Homework Sheet No. 5 Due Date: March 08, 2018 Maximum Points: 50

Theme: Combining biomarkers

Aneurysmal subarachnoid hemorrhage (aSAH) is a serious medical condition with bleeding occurring in the brain. There are several causes. Head trauma is one of them. Neurosurgeons, to begin with, focus on stopping the bleeding and preventing its reoccurrence. Even if successful in stopping bleeding, brain damage with cognitive impairment could occur subsequently. In the class I attempted to develop a diagnostic test to predict brain damage based on a single protein biomarker s100b. There are other ways to develop a prediction model. The one I have in mind in this exercise is combining several biomarkers. The biomarkers of interest are: s100b; log(ndka); gender; and age.

1. Write a short note on the biomarker ndka from internet sources (not more than 5 sentences). 2 points
2. Fit a logistic regression model with response variable ‘outcome’ and predictors s100b, log(ndka), gender, and age. Identify significant predictors. Identify the most significant predictor. Check goodness-of-fit of the model. Write the prediction equation. 3 + 3 +1 + 2 + 2 points
3. Obtain the confusion matrix of the model in Question 2. Spell out the accuracy of the prediction model. 3 + 1 points
4. Write formally the link function of the model, which we will use as a single biomarker X. 2 points
5. Get the non-parametric density curves of the biomarker X under each outcome in the frame. Comment on the densities. Comment. 3 + 1 points
6. Outline how a diagnostic test looks like for the biomarker X. 2 points
7. Invoke the ‘roc’ function with the link function X as a biomarker. Plot the ROC curve that comes with it. 8 points
8. Find a 95% confidence interval for AUC. Comment on the utility of the biomarker ‘X.’ 5 points
9. Develop a diagnostic test based on X. 6 points
10. Compare the biomarkers s100b and X. 6 points