

Quantitative Methods for Lawyers

Problem Set #4

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Instructions: For this assignment, you may **NOT** work in groups. Each student must do his/her own work and submit his/her own problem set. Do not speak to any member of this course or any outside party about this assignment. Please show all of your work (**including Stata output where applicable**) in order to receive credit.

Due at 2pm - April 23, 2012. Please submit a **hard copy** either to me or to Sue Nelson in Room 465. **Retain a photocopy or scanned copy for your records.**

Problem 1 *Worth 20pts*

Imagine you work at a computer repair shop. Over the years you have become experienced at diagnosing problems associated with different types of hardware. In particular, when a “TX1000” brand computer stops working, it is due to a cooling fan problem 30% of the time. If the cooling fan is broken, there is a 45% probability that the hard drive is also broken. If the cooling fan is okay, there is only a 5% chance that the hard drive is broken.

A customer brings you a computer that is not working. After a quick investigation, you determine that the hard drive is broken. What is the probability that the computer has a bad cooling fan?

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Problem 2 *Worth 10pts*

How many possible Four Grams could in theory be realized in a corpus than contains millions of total words and 11,000 unique words?

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Problem 3 *Worth 20pts*

Jones and Smith are currently locked in an intense race for Congress. A local talking head recently claimed that 56% of the likely voters support Jones while only 44% support Smith. In order to test that proposition, you commission a poll that randomly sampled 1000 likely voters. In reviewing the results of the poll, you observe that the sampled population proportion was actually only 51% for Jones.

Assuming that the sampling was correctly obtained and that voter preferences are stable over the period in question, is there sufficient evidence to conclude that the population proportion differs from the 56% that expert claimed? Please show all of your work.

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Problem 4 *Worth 30pts*

Statistical analysis has become an increasingly popular method to develop strategy in a number of domains including sports.

Imagine you are a high school basketball coach and the opposing team has a very tall and athletic player named Shaquille O'Beal. "Baby Shaq" (as he is known) is so good that players on other teams have lots of difficulty stopping him from scoring once he catches a pass. Indeed, throughout the high school season he made 56.6% of the shots he took (note: the average player in the league makes only 38% of his shots).

In basketball, when a player trying to make a shot is hit on the body by someone on the opposing team, thereby causing the player to miss the shot, the player gets to take two free shots from 15 feet away from the basket. These shots are called "foul shots."

Like his namesake, "Baby Shaq" does not shoot foul shots very well. In fact, he makes only 47.2% of his foul shots. Regular shots are worth two points. Foul shots are worth one point each. Because Shaq is less likely to make foul shots, one strategy is to foul him whenever he touches the ball. This strategy has been nicknamed the "hack-a-BabyShaq" plan (i.e. intentionally fouling BabyShaq). Let's see if - given the data - the Hack-A-BabyShaq is actually a sound approach.

Problems:

- (a) Draw a Decision Tree for the Hack-A Baby Shaq Question.
- (b) Please Evaluate whether the "Hack-a-BabyShaq" plan is sound. In doing so, please make specific reference to the expected number of points that are generated using "Hack-a-BabyShaq" plan versus not fouling Baby Shaq. For simplicity sake, assume that Baby Shaq takes 40 shots per game and that in each instance your players could foul BabyShaq before he could actually shoot his shot (i.e. assume "3 point plays" are not possible).

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Problem 5 *Worth 20pts*

Please visit this site: <http://www.ats.ucla.edu/stat/stata/dae/logit.htm>

Replicate all of the results contained on this page through the calculation of the odds ratios (i.e. through the “logit, or” command). Submit the output with your problem set.

The UCLA page describes all of the steps in their words but I would like you to go ahead and explain each step in your own words.

Finally, the UCLA page describes the interpretation of odds ratio for “gpa.” Please interpret the “gre” and “rank=2” terms. Assume you are explaining the substantive interpretation of these two terms to a jury - so please clearly state the substantive interpretation using plain language (to the extent possible).

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