CNN PyTorch Assignment SOS

Suraj Prasad

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Questions

1. Implement a simple Convolutional Neural Network (CNN) using PyTorch for classifying images from the CIFAR-10 dataset. Train the network and evaluate its performance.
2. Modify the CNN architecture to include additional convolutional and pooling layers. Experiment with different kernel sizes and strides. Observe and report the impact on model performance.
3. Implement data augmentation techniques (e.g., random cropping, flipping, rotation) in the CIFAR-10 training pipeline using PyTorch. Train the CNN with augmented data and compare the results with the baseline model.
4. Explore the use of different activation functions (e.g., ReLU, Leaky ReLU, Sigmoid, Tanh) in your CNN. Train and evaluate the model performance for each activation function.
5. Implement batch normalization in your CNN. Train the network with and without batch normalization, and compare the training and validation accuracy.
6. Experiment with different optimization algorithms (e.g., SGD, Adam, RMSprop) for training your CNN. Analyze the convergence speed and final performance of each optimizer.
7. Implement dropout regularization in your CNN to prevent overfitting. Train the network with different dropout rates and evaluate the impact on model performance.
8. Create a custom dataset of your own images, preprocess them, and train a CNN to classify them. Document the steps involved in creating and preprocessing the dataset.
9. Implement transfer learning by fine-tuning a pre-trained CNN (e.g., ResNet, VGG) on the CIFAR-10 dataset. Compare the performance with a CNN trained from scratch.(we will do it later)