Reflection

Honestly, I do not remember about the classification matrix and what any of precision, recall, f1, accuracy are. But, I tried my best to revise and do the assignment in a short time. During hyperparameters tuning, I noticed I faced with the testing scores not changing, but I was able to resolve it.

Report

Layer 1 – 1 input x 32 + 1 bias x 32 = 64

Layer 2 – 32 x 16 + 16 = 528

Layer 3 – 16 x 18 + 18 = 306

Total number of parameters in initial model = 898

Number of layers used in initial architecture = 4 including input layer

The initial model was clearly overfitted with the training set having significantly better f1 scores than the testing set.

Added another layer with 24, I noticed that the testing results stayed the same while the training scores decreased a little.

Then, I tested that model with 16 neuron layer removed. It turned out better.

I also tested with 256, 128, 18 layers. It took 5x more time but the model seems to underfit no matter how the hyperparameters are tuned.

I also noticed that the results with the same hyperparameters do not seem to be consistent.

Appendix

	Test	Train
32, 16, 18 4m 11.6s	precision,recall,f1-score,support 0.21,0.37,0.27,617.0 0.4,0.14,0.21,273.0 0.46,0.16,0.23,243.0 0.95,0.18,0.3,214.0 0.6,0.17,0.27,258.0 0.89,0.15,0.25,54.0 0.74,0.17,0.28,171.0 0.52,0.23,0.32,664.0 0.42,0.2,0.27,569.0 0.65,0.24,0.35,199.0 0.28,0.11,0.15,85.0 0.61,0.22,0.33,399.0 0.21,0.69,0.32,968.0 0.41,0.11,0.17,82.0 0.78,0.24,0.36,472.0 0.63,0.16,0.26,188.0 0.62,0.3,0.4,152.0 0.48,0.19,0.27,246.0 0.3,0.3,0.3,0.3 0.55,0.22,0.28,5854.0 0.48,0.3,0.29,5854.0	precision,recall,f1-score,support 0.8,0.91,0.85,1561.0 0.81,0.81,0.81,648.0 0.87,0.72,0.79,571.0 0.99,0.98,0.99,434.0 0.96,0.9,0.93,620.0 0.98,0.95,0.97,174.0 0.91,0.91,0.91,381.0 0.83,0.83,0.83,1580.0 0.8,0.84,0.82,1334.0 0.94,0.8,0.86,401.0 0.82,0.66,0.74,149.0 0.95,0.88,0.91,932.0 0.86,0.85,0.86,2310.0 0.99,0.93,0.96,175.0 0.92,0.98,0.95,1004.0 0.92,0.87,0.89,428.0 0.86,0.94,0.9,372.0 0.89,0.81,0.85,585.0 0.87,0.87,0.87,0.87 0.89,0.87,0.88,13659.0 0.87,0.87,0.87,13659.0
32, 24, 16, 18 4m 22.6s	precision,recall,f1-score,support 0.13,0.81,0.23,617.0 0.38,0.13,0.19,273.0 0.32,0.21,0.25,243.0 0.93,0.18,0.3,214.0 0.64,0.16,0.26,258.0 0.89,0.15,0.25,54.0 0.7,0.18,0.29,171.0 0.48,0.27,0.34,664.0 0.52,0.18,0.27,569.0 0.6,0.25,0.35,199.0	precision,recall,f1-score,support 0.79,0.89,0.84,1561.0 0.87,0.76,0.82,648.0 0.71,0.85,0.77,571.0 0.98,0.99,0.99,434.0 0.95,0.9,0.93,620.0 0.99,0.94,0.96,174.0 0.95,0.89,0.92,381.0 0.8,0.85,0.82,1580.0 0.91,0.74,0.82,1334.0 0.91,0.82,0.86,401.0 0.88,0.66,0.76,149.0 0.92,0.9,0.91,932.0 0.86,0.85,0.85,2310.0 0.98,0.94,0.96,175.0 0.92,0.97,0.95,1004.0 0.93,0.86,0.89,428.0 0.87,0.94,0.91,372.0

