Lecture notes: L1

Monday: August 24, 2020 HW: Casually read Chapter 1, if you have the time.

Chapter 1

What is statists: Def (pg 2)

*The objective of statistics is to make an inference about a population based on information contained in a sample from that population and to provide an associated measure of goodness for the inference.*

When we make an inference, we are trying to partially or completely describe a phenomenon or physical object. We can do this numerically.

Ex. Characterize the following ten measurements: (2.1, 2.4, 2.2, 2.3, 2.7, 2.5, 2.4, 2.6, 2.6, 2.9)

*Frequency table*



In the above example, we used statistics to describe the data. Probability is the theory behind statistics. In looking at the graph, we may say that it “looks” (sort of) like a normal distribution (bell shaped curve). We would then assume that the underlying distribution is normal and use the properties of the normal distribution.

Section 1.3: Numerical methods:

* Measure of central tendency, mean:

(numerical) ( if talking about the population, i.e. in theory)

* Measure of dispersion or spread, standard deviation:

 (numerical) ( if talking about the population, in theory)

* In Probability theory, we have *Tchebysheff’s theorem* would say that at least 75% of a set of measurements will be within of for any of distributions.

However, for many distributions, approximately 95% of a set of measurements will be within of . This last statement comes from the normal distribution (Bell curve) in which many data sets seem to follow. We therefore have the:

**Empirical Rule (or 68, 95, 99.7 rule)**

For a distribution of measurements that is approximately normal (bell shaped), it follows that the interval with end points

contains approximately 68% of the measurements.

contains approximately 95% of the measurements.

contains approximately almost all (99.7%) of the measurements.

1.5 Theory and Reality (page 14)

*“Theories are conjectures proposed to explain phenomena in the real world. As, such, theories are approximations or models for reality.”*

In this course *“We will not regard statistics as a branch of mathematics but as an area of science concerned with developing a practical theory of information. We will consider statistics as a separate field, analogous to physics- not as a branch of mathematics but as a theory of information that utilizes mathematics heavily.”* (page 15)