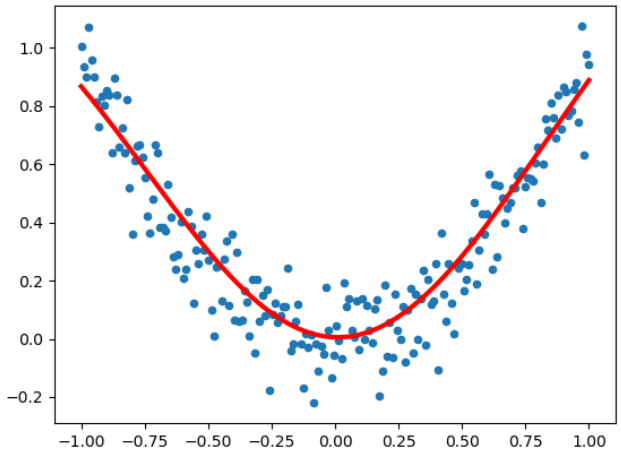
CMPT 310 – A4 Report

Implementation Summary

I started in layers.py and implemented compute_activations by simply following the equation. I then did compute_gradients by following Mehran's updated calculations. After that, I moved on to update_weights, which I referred to the lecture slides to for the formula, afterwards realizing the formula was also in the problem statement. Then I moved on to neural_network.py and did compute_activations in which I had to iterate through each layer and pass the current layer's output to the next layer's input. Next, compute_gradients was similar to activations, but I went backwards and set the current layer's output to the already-iterated-past layer's output, while computing the gradient in each iteration. Next, I implementted update_weights by simply calling the function for each layer. After that, I moved on to toy_example_regressor, and noticed that there was an error in my code in the compute_activations function in layers.py. I troubleshooted this by looking on Piazza and following the error messages. I simply needed to multiply the arrays in a fashion such that a dot product can be calculated. After, that I ran prime_classifier and finished with the coding portion.

Predicted Function Image



Regressor Validation Loss

[Epoch 0]: loss: 11.849840680207045
[Epoch 0]: loss: 8.497981890839224
[Epoch 0]: loss: 5.328049040955218
[Epoch 50]: loss: 0.0914099069685636
[Epoch 50]: loss: 0.06283184099088598
[Epoch 50]: loss: 0.10397231516651376
[Epoch 100]: loss: 0.0835104499718051
[Epoch 100]: loss: 0.053094222531057514
[Epoch 100]: loss: 0.08520996815946408
[Epoch 150]: loss: 0.07758268685616816

[Epoch 150]: loss: 0.048325051010979884
[Epoch 150]: loss: 0.07726032664681884
[Epoch 200]: loss: 0.07034482819549316
[Epoch 200]: loss: 0.04322273543357403
[Epoch 200]: loss: 0.07005388656833975
[Epoch 250]: loss: 0.06260326909426163
[Epoch 250]: loss: 0.03794104566045806
[Epoch 250]: loss: 0.06273527086967612
[Epoch 300]: loss: 0.0548465213574911
[Epoch 300]: loss: 0.032768730066738055
[Epoch 300]: loss: 0.05546474475668239
[Epoch 350]: loss: 0.04745247273347901
[Epoch 350]: loss: 0.027970679598359367
[Epoch 350]: loss: 0.04854942943859564
[Epoch 400]: loss: 0.04071798624221186
[Epoch 400]: loss: 0.023752689867325198
[Epoch 400]: loss: 0.04226287339571473
[Epoch 450]: loss: 0.034835294672838246
[Epoch 450]: loss: 0.020234785346709964
[Epoch 450]: loss: 0.03678603863978279
[Epoch 500]: loss: 0.029884493727132533
[Epoch 500]: loss: 0.017446934868366494
[Epoch 500]: loss: 0.032193804226270516
[Epoch 550]: loss: 0.025849448450208777
[Epoch 550]: loss: 0.015345022307728919
[Epoch 550]: loss: 0.02846897068451161
[Epoch 600]: loss: 0.022647124165473466
[Epoch 600]: loss: 0.013837099957527268
[Epoch 600]: loss: 0.025530247269817688
[Epoch 650]: loss: 0.020158797427185328
[Epoch 650]: loss: 0.012809926571804514
[Epoch 650]: loss: 0.023262350706964023
[Epoch 700]: loss: 0.018255550053272333
[Epoch 700]: loss: 0.01214968777944658
[Epoch 700]: loss: 0.021540696691518417
[Epoch 750]: loss: 0.016815268515918212
[Epoch 750]: loss: 0.011754914648200596
[Epoch 750]: loss: 0.02024784284717507
[Epoch 800]: loss: 0.01573171827182876
[Epoch 800]: loss: 0.011542397331539
[Epoch 800]: loss: 0.019282190241931958
[Epoch 850]: loss: 0.01491768909185327
[Epoch 850]: loss: 0.011448181634489346
[Epoch 850]: loss: 0.018560889241588434

