Outline for Master’s project

Michael Lanier 1/17/2016

The Use of Likelihood Inference for Quantifying Statistical Information

**Introduction**

Start with a simple binomial X~BIN(n=10, theta), observe x=8 successes. Recall that the maximum likelihood estimation (MLE) concludes that theta hat is .8. Likelihood inference is based on the same reasoning, but its focus in on how well the data supports the parameters across the entire parameter space.

Show Plot 1

LR(theta)= L(theta)/L(theta hat) …

Often, the MLE is focus point of likelihood inference leading to such a degree that the MLE is thought to contain all the information. This plot shows us this is not the case as there are a range of values that are very nearly as likely. Referring to the likelihood function can allow us to quantify the amount of information with which we are dealing.

Example 2.

Plot

Obviously there is less information in our first example about the parameter and this conclusion could not be obtained from the MLE along. Not only does the likelihood function quantify information, it is not dependent on the intention of the experimenter. This is known as the likelihood principal and will be illustrated with the following examples:

Example 2.3 Plot 3, 4

Example done on 1/12 with binomial and geometric

The case is therefore strong that the likelihood function is an appropriate way to model data. This is often analytically complex due to the fact that our likelihood is not only dependent on the parameter of interest, but all other parameters (often called nuisance parameters).  
**Plug in likelihood  
Profile Likelihood**

**Likelihood intervals**

**Likelihood ratio test**

**Wald statistics**

**Conclusion**