

# 1 Overview and Introduction

Lecture 1:

- Introductions
- Syllabus
- Course
  1. Probability Concepts (This semester)
    - Basic Probability
    - Discrete Probability Distributions
    - Continuous Probability Distributions
    - Multivariate Probability Distributions
    - Transformations of Random Variables
  2. Inferential Statistics (Next Semester)
    - Central Limit Theorem
    - Estimation
    - Hypothesis Testing
    - Evaluating Estimators

## 2 Statistics Concepts

### 2.1 Why do we do Statistics?

- When we use statistics, we usually want to know something about a population
  - UCONN students
  - CT residents
  - US population
- But getting this information is not easy
  - Too expensive
  - Too time consuming
- So we take a small sample of the population and use the characteristics of the sample as an approximation of the desired characteristics of the population (This is called inferential statistics)

- In order to understand what our sample tells us about the population of interest, we need to know about the probability *Distribution* of our sample
- Defininton: A probability *Distribution* is is a phrase we use to refer to how likely different possible outcomes of a sample are in relation to other possible outcomes

## 2.2 What kinds of things do we want to know?

- Usually we want to know about an attribute that every member of the population has
  - Height
  - Gender
  - Weight
  - Residency
- Each of these characteristics is called a *variable*
  - In general, a variable is a value that is unknown
  - For our purposes, a variable is some attribute of interest that every memeber of the population has

## 2.3 Parameter Vs. Statistic

- When we are interested in a population we often take a sample of the population (a small subset of the population), and use our measurements of the distirbution of the sample to estimate the measurements of the population.
- because we are typically talking about the same kind of measurement of both populations and samples, we use the following definitnons:
  - Defininton: A *Parameter* is a measurement of a population. This is often unkown to us, and always will be. that is why we estimate it.
  - Defininton: A *Statistic* is a measurement of a sample. This is a value we usually know (after collecting a sample) and use it to measure the parameter of interest