**Problem Set #4 (Due November 12)**

ISLR, Chapter 8, #4, #5, #8, #10

Neural Networks Questions

1. From the simple neural network on the slides, start after the first forward pass (the error has already been calculated for you in the slide. Then use backpropagation to:
   1. Calculate the updated value for w8. Remember to show all your work. Your final answer should approximate the answer in the slides.
   2. Calculate the updated value for w4. Again, show your work. Your final answer should approximate the answer in the slides.
2. Using the credit default dataset (Default) in the ISLR package, where default (No and Yes) is the dependent variable and student, balance and income are the independent variables, do the following (this should be done using the caret package):
   1. Split the data into an 80% training set and 20% test set. Use the skim() function to show the structure of both datasets.
   2. Ensure that your data does not have missing values and standardize the data. Again, use skim() to show this has been done successfully.
   3. Fit a neural network model using “nnet” and the default train() function. Describe the selected neural network. How does this perform on the training data? Set up and apply the model to the test data. How does this perform on the test data?
   4. Fit the model again using 10-fold cross-validation and expanding the grid of values tested. Does this change the selected model? If so, how? What does this do to the accuracy in the training and test data?
   5. Using caret, fit a random forest and boosting model. Compare the results against those of the neural network. Which performs best?

Chapter 8:











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