Factsheet: Poisson distribution

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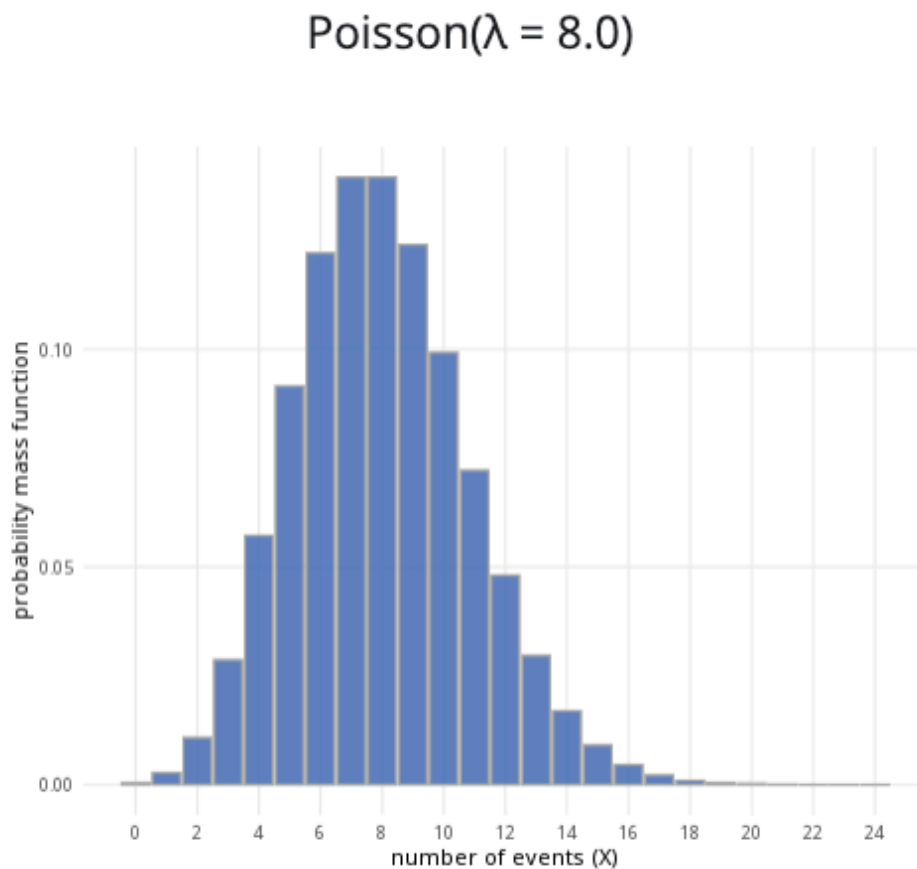
Summary

A factsheet for the Poisson distribution.

Figure 1: An example of the Poisson distribution with $\lambda = 8$.

Where to use: The Poisson distribution is used when a specific event occurs at some rate λ, and you are counting X, the number of times this event occurs in some interval.

Notation: $X \sim \mathrm{Poisson}(\lambda)$ or $X \sim \mathrm{Pois}(\lambda)$.

Parameter: λ is the integer number of times an event occurs within a specific period of time.

Quantity	Value	Notes
Mean	$\mathbb{E}(X) = \lambda$	

Quantity	Value	Notes
Variance	$\mathbb{V}(X) = \lambda$	
PMF	$\mathbb{P}(X = x) = \dfrac{\lambda^x e^{-\lambda}}{x!}$	
CDF	$\mathbb{P}(X \leq x) = \displaystyle\sum_{i=1}^{\lfloor x \rfloor} \dfrac{\lambda^x e^{-\lambda}}{x!}$	$\lfloor x \rfloor$ the floor function

Example: Customers enter Cantor's Confectionery at an average rate of 20 people per hour, and you want to see the likelihood that X number of customers walks in. This can be expressed as $X \sim \mathrm{Pois}(20)$.

Further reading

This interactive element appears in Overview: Probability distributions. Please click this link to go to the guide.

Version history

v1.0: initial version created 04/25 by tdhc and Michelle Arnetta as part of a University of St Andrews VIP project.

- v1.1: moved to factsheet form and populated with material from Overview: Probability distributions by tdhc.