IT416: TOPICS IN DEEP LEARNING

Assignment 8 : Experimental study on convolutional neural network along with several parameters

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1 LEARNING OUTCOME

At the end of this assignment you will learn to implement the convolutional neural network (CNN) and its applications

2 PROBLEM DESCRIPTION

Implement Convolutional Neural Network with specified parameters to solve Classification Problem on CIFAR-10 dataset.

3 IMPLEMENTATION

3.1 Instructions

- Take Validation split as 20% of training data

- Batch Size of 32

- Epochs will be 25 with early stopping using patience of 2

- Learning optimizer: RMSProp

- Loss function : categorical_cross-entropy

- 'RELU' activation functions

- dropout of 0.5

- Softmax function for final layer

3.2 Task

- Design a Convolutional Neural Network with above configuration

- **Model 1:** CNN should have a 2-D convolutional layers with 2X2 Max-Pooling layer, followed by a dense hidden layer of 512 nodes. Final layer will be the softmax output layer. Find the classification accuracies for 2-class classification task. Use 32 filters in Conv2d layer with 3 kernel sizes: 1X1 , 3X3 and 5X5

- **Model 2:** Next you need to use a CNN with successive convolutional layers (no max pool between them), followed by a max-pooling layer and dropout. Note down classification accuracies and compare it with previous CNN model. Justify.

- **Model 3:** Use Convolutional model (**from Model 1**) as an autoencoder. Make changes to the configuration and loss function accordingly and observe the output

- **Model 4:** Use **Model 1:** with kernel size of 3X3. Freeze the convolutional layer. Refit the dense hidden layer (re-training) for 2-class classification task

- **Model 5:** Use **Model 3:** with kernel size of 3X3. Freeze the convolutional layer. Refit the dense hidden layer (re-training) for 2-class classification task. Make sure you change the output layer.

- **Model 6:** Use the concept of Transfer learning. Take **Model 4**. Freeze the features trained for 2-class classifiation. Add a dense softmax layer to fit on the entire dataset (10-class classification).

- Try to change your model and get the best classification on the dataset. You can add/remove hidden layers, incorporate stuffs like Regularization and also change optimizers/learning_rate

3.3 Points to note

- In all the cases, observe the classification accuracies, loss variation and try to justify.

- Use Keras and Tensorflow for this assignment.

4 SUBMISSION

- You have to submit your assignment in Google Colab notebook (.ipynb file) with proper comments and explanation of your approach.

- Your filename should be named as **LabAssignment8_StudentId** . If your id is 202011001 then filename will be **LabAssignment8_202011001.ipynb**

- The submission deadline for this assignment is **27th November 2020 11:59 pm**