Assignment9_Cs6140

November 2, 2025

1 Assignment 9: Introduction To CNN Models

2 Image Classification

Goal: Build a DL-based for Digit Classification on Street View House Numbers dataset.

Street View House Numbers (SVHN) is a digit classification benchmark dataset that contains 600,000 32×32 RGB images of printed digits (from 0 to 9) cropped from pictures of house number plates. The cropped images are centered in the digit of interest, but nearby digits and other distractors are kept in the image. SVHN has three sets: training, testing sets and an extra set with 530,000 images that are less difficult and can be used for helping with the training process.

Question 1: Load the images from file. Present the number of training, testing and Validation samples. Also, show the Image Dimensions, labels, and image formats.

Question 2: Using Keras or PyTorch, clean, normalize, and re-shape the data for the model input.

Question 3: Data augmentation in deep learning is a technique to artificially expand a dataset by creating modified copies of existing data, thereby increasing the size and diversity of the training set. This process improves model performance by enhancing generalizability and reducing overfitting, as it allows the model to encounter a wider range of real-world variations. Common methods include geometric transformations (like image rotation and flips), color space transformations (adjusting brightness, contrast), and random erasing.

Apply any Data Augmentation to increase the variety of training examples, lead to help the model generalize better. Provide the description of apparoch and the importance of data augmentation in DL process.

Question 4: Normalize, reshape, and encode the data to make it ready for classification. Also, what is data batching and why we need it? perform it.

Question 5: Using Keras/PyTorch, implement the Simple CNN and AlexNet to classify different didgits. Provide the details of the proposed architecture for both CNN and AlexNet.

Question 6: Train and evaluate the model in terms of accuracy, training time per sample, f1, precison, recall and loss. Donot forget to prevent over fitting issues, using batch normalization, drop out, and other regularization techniques. Also be sure your model is optimized.