UDACITY

PROJECT

Predicting Boston Housing Prices

A part of the Machine Learning Engineer Nanodegree Program

PROJECT REVIEW

CODE REVIEW

NOTES

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Requires Changes

2 SPECIFICATIONS REQUIRE CHANGES

Well done to complete this assignment, and you have done an excellent job to demonstrate very good understanding of the concepts and techniques. To make your work perfect, there are some changes needed, and I hope my comments can be helpful. Overall you are doing great. Keep it up!

Data Exploration

All requested statistics for the Boston Housing dataset are accurately calculated. Student correctly leverages NumPy functionality to obtain these results.

Your implementation is correct, but as also suggested by the previous reviewer, here we are required to use `numpy` to obtain the statistics, mainly to get familiar with `numpy`. Can you revise the code please?

Note on the standard deviation: here you are using pandas to get the std. By default, the std calculation in pandas assumes degree of freedom of 1 (sample standard deviation). So the `std` result from pandas is higher than that from `numpy.std()`. To align the result, you can set the degree of freedom in pandas to 0, i.e. `std_price = prices.std(ddof =0)`. **But, for the sake of this assignment, please use numpy.**

Student correctly justifies how each feature correlates with an increase or decrease in the target variable.

Nice reasoning!

Developing a Model

Student correctly identifies whether the hypothetical model successfully captures the variation of the target variable based on the model's R^2 score.
The performance metric is correctly implemented in code.

With this high R^2 value we may say that the model has done a good job to capture variation of the data.

Potential pitfall: We only have five points here, and it may be hard to draw conclusion that is statistically significant.

Student provides a valid reason for why a dataset is split into training and testing subsets for a model. Training and testing split is correctly implemented in code.

Well done splitting the data, and you are absolutely right on why we are doing it.

Without a testing set being reserved, there is no data to validate the model to ensure it is working well before being used in the general context. Therefore we need to train the model using training subset and test it over the testing subset to confirm whether the predictions being made on *unseen* data are correct.

Analyzing Model Performance

Student correctly identifies the trend of both the training and testing curves from the graph as more training points are added. Discussion is made as to whether additional training points would benefit the model.

I would not really agree that more data is always beneficial. We can see that there are actually two phases in the testing score with different rates of change. So the benefit of adding more data differs in these two phases. I suggest you to elaborate the two phases separately. Some questions to answer are, which phase benefits more from more data, and is there a limit beyond which adding more data does not really benefit much?

Student correctly identifies whether the model at a max depth of 1 and a max depth of 10 suffer from either high bias or high variance, with justification using the complexity curves graph.

You are right. Visually, for high bias, the training score is low and close to the test score. On the other hand, for high variance, there is a large gap between training and test scores.

Student picks a best-guess optimal model with reasonable justification using the model complexity graph.

I would pick max depth of 5 as well, as this seems to be the turning point between underfitting and overfitting. This is also equivalent to max validation score, as you pointed out.

Evaluating Model Performance

Student correctly describes the grid search technique and how it can be applied to a learning algorithm.

To be more precise, grid search is an exhaustive search algorithm, and it searches over *all* combinations of parameters we specify to find the optimum combination that yields the best performance.

Due to its exhaustive search nature, grid search can be computationally expensive, especially when data size is large and model is complicated. Sometimes we resort to randomized search in this case to search only *some* combinations of the parameters.
Ref: http://scikit-learn.org/stable/modules/generated/sklearn.grid_search.RandomizedSearchCV.html#sklearn-grid-search-randomizedsearchcv

Student correctly describes the k-fold cross-validation technique and discusses the benefits of its application when used with grid search when optimizing a model.

Nice description of k-fold cross validation, which improves accuracy and robustness of grid search by making use of all available data, as you pointed out.

Suggestion: You may note that the results from the k folds are averaged to yield the final evaluation of the model.

Student correctly implements the `fit_model` function in code.

Well done on implementing `fit_model`, which may be the most important code block for this assignment.

Suggestion on code: It would be good to set the `random_state` of `DecisionTreeRegressor` to ensure the result is reproducible.

Student reports the optimal model and compares this model to the one they chose earlier.

Good guess!

Student reports the predicted selling price for the three clients listed in the provided table. Discussion is made as to whether these prices are reasonable given the data and the earlier calculated descriptive statistics.

Well done and very nice justification. In addition to comparing the predictions against the mean and standard deviation, we may notice from the features that these three clients' selling prices actually represent three categories, and the predicted prices are close to the mean, min and max of the dataset respectively.

Student thoroughly discusses whether the model should or should not be used in a real-world setting.

Very nice and thorough discussion here.

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