Poisson versus Normal Distribution

You know that the normal distribution describes continuous data which have a symmetric distribution, with a characteristic "bell" shape. It can represent negative as well as positive real values and is fully characterized by two unrelated parameters, mean and variance. The Poisson distribution is used when the variable represents a nonnegative count of some relatively rare event and is skewed to the right. It is fully defined by one parameter, the mean (λ), which must be positive.

An unusual property of the Poisson distribution is that the mean and variance are equal. This can be a serious limitation because count observations often exhibit variability exceeding that predicted by the Poisson distribution. This leads to overdispersion, which you'll learn more about later. The graph shown here illustrates that for rare events, in contrast to a normal distribution, the Poisson distribution is highly skewed. But, as the mean (λ), increases, the skewness decreases, and the distribution becomes more bell-shaped. It starts to approximate the normal distribution.

As a discrete distribution, the Poisson distribution might be more conventionally represented by a bar chart. The graph shown here represents a continuous approximation to the bar chart for the Poisson distribution.

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