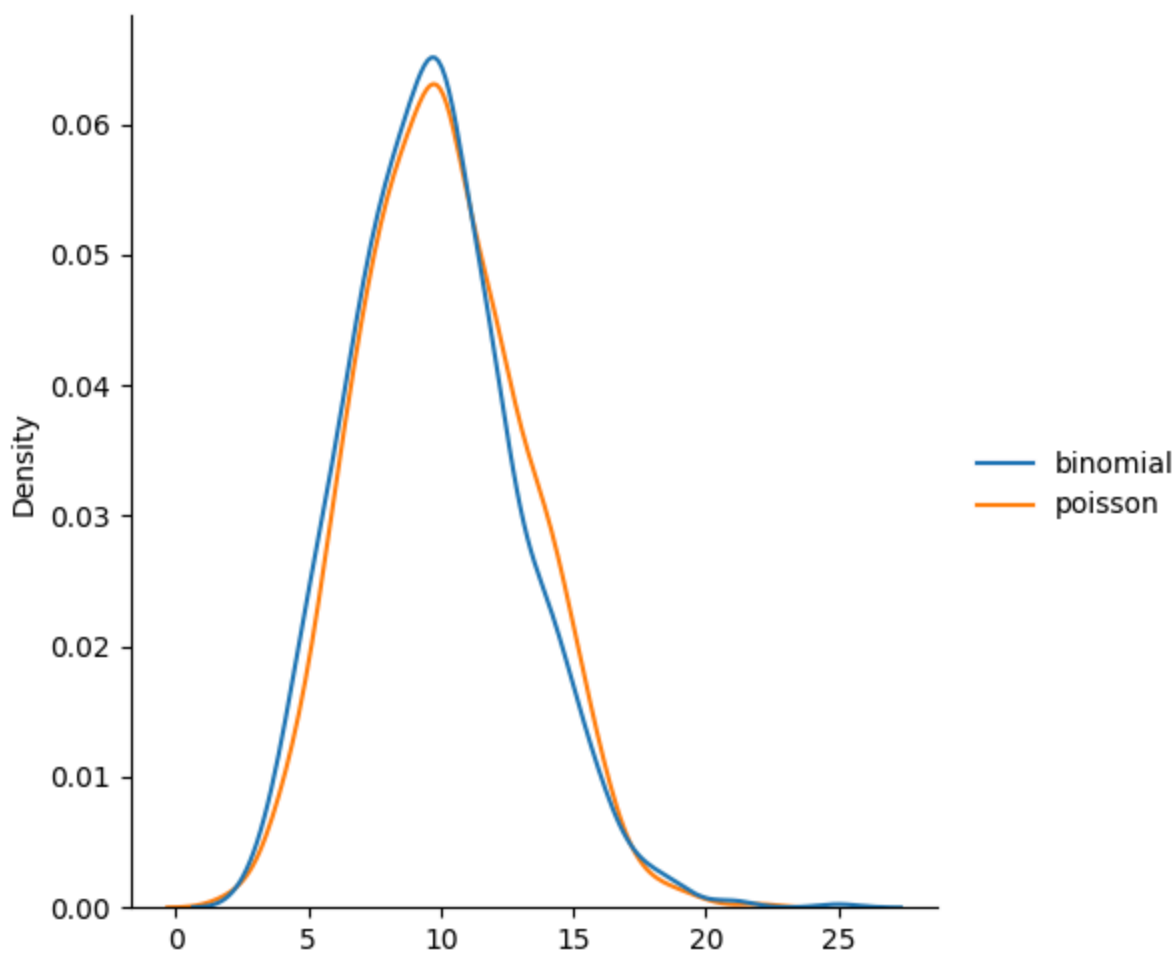


```
"poisson": random.poisson(lam=10, size=1000)
}

sns.displot(data, kind="kde")

plt.show()
```

## Result



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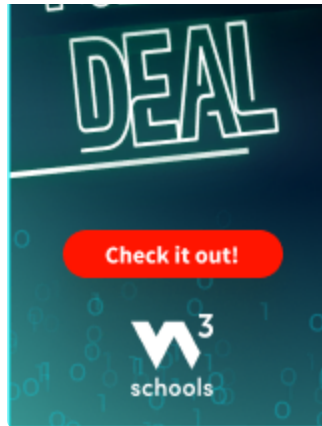
The `random.poisson()` method has two parameters, which ones?

- ☐ `loc` and `size`
- ☐ `dev` and `size`
- ☐ `lam` and `size`

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