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Assignment #5

Multi-layer Perceptron (MLP) Regressor

Data Set:

<https://archive-beta.ics.uci.edu/dataset/186/wine+quality>

A csv of physicochemical metrics and quality score for a list of wines.

Input variables (based on physicochemical tests):	Output variable (based on sensory data):
1 - fixed acidity 2 - volatile acidity 3 - citric acid 4 - residual sugar 5 - chlorides 6 - free sulfur dioxide 7 - total sulfur dioxide 8 - density 9 - pH 10 - sulphates 11 - alcohol	12 - quality (score between 0 and 10)

The data was initially separated into 2 lists separated into red and white wines. Lists have been combined with 2 Booleans to specify if red or if white.

The data is randomized and split before the network is trained. Each test case gets trained on the same split but that split will be regenerated each time the program as a whole is run.

Test Parameters:

In order to test the effect of changing the size and shape of the hidden network I created the network with the following parameters:

Case 1: 1 layer, size 2048

Case 2: 10 layers, sizes 1024, 512, 256, 128, 64, 32, 16, 8, 4, 2

Case 3: 1 layer, size 256

Results

case 1

MLPRegressor(hidden_layer_sizes=(2048,), max_iter=10000)

training set data:

MSE: 0.5221522163355636

MAE: 0.5602819533135875

R²: 0.30932234325638663

testing set data:

MSE: 0.5243529019781219

MAE: 0.5535972469494601

R²: 0.3336989539994871

case 2

MLPRegressor(hidden_layer_sizes=(1024, 512, 256, 128, 64, 32, 16, 8, 4, 2),
max_iter=10000)

training set data:

MSE: 0.4999432856942407

MAE: 0.5561452790774377

R²: 0.33869924082426484

testing set data:

MSE: 0.518843611781777

MAE: 0.5590561002992174

R²: 0.3406996701330237

case 3

MLPRegressor(hidden_layer_sizes=256, max_iter=10000)

training set data:

MSE: 0.5270044448775667

MAE: 0.560927568332522

R²: 0.3029040504012983

testing set data:

MSE: 0.5309398062304539

MAE: 0.5541446529995653

R²: 0.32532890173759044
