Chapter 1

>>> import scipy
>>> scipy.test()
Running unit tests for scipy
NumPy version 1.8.0
NumPy is installed in /opt/python2.76/site-packages/numpy
SciPy version 0.13.3
SciPy is installed in /opt/python2.76/site-packages/scipy
Python version 2.7.6 [GCC 4.1.2 20080704 (Red Hat 4.1.2-54)]
nose version 1.3.0
...
...
...
Ran 8936 tests in 194.730s
OK (KNOWNFAIL=115, SKIP=204)
<nose.result.TextTestResult run=8936 errors=0 failures=0>
```python
>>> import scipy
>>> scipy.test()
Running unit tests for scipy
NumPy version 1.9.0
NumPy is installed in /opt/python3.41/site-packages/numpy
SciPy version 0.14.0
SciPy is installed in /opt/python3.41/site-packages/scipy
Python version 3.4.1 [GCC 4.4.7 20120313 (Red Hat 4.4.7-1)]
nose version 1.3.4
...
...

Ran 16413 tests in 363.062s

FAILED (KNOWNFAIL=277, SKIP=904, errors=326, failures=45)
<nose.result.TextTestResult run=16413 errors=326 failures=45>
```
Help on package scipy.stats in scipy:

NAME
scipy.stats

FILE
/Applications/sage/local/lib/python2.6/site-packages/scipy/stats/__init__.py

DESCRIPTION
Statistical Functions

This module contains a large number of probability distributions as well as a growing library of statistical functions.

Each included distribution is an instance of the class rv_continuous. For each given name the following methods are available. See docstring for rv_continuous for more information:

   rvs:
   random variates with the distribution

   ppf:
   probability density function

   cdf:
   cumulative distribution function

   sf:
   survival function (1.0 - cdf)

   ppf:
   percent-point function (inverse of cdf)

   isf:
   inverse survival function

   mean:
   mean, variance, and optionally skew and kurtosis

Calling the instance as a function returns a frozen pdf whose shape, location, and scale parameters are fixed.

Distributions

The distributions available with the above methods are:

[...]

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Chapter 2
Alonso Quijano, the protagonist of the novel, is a retired country gentleman nearing fifty years of age, living in an unnamed section of La Mancha with his niece and housekeeper. While mostly a rational man of sound reason, his reading of books of chivalry in excess has had a profound effect on him, leading to the distortion of his perception and the wavering of his mental faculties. In essence, he believes every word of these books of chivalry to be true though, for the most part, the content of these books is clearly fiction. Otherwise, his wits, in regards to everything other than chivalry, are intact.

He decides to cut as a knight-errant in search of adventure. He dons an old suit of armour, renames himself “Don Quixote de la Mancha,” and names his skinny horse “Rocinante.” He designates a neighboring farm girl as his lady love, renaming her Dulcinea del Toboso, while she knows nothing about this.
Chapter 3

\[
\begin{pmatrix}
0 & 10 & 0 & 0 & 0 \\
0 & 0 & 20 & 0 & 0 \\
0 & 0 & 0 & 30 & 0 \\
0 & 0 & 0 & 0 & 40 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}
\]

\[
\begin{pmatrix}
1 & 2 \\
3 & 4
\end{pmatrix}
\begin{pmatrix}
1 & 2 \\
3 & 4
\end{pmatrix}
= \begin{pmatrix}
7 & 10 \\
15 & 22
\end{pmatrix}
\]

\[v_1 = \frac{1}{\sqrt{2}}(1,0,1),\]

\[v_2 = (0,1,0),\]

\[v_3 = \frac{1}{\sqrt{2}}(1,0,-1)\]
\[ e^A = \sum_{n=0}^{\infty} \frac{1}{n!} A^n \]

\[ A = U \cdot S \cdot V^*, \quad U = \begin{pmatrix} u_1 \\ \vdots \\ u_n \end{pmatrix}, \quad S = \begin{pmatrix} s_1 & \cdots \\ \cdots & \ddots \\ \cdots & \cdots & s_n \end{pmatrix}, \quad V^* = (v_1 \cdots v_n) \]

\[ \sum_{j=1}^{k} s_j \left( u_j \cdot v_j \right) \]
\[
\begin{pmatrix}
0 & 1 & 0 \\
0 & 0 & 1 \\
0 & 0 & 0 \\
\end{pmatrix}
\begin{pmatrix}
x \\
y \\
z \\
\end{pmatrix}
=
\begin{pmatrix}
1 \\
2 \\
3 \\
\end{pmatrix}
\]
Chapter 4

\[ f(x, y) = \left(1 - x^2\right) + 100 \left(y - x^2\right)^2 \]

\[ \ln(1 + x) \approx x - \frac{x^2}{2} \quad \text{if } x \to 0 \]

\[ \frac{x^2 + 1}{2x + 1} = \left(\frac{1}{2} x - \frac{1}{4}\right) + \frac{5/4}{2x + 1} \]
\[ \Gamma(z) = \int_0^\infty e^{-t} t^{z-1} \, dt \]

