

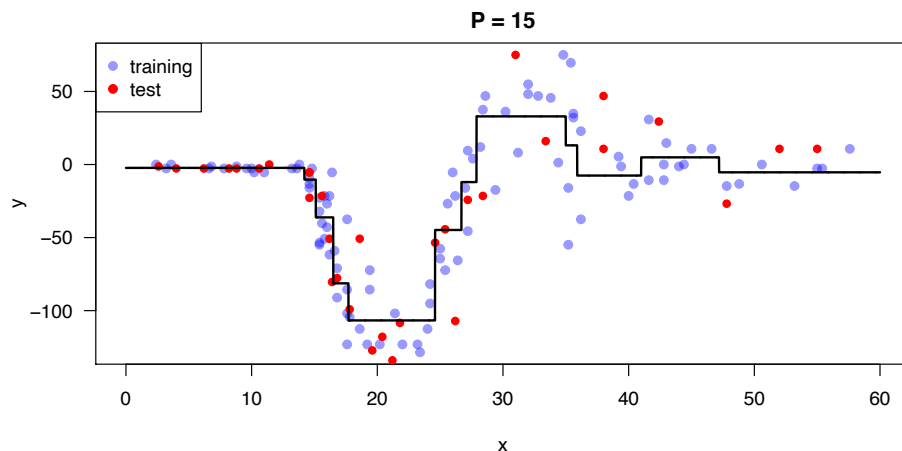
ENGR 421 / DASC 521: Introduction to Machine Learning

Homework 05: Decision Tree Regression

Deadline: December 7, 2020, 11:59 PM

In this homework, you will implement a decision tree regression algorithm in Matlab, Python, or R. Here are the steps you need to follow:

1. Read Sections 9.2.2 and 9.3 from the textbook.
2. You are given a univariate regression data set, which contains 133 data points, in the file named `hw05_data_set.csv`. Divide the data set into two parts by assigning the first 100 data points to the training set and the remaining 33 data points to the test set.
3. Implement a decision tree regression algorithm using the following pre-pruning rule: If a node has P or fewer data points, convert this node into a terminal node and do not split further, where P is a user-defined parameter.
4. Learn a decision tree by setting the pre-pruning parameter P to 15. Draw training data points, test data points, and your fit in the same figure. Your figure should be similar to the following figure.



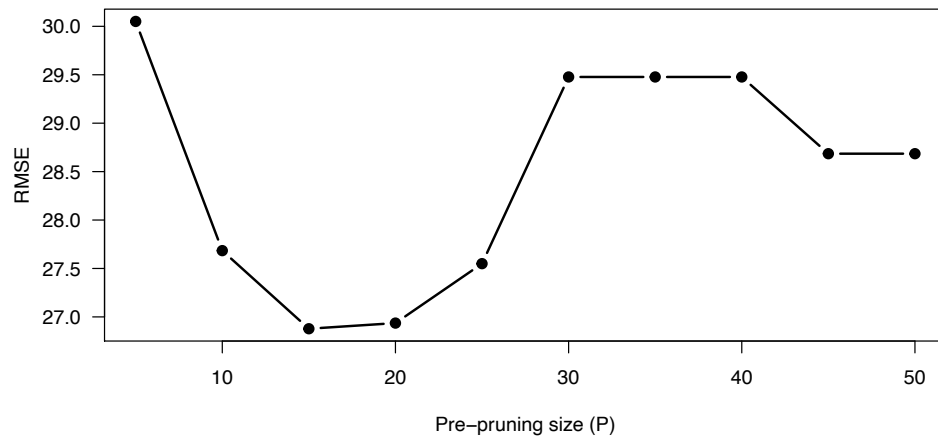
5. Calculate the root mean squared error (RMSE) of your regressogram for test data points. The formula for RMSE can be written as

$$\sqrt{\frac{\sum_{i=1}^{N_{test}} (y_i - \hat{y}_i)^2}{N_{test}}}.$$

Your output should be similar to the following sentence.

RMSE is 26.8777 when P is 15

6. Learn decision trees by setting the pre-pruning parameter P to 5, 10, 15, ..., 50. Draw RMSE for test data points as a function of P . Your figure should be similar to the following figure.



What to submit: You need to submit your source code in a single file (.m file if you are using Matlab, .py file if you are using Python, or .R file if you are using R) and a short report explaining your approach (.doc, .docx, or .pdf file). You will put these two files in a single zip file named as ***STUDENTID.zip***, where ***STUDENTID*** should be replaced with your 7-digit student number.

How to submit: Submit the zip file you created to Blackboard. Please follow the exact style mentioned and do not send a zip file named as ***STUDENTID.zip***. Submissions that do not follow these guidelines will not be graded.

Late submission policy: Late submissions will not be graded.

Cheating policy: Very similar submissions will not be graded.