**CSYE 7374 Cognitive Computing and Deep Neural Network**

*Effect of Activation Layer and Pooling Layer on Convolutional Neural Networks*

Following shows the impact of various activation functions and pooling layers and their impact on convolutional neural networks (CNN)

* All default parameters are used as it is as given in the initial code.
* The only default parameter that has been varied is epoch which has been downsized to 22 from 200 keeping in mind the lack of computing resources at this point of time.

**Available Parameters in Keras:**

**Activation Function**: softmax, selu, elu, softplus, softsign, relu, tanh, sigmoid, hardsigmoid, linear, LeakyReLU, PreLU, ELU, ThresholdedReLU

**Pooling Layers:** Average Pooling, Max Pooling, Global Average Pooling, Global Max Pooling [1D,

2D and 3D]

**Configurations Tested:**

* Max pooling with relu
* Average pooling with relu
* Max pooling with tanh
* Max pooling with elu
* Max pooling with leaky relu

**Discussion of tested configurations:**

(in Percentage )

* Average pooling with relu:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Training Accuracy | Validation Accuracy | Test Accuracy |
| Actual Value | 67.32 | 73.36 | 70 |

* Max pooling with relu:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Training Accuracy | Validation Accuracy | Test Accuracy |
| Actual Value | 64.77 | 69.76 | 67 |

* Max pooling with tanh:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Training Accuracy | Validation Accuracy | Test Accuracy |
| Actual Value | 64.72 | 69.43 | 67 |

* Max pooling with elu:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Training Accuracy | Validation Accuracy | Test Accuracy |
| Actual Value | 67.12 | 72.93 | 71 |

* Max pooling with leaky relu:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Training Accuracy | Validation Accuracy | Test Accuracy |
| Actual Value | 71.17 | 75.59 | 74 |

Observations from the analysis:

* In all our observations we see that the final tanning accuracy is less that validation accuracy suggesting that there is lot of improvement that can be done in the model just by increasing the number of epochs
* Average pooling and max pooling does not affect the accuracy of the process as such here in the example
* Using leak relu as activation function proved out to be best choice and tanh performed the worst out of all. Other combinations provided almost same kind of results 56