

STAT 477/STAT 577

HW 6 - Module 2: Sections 6 and 7

1. In 1990, a random sample of 1,600 adults in the United States were asked whether or not they approved of the job George H.W. Bush was doing as president. One month later, the same people were asked the same question. The data are given in the file **Bushapproval.csv** in Canvas.
 - (a) Calculate the contingency table for the two approval ratings.
 - (b) Use the contingency table to calculate an estimate of the proportion of adults in the U.S. who approved of the job President Bush was doing for each time period.
 - (c) Explain why the two estimates you calculated in part (b) are not independent from each other.
 - (d) Use McNemar's test to determine if the proportion of adults in the U.S. who approved of the job President Bush was doing is different between the two time periods.
 - (e) Calculate a 95% confidence interval for the difference in the proportion of adults in the U.S. who approved of the job President Bush was doing between the two time periods. Interpret this confidence interval.
2. During the 1970's, 80's and 90's, Gene Siskel and Roger Ebert worked as film critics for the Chicago Tribune and Chicago Sun Times, respectively. In their syndicated TV show, *At the Movies*, they presented their reviews of recently released movies using a Thumbs Up/Thumbs Down system. This system also allowed them to give a mixed review. Their reviews for 160 movies from April 1995 through September 1996 are given in the file **AttheMovies.csv** in Canvas.
 - (a) Calculate the contingency table of the reviews from Siskel and Ebert. Make sure to use an appropriate order for the categories of the two variables.
 - (b) Calculate the distribution of reviews for Siskel and the distribution of reviews for Ebert on these 160 movies. Who gave a higher percentage of movies a Thumbs Up review? Who have a higher percentage of movies a Thumbs Down review?
 - (c) Use the extension to McNemar's test to determine if there was a difference in the distribution of reviews between the two critics.
 - (d) On what proportion of the movies did Siskel and Ebert agree on their reviews?
 - (e) Calculate Cohen's kappa for these data.
 - (f) Calculate weighted kappa for these data using the squared weight function.
 - (g) Based on your answers to the previous three parts, did Siskel and Ebert seem to agree on their reviews for movies? Explain your answer.
3. In educational assessment, open-ended questions (called free-response questions) tend to provide more information about learning than multiple choice questions. However,

these open-ended questions are more difficult and time consuming to grade than multiple choice questions. In an on-going project, researchers at a large university are studying the accuracy of computer scored open-ended responses by comparing them to person scored responses. In this example, the computer and a person scored the same 1,011 student responses to the same open-ended question. Each question was scored as either a 1 = minimal understanding of concept, 2 = moderate understanding of concept, or 3 = full understanding of concept. These scores can be found in the file **Scores.csv** in Canvas.

- (a) Calculate the contingency table for the scores from the computer and from the person.
- (b) On what proportion of the scores do the computer and person agree?
- (c) Calculate Cohen's kappa for these data.
- (d) Calculate weighted kappa for these data using the squared weight function.
- (e) Based on your previous answers, does there seem to be agreement on scores between the computer and the person. Explain your answer.