\[ \ln\left( \frac{a!}{b!} \right) \approx 10^{10} \psi(a) \]
\[ \zeta(p) = \sum_{n=1}^{\infty} \frac{1}{n^p} \]

\[ \zeta(a, p) = \sum_{n=0}^{\infty} \frac{1}{(n + a)^p} \]

\[ y'' = xy \]
\[ x^2 y'' + xy' + \left( x^2 = a^2 \right) y = 0 \]

\[ x^2 y'' + xy' + \left( x^2 = a^2 \right) y = \frac{4 \left( \frac{x}{2} \right)^{a+1}}{\sqrt{\pi} \left( a + \frac{1}{2} \right)} \]
\[
\begin{aligned}
x' &= x^2 - 2x - y + 0.5 \\
y' &= x^2 + 4y^2 - 4
\end{aligned}
\]

\[
\begin{align*}
exp(n, x) &= \int_1^n \frac{e^{-xt}}{t^n} \, dt & \exp(x) &= \int_1^\infty \frac{e^{-xt}}{t^n} \, dt \\
expi(x) &= \int_{-\infty}^x \frac{e^t}{t} \, dt & \dawson(x) &= e - x^2 \int_0^x e^{-t^2} \, dt \\
erf(x) &= \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} \, dt & \erfc(x) &= \frac{2}{\sqrt{\pi}} \int_x^{\infty} e^{-t^2} \, dt \\
spen(x) &= -\int_1^x \frac{\log t}{t-1} \, dt
\end{align*}
\]
\[
fresnel(z) = \int_0^z \sin\left(\frac{\pi}{2} t^2\right) dt
\]
\[
sici(x) = \int_0^x \frac{\sin t}{t} dt, \quad \gamma + \log x + \int_0^x \frac{\cos t - 1}{t} dt
\]
\[
shichi(x) = \int_0^x \frac{\sinh t}{t} dt, \quad \gamma + \log x + \int_0^x \frac{\cosh t - 1}{t} dt
\]
\[
\gamma = \lim_{n \to \infty} \left( \sum_{k=1}^{n} \frac{1}{k} - \log n \right)
\]
\[
\text{ellipkm1}(m) = \int_0^{\pi/2} \frac{d\theta}{\sqrt{1 - m \sin^2 \theta}} \quad \text{ellipe}(m) = \int_0^{\pi/2} \sqrt{1 - m \sin^2 \theta} d\theta
\]
\[
\text{ellipinc}(m, n) = \int_0^n \frac{d\theta}{\sqrt{1 - m \sin^2 \theta}} \quad \text{ellipeinc}(m, n) = \int_0^n \sqrt{1 - m \sin^2 \theta} d\theta
\]
\[ \text{gammainc}(a, x) = \frac{1}{\Gamma(a)} \int_{0}^{x} e^{-t} t^{a-1} \, dt \]
\[ \text{gammaincc}(a, x) = \frac{1}{\Gamma(a)} \int_{x}^{\infty} e^{-t} t^{a-1} \, dt \]
\[ \text{betainc}(a, b, c) = \frac{\Gamma(a + b)}{\Gamma(a) \Gamma(b)} \int_{0}^{x} t^{a-1} (t-1)^{b-1} \, dt \]

\[ \frac{dy}{dt} = f(t, y), \quad y(t) = (y_1(t), \ldots, y_n(t)), t \in \mathbb{R} \]

\[ y' = -20y, \quad y(0) = 1 \]
\begin{align*}
\frac{dx}{dt} &= \sigma(y - x) \\
\frac{dy}{dt} &= rx - y - xz \\
\frac{dz}{dt} &= xy - bz
\end{align*}
Chapter 5
\[ L(x, y) = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} b_1 \\ b_2 \end{pmatrix} \]

\[ f(z) = \frac{az + b}{cz + d} \]
Alonso Quijano, the protagonist of the novel, is a retired country gentleman nearing fifty years of age, living in an unnamed section of La Mancha with his niece and housekeeper. While, mostly a rational man of sound reason, his reading of books of chivalry in his youth has had a profound effect on him, leading to the distortion of his perception and the wandering of his mental faculties. In general, the imaginary word of the books of chivalry to be true, though, for the most part, the content of those books is clearly fiction. Otherwise, his wits, in regards to anything other than chivalry, are intact. He decides to cut as a knight errant in search of adventure. He dons an old suit of armour, renames himself “Don Quixote de la Mancha,” and names his skinny horse “Rocinante.” He designates a neighboring farm girl as his lady love, renaming her Dulcinea del Toboso, while she knows nothing about this.
Chapter 6
Chapter 7
\[ \nabla^2 \phi(x, y) = 0 \]
\[
\phi(x = 0, y) = 0; \phi(x = 1, y) = 1; y \neq 0 \text{ and } y \neq 1
\]
\[
\phi(x, y = 0) = \phi(x, y = 1) = 0
\]

\[
\phi(x, y) = 2 \sum_{n=1}^{\infty} \left[ \frac{1}{n\pi} - \frac{\cos(n)}{n\pi} \right] \frac{\sinh(n \pi x)}{\sinh(n \pi)} \sin(n \pi y)
\]