Analysis Report

CSYE 7374 Cognitive Computing and Deep Neural Network

Effect of Activation Layer and Pooling Layer on Convolutional Neural Networks

Aim: To discuss impact of various different activation functions and pooling layers and their impact on convolutional neural networks (CNN)

Assumptions: We have taken few assumptions that would be used to analyze the effect of activation functions and pooling layers:

- 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.

Deep-Learning Framework Used: Keras

Available Parameters for Variation:

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:

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

Discussion of tested configurations:

**All accuracies are expressed in percentage

- Average pooling with relu:

	Training Accuracy	Validation Accuracy	Test Accuracy
Actual Value	67.32	73.36	70
Lowest	32.81	41.45	NA
Highest	67.32	73.36	NA

- Max pooling with relu:

	Training Accuracy	Validation Accuracy	Test Accuracy
Actual Value	64.77	69.76	67
Lowest	36.84	46.71	NA
Highest	64.77	69.76	NA

- Max pooling with tanh:

	Training Accuracy	Validation Accuracy	Test Accuracy
Actual Value	64.72	69.43	67
Lowest	37.45	45.62	NA
Highest	64.72	69.45	NA

- Max pooling with elu:

	Training Accuracy	Validation Accuracy	Test Accuracy
Actual Value	67.12	72.93	71
Lowest	37.46	46.27	NA
Highest	67.12	72.93	NA

- Max pooling with leaky relu:

	Training Accuracy	Validation Accuracy	Test Accuracy
Actual Value	71.17	75.59	74
Lowest	34.17	46	NA
Highest	71.17	75.59	NA

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