STAT 270 Lecture 15
Fall 2015
14 October 2015

- We finished 'Discrete Distributions'.
- In the text we have finished Chapter 4; it is up to you to read about Poisson processes.
- Problems from text: 4.12, 4.13, 4.14, 4.15, 4.17, 4.19, 4.22.
- Midterm Friday covers a bit of Chapter 3 and all of Chapter 4.
- Handwritten slides.
- Key jargon, ideas:
  - The Binomial Distribution:
    - Repeat some random experiment a fixed number, n, of times.
    - Each time record whether something happens ('Success', S) or doesn't happen ('Failure',F).
    - Make sure the outcomes are *independent*.
    - Make sure p, the probability of S, is the same every time.
    - Let X be the number of Successes in the n trials.
    - Then X has a Binomial(n, p) distribution.
  - If X has a Binomial(n, p) distribution:
    - $\mathrm{E}(X) = np$.
    - $\mathrm{Var}(X) = np(1-p)$. Sometimes we use the shorthand $q = 1-p$.
    - We can write $X = X_1 + \cdots + X_n$ where the X_i are Bernoulli random variables. Use this to compute means and variances.
  - If we have a sequence $X_n, n = 1, 2, \ldots$ and each X_n has a Binomial distribution with n trials and success probability p_n such that

$$\lim_{n\to\infty} np_n = \mu$$

    then

$$\lim_{n\to\infty} P(X_n = k) = \frac{\mu^k}{k!}e^{-\mu} \quad k = 0, 1, \ldots.$$

  - The pmf

$$p(k) = \frac{\mu^k}{k!}e^{-\mu} \quad k = 0, 1, \ldots$$

    is called the Poisson distribution with mean μ.
  - If X has a Poisson(μ) distribution then

$$\mathrm{E}(X) = \mu$$

    and

$$\mathrm{Var}(X) = \mu.$$