	0.39,0.08,0.14,85.0 0.71,0.21,0.32,399.0 0.57,0.28,0.38,968.0 0.45,0.11,0.18,82.0 0.7,0.24,0.35,472.0 0.54,0.17,0.26,188.0 0.64,0.32,0.42,152.0 0.39,0.2,0.26,246.0 0.28,0.28,0.28,0.28 0.55,0.23,0.28,5854.0 0.52,0.28,0.3,5854.0	0.79,0.86,0.82,585.0 0.86,0.86,0.86,0.86 0.89,0.87,0.88,13659.0 0.87,0.86,0.86,13659.0
32, 24, 18 4m 15.3s	precision,recall,f1-score,support 0.48,0.22,0.3,617.0 0.35,0.14,0.19,273.0 0.47,0.15,0.23,243.0 0.93,0.18,0.3,214.0 0.72,0.16,0.27,258.0 0.89,0.15,0.25,54.0 0.52,0.18,0.27,171.0 0.2,0.45,0.28,664.0 0.38,0.22,0.28,569.0 0.57,0.24,0.34,199.0 0.28,0.11,0.15,85.0 0.77,0.2,0.31,399.0 0.21,0.61,0.31,968.0 0.43,0.11,0.17,82.0 0.79,0.24,0.36,472.0 0.58,0.18,0.28,188.0 0.74,0.28,0.41,152.0 0.39,0.2,0.26,246.0 0.29,0.29,0.29,0.29 0.54,0.22,0.28,5854.0 0.47,0.29,0.29,5854.0	precision,recall,f1-score,support 0.8,0.91,0.85,1561.0 0.96,0.7,0.81,648.0 0.9,0.69,0.78,571.0 1.0,0.98,0.99,434.0 0.91,0.93,0.92,620.0 0.99,0.94,0.96,174.0 0.97,0.88,0.92,381.0 0.81,0.85,0.83,1580.0 0.8,0.84,0.82,1334.0 0.89,0.84,0.86,401.0 0.92,0.64,0.75,149.0 0.86,0.93,0.89,932.0 0.86,0.85,0.86,2310.0 0.99,0.93,0.96,175.0 0.93,0.97,0.95,1004.0 0.93,0.86,0.89,428.0 0.93,0.91,0.92,372.0 0.83,0.85,0.84,585.0 0.87,0.87,0.87,0.87 0.9,0.86,0.88,13659.0 0.87,0.87,0.87,13659.0
256, 128, 18 20m	precision,recall,f1-score,support 0.38,0.25,0.3,617.0 0.43,0.11,0.17,273.0 0.33,0.19,0.24,243.0 0.95,0.18,0.3,214.0	precision,recall,f1-score,support 0.78,0.92,0.84,1561.0 0.91,0.74,0.82,648.0 0.76,0.8,0.78,571.0 0.99,0.98,0.99,434.0

	0.5,0.18,0.26,258.0 0.53,0.15,0.23,54.0 0.66,0.17,0.27,171.0 0.13,0.71,0.22,664.0 0.42,0.21,0.28,569.0 0.69,0.24,0.35,199.0 0.28,0.11,0.15,85.0 0.71,0.21,0.32,399.0 0.52,0.28,0.37,968.0 0.41,0.11,0.17,82.0 0.73,0.23,0.35,472.0 0.61,0.16,0.26,188.0 0.63,0.3,0.41,152.0 0.42,0.19,0.26,246.0 0.27,0.27,0.27,0.27 0.52,0.22,0.27,5854.0 0.49,0.27,0.29,5854.0	0.89,0.95,0.92,620.0 0.94,0.97,0.95,174.0 0.92,0.91,0.92,381.0 0.85,0.8,0.83,1580.0 0.82,0.83,0.82,1334.0 0.95,0.79,0.86,401.0 0.74,0.74,0.74,149.0 0.92,0.9,0.91,932.0 0.87,0.85,0.86,2310.0 0.99,0.93,0.96,175.0 0.94,0.97,0.95,1004.0 0.95,0.85,0.89,428.0 0.93,0.92,0.92,372.0 0.84,0.86,0.85,585.0 0.87,0.87,0.87,0.87 0.89,0.87,0.88,13659.0 0.87,0.87,0.87,13659.0