Math 29 Course Paper

Date Assigned: October 25 Date Due: November 19

The probability course paper is your opportunity to explore a probability-related topic of your choosing. It may be a topic we will not cover in class, or a more in-depth look at a topic we have studied briefly. You will need to do some research on your topic of interest and include appropriate references culminating in a formal write up of 4-8 pages discussing the topic and what you have learned. Possible topics are listed below. You may choose one of these or brainstorm your own topic, in which case you should check with me to be sure it is an appropriate and manageable topic. The formal write up may be entirely mathematical derivations, or entirely a discussion of an application or a mixture of both. It will depend on what you choose to investigate. You may NOT write a historical paper on a statistician’s life, but you may briefly investigate a statistician to come up with a method or application to further investigate. For example, you cannot write a summary of the life of Sir Thomas Bayes, but if you found out he is the “father” of Bayesian statistics, and that interested you, you could investigate Bayesian statistics.

Details: 10% of course grade, 4-8 pages, typed, 1.5 or double spaced, turn in a hard copy, no title page is necessary

Possible Topics:

* Describe and discuss applications of the t distribution, a continuous distribution we won't be covering this semester.
  + Other distributions: F, Weibull, chi-square, non-central t, Cauchy, Beta-Binomial (ask me for a related article), and many more (see class handout)
* Explore use of the hypergeometric distribution in capture-recapture sampling.
* Take a more in-depth look at Markov Chains.
* Learn a little about Bayesian probability (what is a prior distribution?).
* Investigate 2 class classification and the naïve Bayes rule in this context.
* Investigate some basics of stochastic processes or Brownian motion.
* Investigate some properties of mixture distributions.
* Investigate the higher level *exponential family* of distributions and basic properties.
* Explore the use of probability in detecting bias in jury selection (ask me for article).
* Explore additional examples of Simpson’s Paradox.
* Investigate a different Central Limit Theorem than the one in the text (I can give you names).
* Explore characteristic functions (generalized versions of mgfs).
* Explore probability generating functions and/or central moments.
* Investigate the Probability Integral Transform and how random numbers are generated by computer.