

Assignment 5

1. What is a Convolutional Neural Network (CNN) and what makes it suitable for image-related tasks?
2. Explain the concept of local connectivity in CNNs.
3. What are the key parameters of a Convolutional Layer?
4. Why is zero-padding used in Convolutional Layers, and what impact does it have on the spatial arrangement?
5. What is the purpose of a Pooling Layer in a ConvNet?
6. If a Pooling Layer with a filter size of 2×2 and a stride of 2 is applied to an input volume of size $28 \times 28 \times 64$, calculate the size of the output volume.
7. Given an input volume of size $32 \times 32 \times 3$ and a Convolutional Layer with 32 filters of size 3×3 and a stride of 1, calculate the size of the output volume.
8. For a convolutional layer with 8 filters of size 3×3 and a depth of 3, calculate the total number of parameters, including biases.
9. For a fully-connected layer connected to an input volume of $256 \times 256 \times 3$ how many weights and biases are needed if there are 100 neurons in the fully-connected layer?

Challenge Task: Image Classification using Convolutional Neural Networks (ConvNet)

Objective: Build a Convolutional Neural Network (ConvNet) for image classification using only Convolutional (Conv), Pooling (Pool), and Fully-Connected (FC) layers. The task involves classifying images from the CIFAR-10 dataset.

Requirements:

1. Create a ConvNet architecture with a combination of Convolutional, Pooling, and Fully-Connected layers.
2. Train the model on the CIFAR-10 training dataset.
3. Save the trained model in a .h5 file.
4. Evaluate the model on the CIFAR-10 test dataset.

Hyperparameters to Experiment With:

- Number of Convolutional Layers
- Number of Filters in Convolutional Layers
- Size of Filters in Convolutional Layers
- Pooling Type and Size
- Number of Fully-Connected Layers
- Learning Rate
- Batch Size
- Number of Epochs

Submission Instructions:

1. Submit a Notebook (.ipynb) or Python script (.py) containing the complete code.
2. Save the trained model in a file named "yourname_model.h5".
3. Report the final test accuracy achieved by your model.