

Using device: CUDA

Task execution time: 945.17 seconds

**Completed Tasks:**

Task 1.1: Load CIFAR-10 Dataset ✓

Task 1.2: Visualize CIFAR-10 Samples ✓

Task 1.3: Convert to Grayscale ✓

Task 2.1: Extract SIFT Features ✓

Task 2.2: Visualize SIFT Keypoints ✓

Task 3.1: Generate Codebook ✓

Task 3.2: Create BoVW Histograms ✓

Task 4.1: Train SVM Classifier ✓

Task 4.2: Train CNN Classifier ✓

Task 5.1: Compare SVM and CNN ✓

Task 6.1: Apply Data Augmentation ✓

Task 6.3: Train CNN with Augmentation ✓

Task 7: Final Comparison and Analysis ✓

Reset (Clear Task)

# CIFAR-10 Image Classification with BoVW and CNN

This application implements image classification on the CIFAR-10 dataset using:

- Bag of Visual Words (BoVW) model with SVM classifier
- Deep Learning approach with ResNet-18 CNN
- Data augmentation techniques

Follow the tasks step by step using the dropdown menu.

Select a task to run:

Task 6.3: Train CNN with Augmentation



Run Task

## Task 6.3: Train CNN with Augmentation

Number of epochs



Batch size

64



Learning rate



☐ Force retraining (ignore saved model)

