STAT 477/STAT 577
HW 7 - Module 3: Section 1

Like many of their species, wolf spiders are known to practice cannibalism, with female spiders eating male spiders either before, during or after mating. However, since cannibalism does not occur after every act of mating, researchers have been interested in determining factors associated with the occurrence of cannibalism. In one such study, 52 female-male pairs were measured and then observed mating. Does the size difference between the female and male spiders help explain whether or not cannibalism occurred? The file **wolfspiders.csv** contains information about the presence or absence of cannibalism for each pair and the size difference between the female and male spiders (in mm).

1. In what proportion of the 52 matings did cannibalism occur?
2. Write the equation for predicting the log odds of cannibalism from the size difference between the female and male spiders.
3. Write the equation for predicting the probability of cannibalism from the size difference between the female and male spiders.
4. Interpret the slope and intercept of the logistic regression equation.
5. Find the predicted probability of cannibalism for a size difference between the female and male spiders of -0.2mm and 0.4mm.
6. Find confidence intervals for the probability of cannibalism for a size difference between the female and male spiders of 0mm and 0.8mm. Interpret both intervals.
7. Test for the statistical significance of the size difference between the female and male spiders in predicting the probability of cannibalism. Report both the Wald test statistic and the likelihood ratio test statistic as a part of your answer.
8. Calculate the pseudo R^2 statistic for this logistic regression. Comment on its value.
9. Conduct a goodness of fit test using the Hosmer-Lemeshow test statistic with the number of groups set to 5. Does this model appear to fit the data?
10. Give the confusion table for the logistic regression model. Use this table to calculate the agreement, sensitivity, and specificity of the model. Comment on these values.
11. Graph the ROC curve for this logistic regression model. Calculate the area under the ROC curve and interpret this value.