scipy.stats.poisson

scipy.stats.**poisson** = *<scipy.stats._discrete_distns.poisson_gen object>* [source] (https://github.com/scipy/scipy/blob/v1.1.0/scipy/stats/_discrete_distns.py)

A Poisson discrete random variable.

As an instance of the **rv_discrete** (scipy.stats.rv_discrete.html#scipy.stats.rv_discrete) class, **poisson** object inherits from it a collection of generic methods (see below for the full list), and completes them with details specific for this particular distribution.

Notes

The probability mass function for **poisson** is:

$$f(k) = \exp(-\mu)\frac{mu^k}{k!}$$

for $k \geq 0$.

poisson takes μ as shape parameter.

The probability mass function above is defined in the "standardized" form. To shift distribution use the `loc` parameter. Specifically, `poisson.pmf(k, mu, loc)` is identically equivalent to `poisson.pmf(k - loc, mu)`.

Examples

```
>>> from scipy.stats import poisson
>>> import matplotlib.pyplot as plt
>>> fig, ax = plt.subplots(1, 1)
```

Calculate a few first moments:

```
>>> mu = 0.6
>>> mean, var, skew, kurt = poisson.stats(mu, moments='mvsk')
```

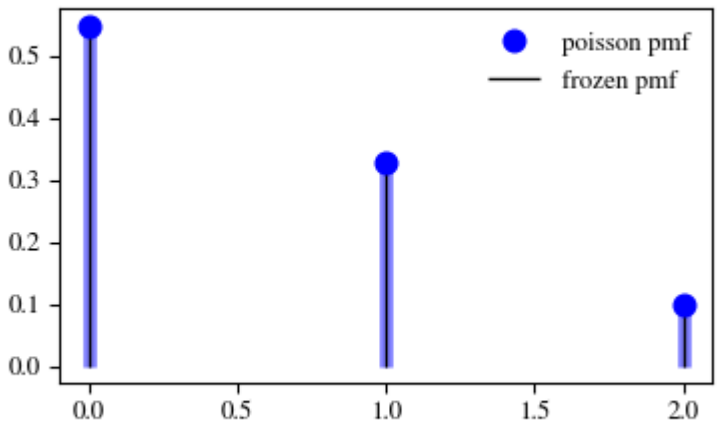
Display the probability mass function (`pmf`):

```
>>> x = np.arange(poisson.ppf(0.01, mu),
...               poisson.ppf(0.99, mu))
>>> ax.plot(x, poisson.pmf(x, mu), 'bo', ms=8, label='poisson pmf')
>>> ax.vlines(x, 0, poisson.pmf(x, mu), colors='b', lw=5, alpha=0.5)
```

Alternatively, the distribution object can be called (as a function) to fix the shape and location. This returns a “frozen” RV object holding the given parameters fixed.

Freeze the distribution and display the frozen `pmf`:

```
>>> rv = poisson(mu)
>>> ax.vlines(x, 0, rv.pmf(x), colors='k', linestyles='-', lw=1,
...         label='frozen pmf')
>>> ax.legend(loc='best', frameon=False)
>>> plt.show()
```



Check accuracy of `cdf` and `ppf`:

```
>>> prob = poisson.cdf(x, mu)
>>> np.allclose(x, poisson.ppf(prob, mu))
True
```

Generate random numbers:

```
>>> r = poisson.rvs(mu, size=1000)
```

Methods

rvs(mu, loc=0, size=1, random_state=None)	Random variates.
pmf(k, mu, loc=0)	Probability mass function.
logpmf(k, mu, loc=0)	Log of the probability mass function.
cdf(k, mu, loc=0)	Cumulative distribution function.
logcdf(k, mu, loc=0)	Log of the cumulative distribution function.
sf(k, mu, loc=0)	Survival function (also defined as `1 - cdf`, but *sf* is sometimes more accurate).
logsf(k, mu, loc=0)	Log of the survival function.
ppf(q, mu, loc=0)	Percent point function (inverse of `cdf` — percentiles).
isf(q, mu, loc=0)	Inverse survival function (inverse of `sf`).

stats(mu, loc=0, moments='mv')	Mean('m'), variance('v'), skew('s'), and/or kurtosis('k').
entropy(mu, loc=0)	(Differential) entropy of the RV.
expect(func, args=(mu,), loc=0, lb=None, ub=None, conditional=False)	Expected value of a function (of one argument) with respect to the distribution.
median(mu, loc=0)	Median of the distribution.
mean(mu, loc=0)	Mean of the distribution.
var(mu, loc=0)	Variance of the distribution.
std(mu, loc=0)	Standard deviation of the distribution.
interval(alpha, mu, loc=0)	Endpoints of the range that contains alpha percent of the distribution

Previous topic

scipy.stats.planck (scipy.stats.planck.html)

Next topic

scipy.stats.randint (scipy.stats.randint.html)