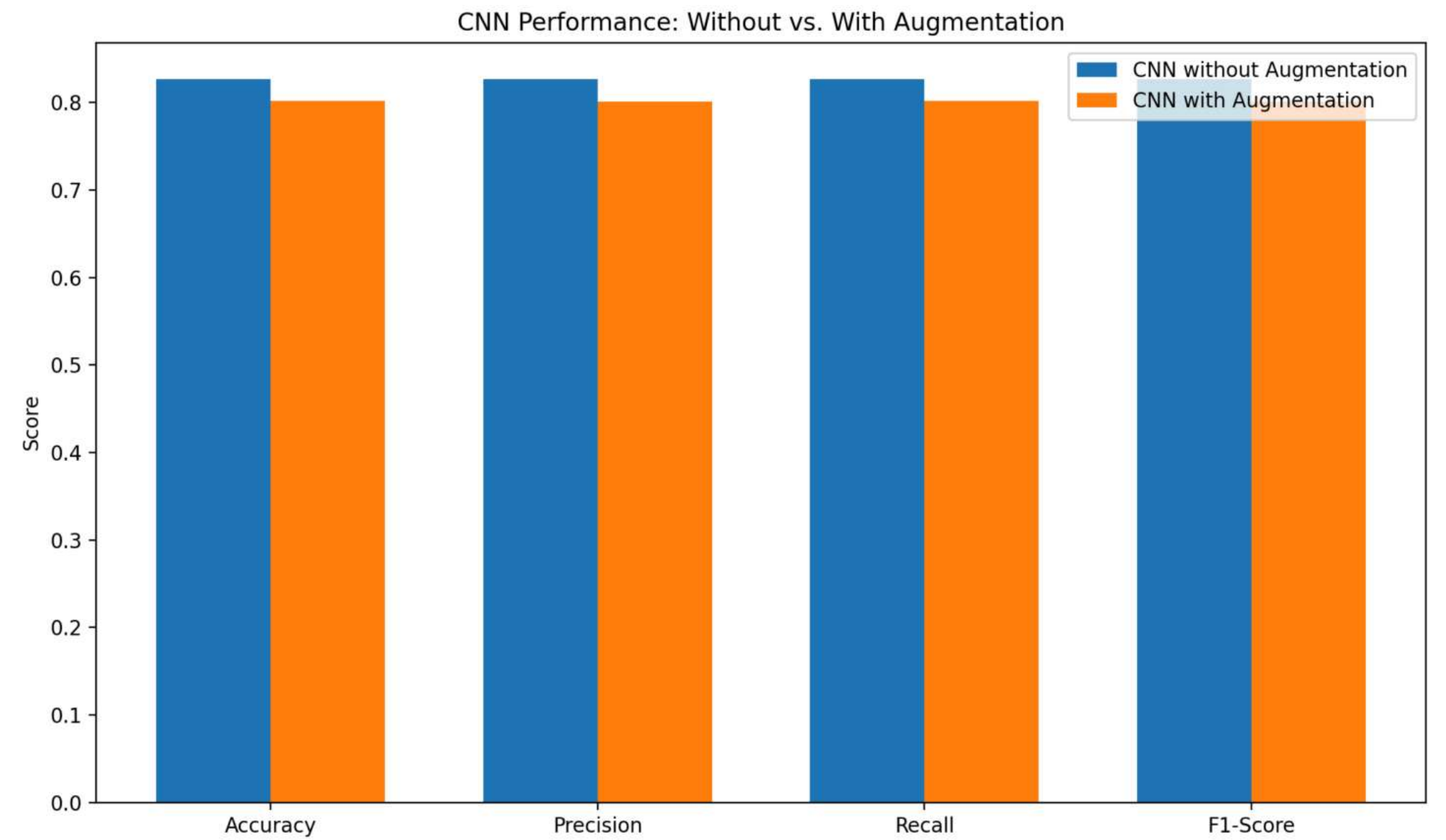
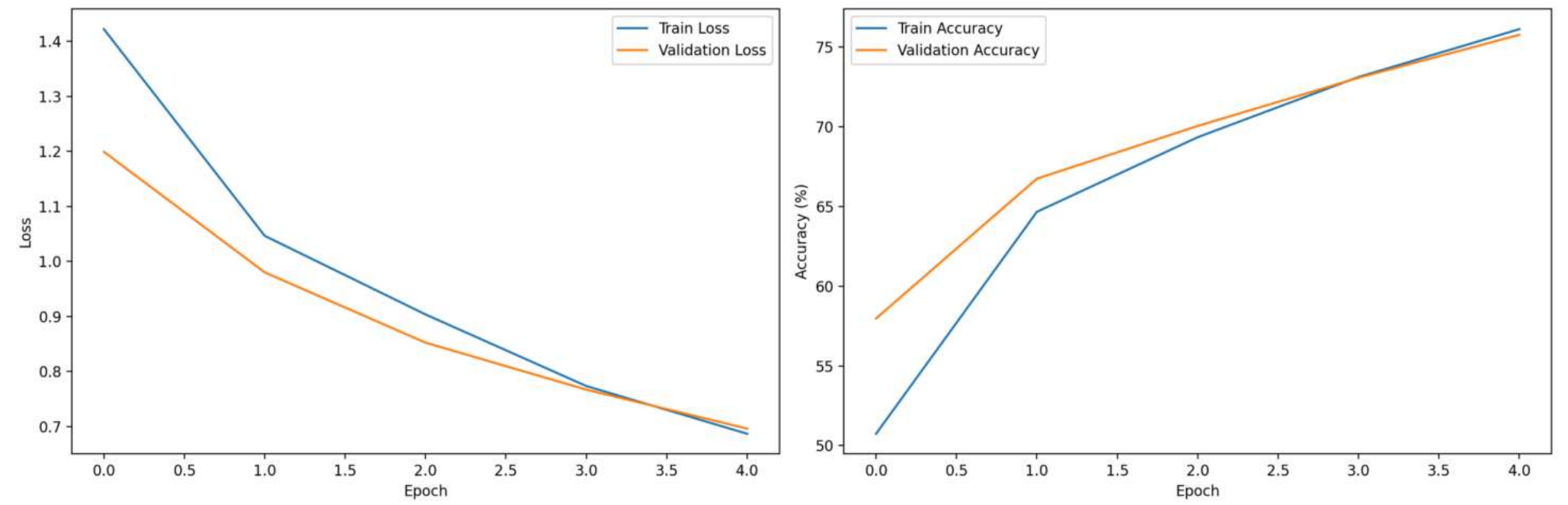
## CNN Classification Results with Augmentation

Accuracy: 0.8019

Precision: 0.8014

Recall: 0.8019

F1-Score: 0.8009



Improvement with Data Augmentation

Accuracy: -3.07%

Precision: -3.11%

Recall: -3.07%

F1\_score: -3.10%

CNN classifier with augmentation training/loading completed!