Poisson distribution

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy import stats
```

Poisson distribution is characterized by a single parameter λ. See:

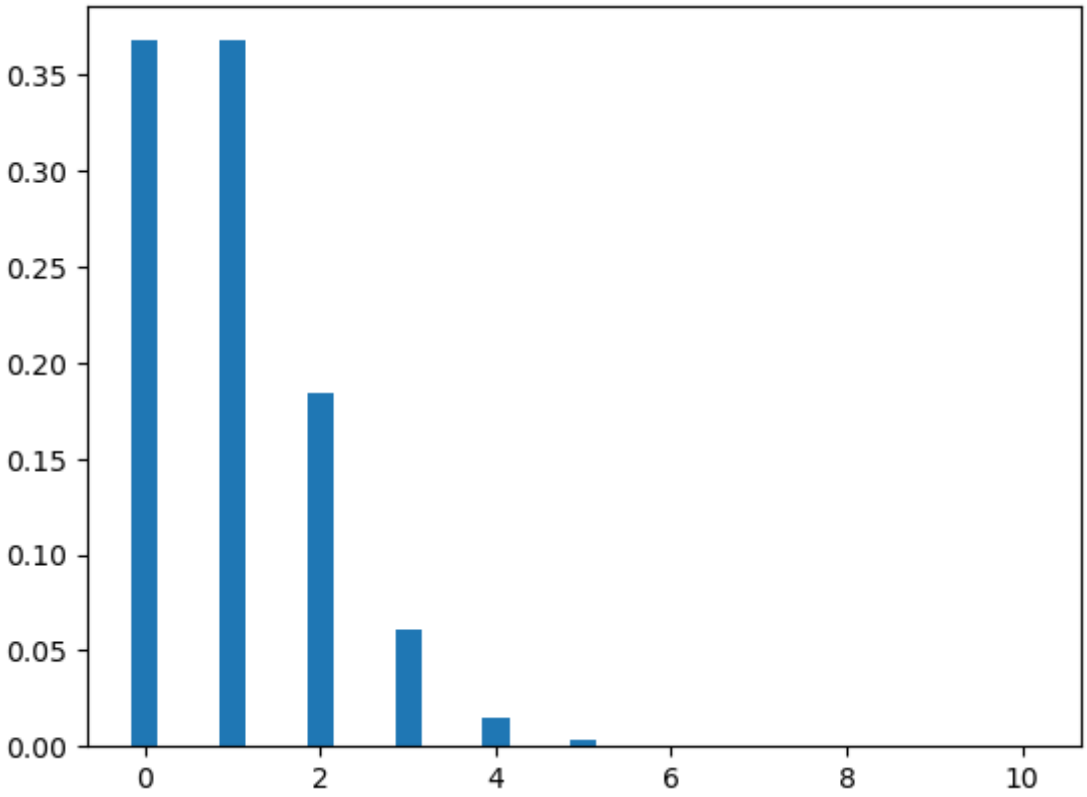
https://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.poisson.html

In [2]:
```
# expectation of lam=1 event on average
lam = 1
x = np.arange(11)   # = [0 1 .. 10]
p = stats.poisson.pmf(x, lam)
# Here are the probabilities of observing 0, 1, .., 10 events
print(x, p)
```

```
[ 0  1  2  3  4  5  6  7  8  9 10] [3.67879441e-01 3.67879441e-01 1.83939721e-
01 6.13132402e-02
 1.53283100e-02 3.06566201e-03 5.10943668e-04 7.29919526e-05
 9.12399408e-06 1.01377712e-06 1.01377712e-07]
```

In [3]:
```
plt.bar(x, p, width=0.3)
```

Out[3]:
```
<BarContainer object of 11 artists>
```



Below is the probability of observing 9 events if the expectation is 2.315e-5 (neutrinos from SN1987A).

In [4]:
```
stats.poisson.pmf(9, 2.315e-5)
```

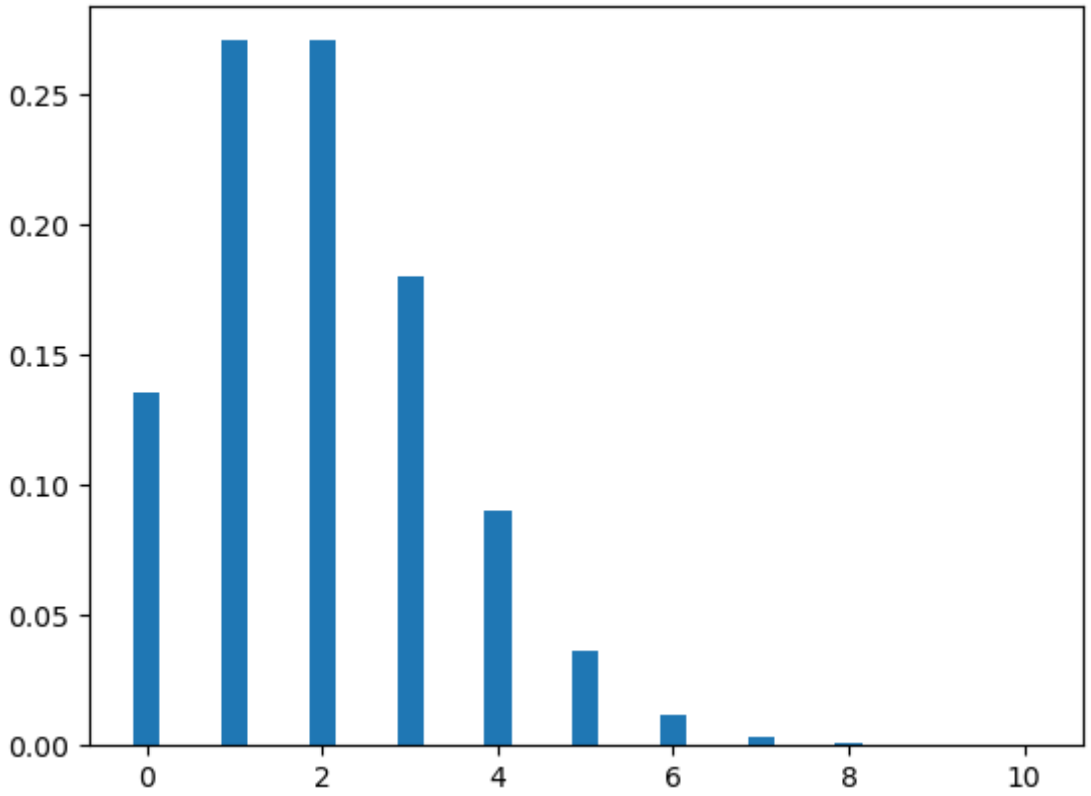
Out[4]:
```
5.262424419128112e-48
```

In [5]:
```
lam = 2
x = np.arange(11)   # = [0 1 .. 10]
p = stats.poisson.pmf(x, lam)
# Here are the probabilities of observing 0, 1, .., 10 events
print(x, p)
```

```
[ 0  1  2  3  4  5  6  7  8  9 10] [1.35335283e-01 2.70670566e-01 2.70670566e-
01 1.80447044e-01
 9.02235222e-02 3.60894089e-02 1.20298030e-02 3.43708656e-03
 8.59271640e-04 1.90949253e-04 3.81898506e-05]
```

In [6]:
```
plt.bar(x, p, width=0.3)
```

Out[6]:
```
<BarContainer object of 11 artists>
```



In [ ]:
```

```