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CSC3831 Predictive Analytics
Machine Learning House Price Prediction

First Model – Linear Regression

I implemented a grid search which attempts to find the best hyperparameters for the linear regression model on the dataset. The grid search takes in as hyper-parameters; fit_intercept, copy_x, and n_jobs to search over. The grid search returned a list of results for each set of hyperparameters.

Fit Intercept	Copy X	N jobs	MSE	R^2
TRUE	TRUE	1	0.37206	0.621966
TRUE	TRUE	2	0.37206	0.621966
TRUE	TRUE	3	0.37206	0.621966
TRUE	TRUE	4	0.37206	0.621966
TRUE	FALSE	-1	0.37206	0.621966
TRUE	FALSE	1	0.372047	0.621979
TRUE	FALSE	2	0.372047	0.621979
TRUE	FALSE	3	0.372047	0.621979
TRUE	FALSE	4	0.372047	0.621979
FALSE	TRUE	-1	0.372046	0.621981
FALSE	TRUE	1	0.372046	0.621981
FALSE	TRUE	2	0.372046	0.621981
FALSE	TRUE	3	0.372046	0.621981
FALSE	TRUE	4	0.372046	0.621981
FALSE	FALSE	-1	0.372046	0.621981
FALSE	FALSE	1	0.372046	0.621981
FALSE	FALSE	2	0.372046	0.621981
FALSE	FALSE	3	0.372046	0.621981
FALSE	FALSE	4	0.372046	0.621981

These results suggest that the choice of hyperparameters has a minimal impact on the model's performance. The MSE scores are relatively close together and the R^2 scores are all above 0.6, indicating that the model is performing relatively well, but there is still room for improvement.

Second Model – Multi-Layer Perceptron

Another grid search is performed to find the best hyperparameters for the multi-layer perceptron model. The different hyper-parameters tested were number of units, activation function, number of layers. The grid search returned 192 results; the top 10 models are shown below.

Units Per Layer	Activation Function	Layers	Optimizer	Epochs	Batch Size	MSE	MAE
128	relu	3	adam	10	64	0.203492	0.30959
512	relu	2	adam	10	64	0.204488	0.308437
256	relu	5	adam	10	8	0.204824	0.306975
512	relu	5	adam	10	32	0.205468	0.317355
256	relu	2	adam	10	32	0.206546	0.311331
128	relu	4	adam	10	16	0.206783	0.306865
256	relu	5	adam	10	16	0.2072	0.312006
512	relu	2	adam	10	32	0.207466	0.306897
128	relu	3	adam	10	16	0.207523	0.308899

The results show that more units, and layers does not necessarily lead to better performance. I then tested different epochs and optimizers with the hyperparameters of the best model from the first grid search.

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Units Per Layer	Activation Function	Layers	Optimizer	Epochs	Batch Size	MSE	MAE
128	relu	3	adam	10	64	0.203516	0.30981
128	relu	3	adam	10	64	0.214913	0.326542
128	relu	3	adam	25	64	0.215211	0.305607
128	relu	3	adamax	25	64	0.215381	0.321018
128	relu	3	adam	50	64	0.218082	0.303142
128	relu	3	adamax	10	64	0.219988	0.327635
128	relu	3	rmsprop	50	64	0.220686	0.304911
128	relu	3	rmsprop	10	64	0.23416	0.334149
128	relu	3	rmsprop	25	64	0.253742	0.348849
128	relu	3	adagrad	50	64	0.257711	0.35942
128	relu	3	adagrad	25	64	0.283529	0.379947
128	relu	3	adagrad	10	64	0.305943	0.395837

Unexpectedly increasing the epochs and changing the optimizer did not increase performance.

Third Model – Random Forest Regressor

Sample text