Discrete Statistical Distributions

0.4 Percent Pcint Function (Inverse CDF)

1 Bernoulli

A Bernoulli random variable of parameter p takes one of only two values $X = 0$ or $X = 1$. The probability

$$M(t) = $$

7 Zipf (Zeta)

A random variable has the zeta distribution (also called the zipf distribution) with parameter $\alpha > 1$ if it's probability mass function is given by

$$p(k;\alpha) = \frac{1}{\zeta(\alpha)\,k^{\alpha}} \quad k \geq 1$$

where

$$\zeta(\alpha) = \sum_{n=1}^{\infty} \frac{1}{n^{\alpha}}$$

is the Riemann zeta function. Other functions of this distribution are

$$\begin{aligned}
F(x;\alpha) &= \frac{1}{\zeta(\alpha)} \sum_{k=1}^{x} \frac{1}{k^{\alpha}} \\
\mu &= \frac{\zeta_1}{\zeta_0} \quad \alpha > 2 \\
\mu_2 &= \frac{\zeta_2\zeta_0 - \zeta_1^2}{\zeta_0^2} \quad \alpha > 3 \\
\gamma_1 &= \frac{\zeta_3\zeta_0^2 - 3\zeta_0\zeta_1\zeta_2 + 2\zeta_1^3}{[\zeta_2\zeta_0 - \zeta_1^2]^{3/2}} \quad \alpha > 4 \\
\gamma_2 &= \frac{\zeta_4\zeta_0^3 - 4\zeta_3\zeta_1\zeta_0^2 + 12\zeta_2\zeta_1^2\zeta_0 - 6\zeta_1^4 - 3\zeta_2^2\zeta_0^2}{(\zeta_2\zeta_0 - \zeta_1^2)^2}.
\end{aligned}$$

$M(t)$.25Td19.2f5093.338TF149.963963Tf6.7540Td[(()]T

is the Lerch Transcendent. Also define $r = \log(1 - p)$

$$\mu = -\frac{p}{(1-p)\,r}$$

$$\mu_2 = -\frac{p\,[p + r]}{}$$

10 Discrete Laplacian

Defined over all integers for $a > 0$

$$p(k) = \tanh\left(\frac{a}{2}\right) e^{-a|k}$$