Test 1 – Activation Functions

100 Tests

relu, softmax, tanh, sigmoid, hard\_sigoid, linear, selu, softplus, softsign, elu

|  |  |  |
| --- | --- | --- |
| Activation 1 | Activation 2 | Error % |
| selu | softmax | **8,1** |
| selu | sigmoid | **8,24** |
| tanh | softmax | **8,4** |
| softsign | softmax | **8,45** |
| linear | softmax | **8,46** |

Test 2 – Optimization Function

91 Tests

sgd, rmsprop, adagrad, adadelta, adam, adamax, nadam

|  |  |  |  |
| --- | --- | --- | --- |
| Activation 1 | Activation 2 | Optimizer | Error % |
| relu | softmax | nadam | **7,28** |
| selu | softmax | nadam | **7,52** |
| tanh | softmax | nadam | **7,68** |
| linear | softmax | nadam | **7,7** |
| elu | softmax | nadam | **7,72** |

Test 3 – Loss Function

60 Tests

mean\_squared\_error, mean\_absolute\_error, ,mean\_absolute\_percentage\_error, mean\_squared\_logarithmic\_error, squared\_hinge, hinge, categorical\_hinge, logcosh, categorical\_crossentropy, binary\_crossentropy, kullback\_leibler\_divergence, poisson, cosine\_proximity

|  |  |  |  |
| --- | --- | --- | --- |
| Activation 1 | Activation 2 | Loss Function | Error % |
| relu | softmax | binary\_crossentropy | **1,39%** |
| selu | softmax | binary\_crossentropy | **1,43%** |
| tanh | softmax | binary\_crossentropy | **1,46%** |
| linear | softmax | binary\_crossentropy | **1,46%** |
| elu | softmax | binary\_crossentropy | **1,50%** |

Test 4 – Epoch number

95 Tests

1 – 19

|  |  |  |  |
| --- | --- | --- | --- |
| N° Epochs | Activation 1 | Activation 2 | Error % |
| 19 | relu | softmax | **0,67%** |
| 18 | relu | softmax | **0,69%** |
| 17 | relu | softmax | **0,73%** |
| 16 | relu | softmax | **0,77%** |
| 14 | relu | softmax | **0,78%** |

Test 5 – Batch Size

25 – 500

|  |  |  |  |
| --- | --- | --- | --- |
| bath size | Activation 1 | Activation 2 | Error % |
| 25 | relu | softmax | **0,82%** |
| 50 | relu | softmax | **1,00%** |
| 75 | relu | softmax | **1,13%** |
| 25 | selu | softmax | **1,18%** |
| 100 | relu | softmax | **1,19%** |

Optimal Settings

CUDA\_VISIBLE\_DEVICES=1 python main.py simple\_NN nadam binary\_crossentropy 15 15 relu softmax

('Training Time : ', 1073.427568912506)

10000/10000 [==============================] - 1s 74us/step

('Evaluation Time : ', 0.7415130138397217)

Baseline Error: 0.42%

CUDA\_VISIBLE\_DEVICES=1 python main.py simple\_NN nadam binary\_crossentropy 15 10 relu softmax

('Training Time : ', 1589.2177197933197)

10000/10000 [==============================] - 1s 74us/step

('Evaluation Time : ', 0.7362439632415771)

Baseline Error: 0.43%

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