Lab Assignment 7 – CNN Exploration and Understanding of Model Behavior

Explore different Convolutional Neural Network design choices for Digit classification using MNIST dataset. **Use previous lab assignment to start with.**

Exploration

1. **Number of filters:** Plot bar graphs to calculate the filter wise accuracies for running CNN Model over multiple number of filters.(CNN with 1 convolution hidden layer (32 filters of 3*3), flatten layer and output layer, (with any activation function and any optimizer) for 5 epochs.) Change number of filters as 4, 32, 128, 512, 2056. Plot the training and testing accuracies for all these filters. (X axis having number of filters, Y axis having accuracy)
2. **Number of Layers:**
    a. Plot bar graphs to calculate the layer wise accuracies for running CNN Model over multiple architectures. Run CNN with 1 convolution hidden layer (32 filters of 3*3), flatten layer and output layer, (with any activation function and any optimizer) for 5 epochs. Change number of convolutional layers as 2, 3, 4. Plot the training and testing accuracies for all these layers. (X axis having number of layers, Y axis having accuracy)
    b. Repeat the above model configuration for multiple epochs 5, 10, 50, 100. Plot bar graphs to calculate the epoch wise accuracies for running CNN Model. Use CNN with 1 convolution hidden layer (32 filters of 3*3), flatten layer and output layer, (with any activation function and any optimizer) Plot the training and testing accuracies for all these layers. (X axis having number of epochs, Y axis having accuracy)
3. **Size of Filters:** Plot bar graphs to calculate the filter size wise accuracies for running CNN Model over multiple architectures. Run CNN with 2 convolution layer (16 filters of 3*3 filter, each layer), flatten layer and output layer (with any activation function and any optimizer) for 5 epochs. Run the same architecture with different sizes of filters as 5*5 and 7*7. Plot the training and testing accuracies for all these filters. (X axis having different types of filters, Y axis having accuracy)
4. **Activation function**: Run CNN with 2 convolution layer (16 filters of 3*3 filter, each layer), flatten layer and output layer (with any optimizer) with sigmoid activation function for all layers, for 5 epochs. Change only the activation function as tanh, relu (for all layers) etc. Plot the training and testing accuracies for all these filters. (X axis having different types of activation function, Y axis having accuracy)
5. **Influence of Striding**: Plot bar graphs to calculate the striding value wise accuracies. Run CNN with 2 conv layer, 32 filters each of size 3*3 filters, flatten layer and output layer with any optimizer with relu activation function for all layers, for 5 epochs. Run the same model with striding 2, 3 etc. Plot the training and testing accuracies for all these striding values. (X axis having different types of striding, Y axis having accuracy)
6. **Influence of Padding**: Plot bar graphs to calculate the padding value wise accuracies. Run CNN with 2 conv layer, 32 filters each of size 3*3 filters, flatten layer and output layer with any optimizer with relu activation function for all layers, for 5 epochs. Run the same model with padding. Plot the training and testing accuracies for all these padding values. (X axis having different types of padding, Y axis having accuracy)

7. **Influence of Pooling:** Plot bar graphs to calculate the pooling value wise accuracies. Run CNN with 2 conv layer, 32 filters each of size 3*3 filters, flatten layer and output layer with any optimizer with relu activation function for all layers, for 5 epochs. Run the same model with pooling 2*2, 3*3 etc. Plot the training and testing accuracies for all these pooling filter values. (X axis having different types of pooling filters, Y axis having accuracy)