**Machine Learning**

Project 2

Kevin Chen

E-mail: [nkc160130@utdallas.edu](mailto:nkc160130@utdallas.edu)

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# Network Description

As there are two types of training data in the project, the project will consist of two models: one for the 8% training data and one for the 16% training data.

*Layers (8% training):*

* ELU (20 units)
* Dropout (0.6)
* Linear (2 units)
* SoftMax (2 units)

*Layers (16% training):*

* ELU (20 units)
* Dropout (0.3)
* ELU (10 units)
* Dropout (0.3)
* ELU (5 units)
* Linear (2 units)
* SoftMax (2 units)

*Additional details (both):*

* Optimizer: ADAM
* Loss: Sparse Categorical Cross Entropy

Prior to setting up and training/testing the model, the following is used to preprocess the data, to prepare it for training/testing:

* Augmenting the testing dataset with normal distributed random noise of the same dimensions, then randomly choosing from the noise dataset to put into the training dataset
* Scaling the values of the features into the range of [0,1]
* Square root transformation of values on the features

# Performance of Network

Below is the accuracy of both 8% and 16% training deep learning models on seeds 0-20:

Accuracy for seed 0:

8: 0.9490333795547485

16: 0.9499121308326721

----------------------------------------

Accuracy for seed 1:

8: 0.942882239818573

16: 0.9551845192909241

----------------------------------------

Accuracy for seed 2:

8: 0.942882239818573

16: 0.95782071352005

----------------------------------------

Accuracy for seed 3:

8: 0.945518434047699

16: 0.948154628276825

----------------------------------------

Accuracy for seed 4:

8: 0.9384886026382446

16: 0.9551845192909241

----------------------------------------

Accuracy for seed 5:

8: 0.945518434047699

16: 0.9543058276176453

----------------------------------------

Accuracy for seed 6:

8: 0.9446397423744202

16: 0.9534270763397217

----------------------------------------

Accuracy for seed 7:

8: 0.9499121308326721

16: 0.95782071352005

----------------------------------------

Accuracy for seed 8:

8: 0.9437609910964966

16: 0.9569420218467712

----------------------------------------

Accuracy for seed 9:

8: 0.9551845192909241

16: 0.9595782160758972

----------------------------------------

Accuracy for seed 10:

8: 0.9472759366035461

16: 0.95782071352005

----------------------------------------

Accuracy for seed 11:

8: 0.9437609910964966

16: 0.95782071352005

----------------------------------------

Accuracy for seed 12:

8: 0.9499121308326721

16: 0.95782071352005

----------------------------------------

Accuracy for seed 13:

8: 0.945518434047699

16: 0.9463971853256226

----------------------------------------

Accuracy for seed 14:

8: 0.9437609910964966

16: 0.948154628276825

----------------------------------------

Accuracy for seed 15:

8: 0.942882239818573

16: 0.9569420218467712

----------------------------------------

Accuracy for seed 16:

8: 0.942882239818573

16: 0.9586994647979736

----------------------------------------

Accuracy for seed 17:

8: 0.9463971853256226

16: 0.9543058276176453

----------------------------------------

Accuracy for seed 18:

8: 0.945518434047699

16: 0.9525483250617981

----------------------------------------

Accuracy for seed 19:

8: 0.9472759366035461

16: 0.9569420218467712

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