

**Problem 1.** Please consider attached Excel file called `Reduced_Car_Data.xlsx`. This is the data set we used previously except that we have now removed several descriptive variables and left only: `Displacement`, `Horsepower` and `Weight`. Please build a regression model using TensorFlow that will predict the gasoline consumption (MPG - Miles Per Gallon) of cars based on three remaining variables. Please extract a percentage of data to serve as a training set and a percentage to serve as the test set. **Please report on the accuracy of your model.**

**Problem 2.** Consider the attached file `linear_regression.py` and the attached data file `fire_theft.xls`. Compare results of this original solution to a solution with new feature quadratic in  $X$  (the number of fires), and then with a solution cubic in  $X$ . For all three solutions, plot the diagram of predicted values vs. original target values. You can have three different diagrams or you can present all those curves and data on one diagram. Either way is fine. Perform these calculations using the same set of parameters. Present TensorBoard Graphs for all three solutions and point to any differences between them.

**Problem 3.** Consider the attached file `logistic_regression_mnist.py`. We have stated the results of that program in class but left many details unexplained. Search through TensorFlow API documentation and the Internet and describe for us what is the meaning and purpose of functions used in step 5 and step 6. Demonstrate that you can run the code successfully. Fetch for us the TensorBoard Graph. Vary parameter `batch_size` through values: 8, 64, 128, 256 and report and plot changes in the execution time and accuracy. Keep other parameters the same as in the original program. Similarly, vary parameter `learning_rate` through values 0.001, 0.005, 0.01, 0.02 and 0.05. Report and plot changes in the execution time and accuracy.

Please, describe every step of your work and present all intermediate and final results in a Word document. Please, copy past text version of all essential command and snippets of results into the Word document with explanations of the purpose of those commands. We cannot retype text that is in JPG images. Please, always submit a separate copy of the original, working scripts and/or class files you used. Sometimes we need to run your code and retyping is too costly. Please include in your MS Word document only relevant portions of the console output or output files. Sometime either console output or the result file is too long and including it into the MS Word document makes that document too hard to read. PLEASE DO NOT EMBED files into your MS Word document. For issues and comments visit the class Discussion Board.