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Erlang Distribution

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Given a Poisson distribution with a rate of change λ, the distribution function $D(x)$ giving the waiting times until the hth Poisson event is

$$D(x) = 1 - \sum_{k=0}^{h-1} e^{-\lambda x} \frac{(\lambda x)^k}{k!} \quad (1)$$

$$= 1 - \frac{\Gamma(h, x\lambda)}{\Gamma(h)} \quad (2)$$

for $x \in [0, \infty)$, where $\Gamma(x)$ is a complete gamma function, and $\Gamma(a, x)$ an incomplete gamma function. With h explicitly an integer, this distribution is known as the Erlang distribution, and has probability function

$$P(x) = \frac{\lambda (\lambda x)^{h-1}}{(h-1)!} e^{-\lambda x}. \quad (3)$$

It is closely related to the gamma distribution, which is obtained by letting $\alpha \equiv h$ (not necessarily an integer) and defining $\theta \equiv 1/\lambda$. When $h = 1$, it simplifies to the exponential distribution.

Evans *et al.* (2000, p. 71) write the distribution using the variables $b = 1/\lambda$ and $c = h$.

SEE ALSO:
Exponential Distribution, Gamma Distribution, Poisson Distribution

REFERENCES:
Evans, M.; Hastings, N.; and Peacock, B. "Erlang Distribution." Ch. 12 in *Statistical Distributions, 3rd ed.* New York: Wiley, pp. 71-73, 2000.

Referenced on Wolfram|Alpha: Erlang Distribution

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