Neural Network Writeup

Neural network with 2 hidden layers class was developed as a group collaboration. Leave one out cross validation was created by me and Brandon.

neural_hw3.py → Neural network class and other functions
loo_wdbc_kearney.py → data input, leave one out, and results

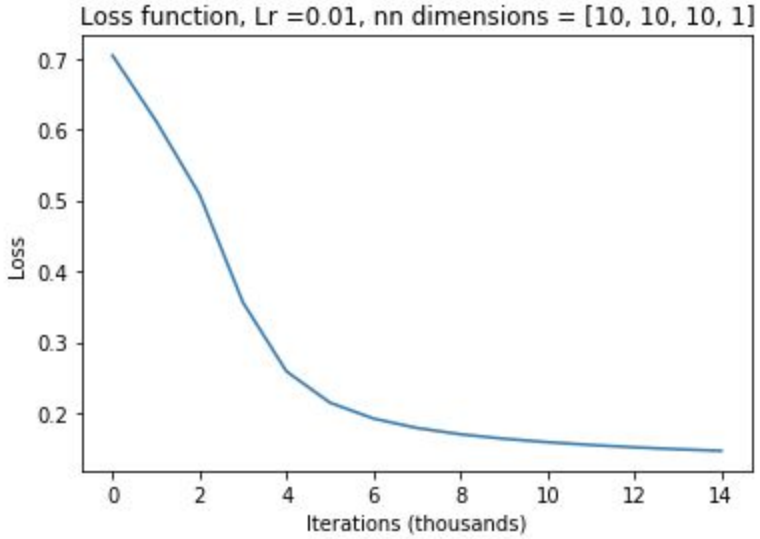
Primary features
Change number of neurons for each layer (input, hidden 1, hidden 2, output
self.dims = [10, 10, 10, 1]

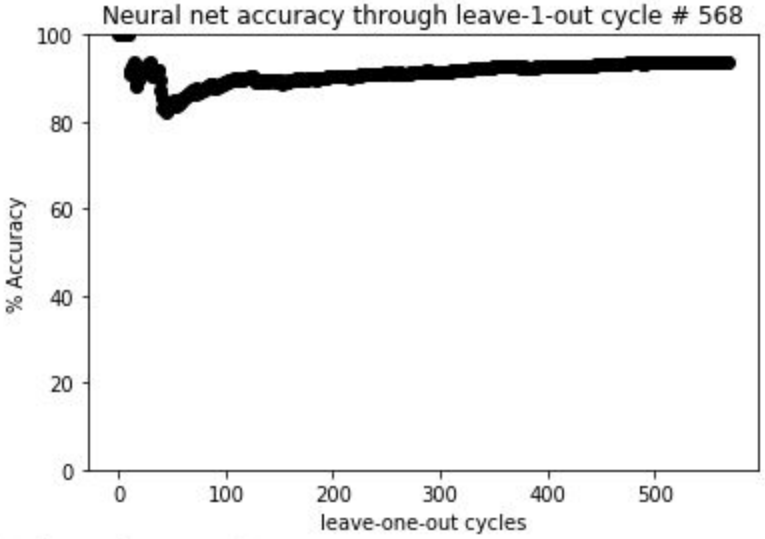
Choose learning rate
self.lr = 0.01

Choose number of iterations for gradient descent
def gd(self, X, Y, iter=15000):

Results analysis

I ran the neural net class twice on the same breast cancer dataset using different #neurons and #iterations. Both leave-one-out cross validations had about a 2 hour runtime. Using 10-neuron hidden layers (page 2) and 15,000 iterations, there was an average final loss of 0.144. The neural net had an error rate of 93.67%, although most of the incorrect predictions were distributed within the first 150 testing samples. With 15-neuron hidden layers and increased gradient descent iterations (25,000), the accuracy increased to 94.20% (page 3).



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Cycle number:  568
average loss:  0.14435725919124334
Total accuracy:  93.67311072056239
Incorrect predictions, sample #:  [10, 16, 31, 38, 39, 40, 41, 44, 54,
73, 89, 112, 126, 128, 135, 146, 152, 171, 184, 205, 215, 238, 255,
263, 290, 297, 363, 375, 379, 413, 421, 489, 514, 541, 558, 560]
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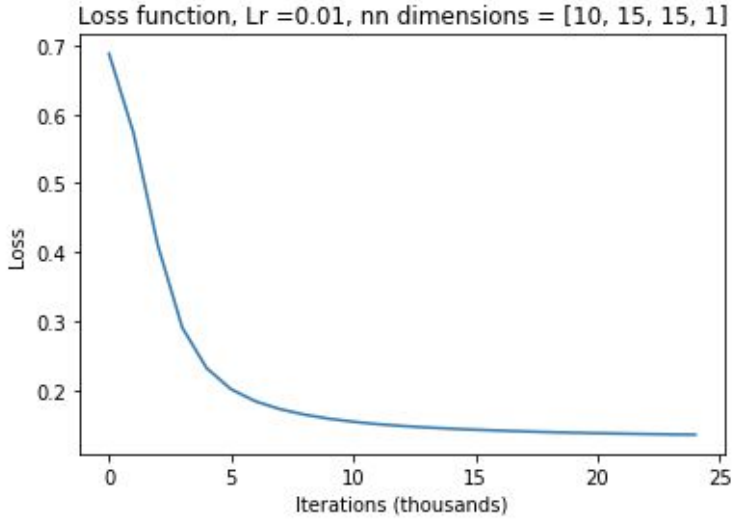

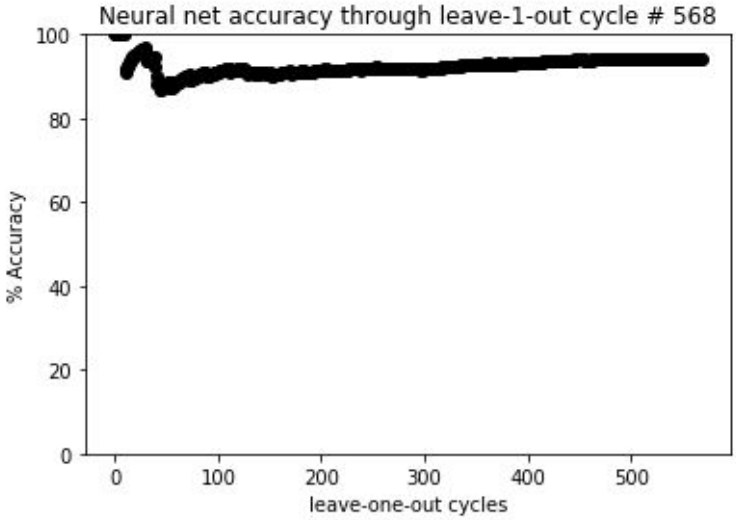


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Cycle number:  568
average loss:  0.13436725250212905
Total accuracy:  94.20035149384886
Incorrect predictions, sample #:  [10, 31, 39, 40, 41, 44, 54, 73, 89, 112, 126, 128,
135, 146, 152, 171, 184, 205, 215, 238, 255, 263, 275, 290, 297, 363, 379, 455, 489, 514,
528, 541, 560]
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