Section 5.3 — Poisson Distribution

Chris Godbout

Outline

Introduction

Examples

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Definition

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Requirements

1. The random variable *X* is the number of occurrences of an event over some interval.
2. Each success must be independent of other successes.
3. The mean number of successes in a given interval must be constant

Probability and Parameters

Probability

For a Poisson random variable X, the probability of obtaining exactly x successes in any particular interval is given by

$$P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

where $e \approx 2.718282$ and λ is the mean number of successes.

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The parameters are:

- The mean is $\mu = \lambda$.
- The standard deviation of $\sigma = \sqrt{\lambda}$.

Examples

Pizza

A pizza place receives an average of 20 pizza orders per hour during lunch. What is the probability that they receive exactly 23 during a given lunch? What is the probability that they receive less than 10?

Spiders!

On average, I kill 2 spiders a week in my house. What is the probability that I will kill 5 spiders in the next two weeks? What is the probability that I will kill no more than 4 in the next two weeks?

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What is the probability that a randomly selected corps-year has 0 deaths? What about 1? 2? 3? 4?

Actual numbers for deaths by horse-kick.

The actual numbers were

Number of deaths	Number of corps-years
0	144
1	91
2	32
3	11
4	2