[Epoch 900]: loss: 0.014304508036025622
[Epoch 900]: loss: 0.011425655168264437
[Epoch 900]: loss: 0.01801924594582908
[Epoch 950]: loss: 0.013839695326082539
[Epoch 950]: loss: 0.011442469459743615
[Epoch 950]: loss: 0.01760831684988574
Validation Loss 0.011963717401267194

Prime Classifier Validation Loss & Accuracy

[Epoch 0]: validation loss: 0.20127979, validation accuracy: 69.43%
[Epoch 1]: validation loss: 0.11581653, validation accuracy: 85.94%
[Epoch 2]: validation loss: 0.09948711, validation accuracy: 87.44%
[Epoch 3]: validation loss: 0.09273907, validation accuracy: 88.30%
[Epoch 4]: validation loss: 0.08897993, validation accuracy: 88.72%
[Epoch 5]: validation loss: 0.08652825, validation accuracy: 89.06%
[Epoch 6]: validation loss: 0.08472717, validation accuracy: 89.32%
[Epoch 7]: validation loss: 0.08315523, validation accuracy: 89.39%
[Epoch 8]: validation loss: 0.08117772, validation accuracy: 89.68%
[Epoch 9]: validation loss: 0.07827912, validation accuracy: 90.09%
[Epoch 10]: validation loss: 0.07484797, validation accuracy: 90.62%
[Epoch 11]: validation loss: 0.07118534, validation accuracy: 91.22%
[Epoch 12]: validation loss: 0.06739957, validation accuracy: 91.82%
[Epoch 13]: validation loss: 0.06351675, validation accuracy: 92.39%
[Epoch 14]: validation loss: 0.05953572, validation accuracy: 92.90%
[Epoch 15]: validation loss: 0.05560662, validation accuracy: 93.60%
[Epoch 16]: validation loss: 0.05196046, validation accuracy: 94.12%
[Epoch 17]: validation loss: 0.04873160, validation accuracy: 94.46%
[Epoch 18]: validation loss: 0.04594967, validation accuracy: 94.72%
[Epoch 19]: validation loss: 0.04357872, validation accuracy: 94.92%
[Epoch 20]: validation loss: 0.04155667, validation accuracy: 95.21%
[Epoch 21]: validation loss: 0.03982112, validation accuracy: 95.45%
[Epoch 22]: validation loss: 0.03831892, validation accuracy: 95.65%
[Epoch 23]: validation loss: 0.03700730, validation accuracy: 95.79%
[Epoch 24]: validation loss: 0.03585224, validation accuracy: 95.96%
[Epoch 25]: validation loss: 0.03482659, validation accuracy: 96.07%
[Epoch 26]: validation loss: 0.03390858, validation accuracy: 96.12%
[Epoch 27]: validation loss: 0.03308090, validation accuracy: 96.21%
[Epoch 28]: validation loss: 0.03232983, validation accuracy: 96.32%
[Epoch 29]: validation loss: 0.03164453, validation accuracy: 96.39%
[Epoch 30]: validation loss: 0.03101625, validation accuracy: 96.47%
[Epoch 31]: validation loss: 0.03043786, validation accuracy: 96.51%
[Epoch 32]: validation loss: 0.02990342, validation accuracy: 96.58%
[Epoch 33]: validation loss: 0.02940792, validation accuracy: 96.62%
[Epoch 34]: validation loss: 0.02894711, validation accuracy: 96.68%

[Epoch 35]: validation loss: 0.02851736, validation accuracy: 96.73%
[Epoch 36]: validation loss: 0.02811557, validation accuracy: 96.75%
[Epoch 37]: validation loss: 0.02773900, validation accuracy: 96.78%
[Epoch 38]: validation loss: 0.02738531, validation accuracy: 96.83%
[Epoch 39]: validation loss: 0.02705240, validation accuracy: 96.88%
[Epoch 40]: validation loss: 0.02673845, validation accuracy: 96.93%
[Epoch 41]: validation loss: 0.02644183, validation accuracy: 96.95%
[Epoch 42]: validation loss: 0.02616109, validation accuracy: 96.98%
[Epoch 43]: validation loss: 0.02589496, validation accuracy: 96.99%
[Epoch 44]: validation loss: 0.02564228, validation accuracy: 97.04%
[Epoch 45]: validation loss: 0.02540203, validation accuracy: 97.04%
[Epoch 46]: validation loss: 0.02517329, validation accuracy: 97.03%
[Epoch 47]: validation loss: 0.02495521, validation accuracy: 97.04%
[Epoch 48]: validation loss: 0.02474705, validation accuracy: 97.06%
[Epoch 49]: validation loss: 0.02454812, validation accuracy: 97.08%