Abstract

This document contains the typed notes for the course "Statistics For Applications" offerred by MIT. These notes are meant to be a condensation of the video lectures posted on MIT OCW YouTube channel and is used strictly as a reference only. One section will be dedicated for each video lecture for ease of referencing. The official pre-requisites of the course are as follows:

- Probability (18.600 or 6.041)
- Calculus 2
- Basic Linear Algebra

Contents

1 Lecture 1: Introduction

This first lecture is largely about the logistics of the course and thus the majority of this section is empty.

1.1 Near End-of-Lecture Exercise: Exam Scores

Consider the test scores of 15 students represented by X_i, assuming that $X_i \sim \mathcal{N}(\mu, \sigma^2)$. Suppose the list of scores are given by

$$L = \{65, 41, 70, 40, 58, 82, 76, 78, 59, 59, 84, 89, 134, 51, 72\}. \tag{1}$$

We want to find an estimator for μ. An estimator for μ is the average

$$\hat{\mu} = \frac{1}{n} \sum_{i=1}^{15} X_i = 67.5. \tag{2}$$

An estimate for σ is calculated by the variance defined by

$$\sigma^2 = \mathbb{E}\left[(X - \mathbb{E}[X])^2\right]. \tag{3}$$

And thus

$$\hat{\sigma^2} = \frac{1}{n} \sum_{i=1}^{n} (X_i - \hat{\mu})^2 = 18. \tag{4}$$

The primary takeaway here is that *estimators are obtained by replacing expectation values with averages.*