# Notes for "Statistics Informed Decisions using Data"

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**Abstract**

These notes covers several chapters from "Statistics Informed Decisions using Data," focusing on practical applications.

# 1 Probability Distributions

**Poisson distribution** A random variable $X$, the number of successes in a fixed interval, follows a Poisson process if:

- The probability of 2 or more successes in a sufficiently small subinterval, is 0.

- The probability of success is the same for any two intervals of equal length.

- The number of successes in any interval is independent of the number of successes in any other intervals, as long as said intervals do not overlap.

A Poisson process is described by:

$$P(x) = \frac{(\lambda t)^x}{x!} \exp(-\lambda t), \quad x = 0, 1, ... n \tag{1}$$

Where $\lambda$ is the average number of occurrences of the event in an interval of length 1.

# 2 Inference

## 2.1 Hypothesis Tests

We try to find support for the **alternative hypothesis**, $H_1$. The **null hypothesis**, $H_0$, is assumed true until refuted by evidence, and assumes no change/difference/etc. Three ways to set up null and alternative hypotheses:

1. Two-tailed test: equal versus not equal

$$H_0 = x$$
$$H_1 \neq x$$

2. Left-tailed test: equal versus less than

$$H_0 = x$$
$$H_1 < x$$

3. Right-tailed test: equal versus greater than

$$H_0 = x$$
$$H_1 > x$$