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MACHINE LEARNING LAB WEEK 14

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SECTION: C

1.INTRODUCTION

The objective of this lab was to design, implement, and train a Convolutional Neural Network (CNN) using PyTorch to classify images of hand gestures into one of three categories: **rock, paper, or scissors**. The provided dataset contained labeled gesture images organized into folders, and I completed all missing code sections in the boilerplate notebook to successfully train and evaluate the CNN model.

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2. Model Architecture

The CNN model consists of **three convolutional blocks** followed by a **fully-connected classifier**.

Convolutional Blocks

Each block includes:

- **Conv2d** layer
- **ReLU** activation
- **MaxPool2d** layer
  The architecture:

1. **Block 1**
   - Conv2d: 3 → 16 channels
   - Kernel size: 3 × 3
   - Padding: 1
   - MaxPool: 2×2 (reduces size 128 → 64)
2. **Block 2**
   - Conv2d: 16 → 32 channels

- Kernel: 3 × 3
- Padding: 1
- MaxPool: 2×2 (64 → 32)

3. **Block 3**
   - Conv2d: 32 → 64 channels
   - Kernel: 3 × 3
   - Padding: 1
   - MaxPool: 2×2 (32 → 16)
     After the 3 pooling operations, the 128×128 input image shrinks to **16×16**, with 64 feature maps, resulting in a flattened vector of **64 × 16 × 16 = 16384 features**.

Fully-connected Classifier

1. Flatten
2. Linear layer: 16384 → 256
3. ReLU activation
4. Dropout (p = 0.3)
5. Linear layer: 256 → 3 (rock, paper, scissors)

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3. Training and Performance

Hyperparameters

- **Optimizer:** Adam
- **Loss Function:** CrossEntropyLoss
- **Learning Rate:** 0.001
- **Epochs:** 10
  Final Test Accuracy:97.95%

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4. Conclusion and Analysis

? Briefly discuss your results. Did the model perform well?

The CNN successfully classified rock–paper–scissors images, achieving good testing accuracy OF 97.95%.

? Were there any challenges you faced?

- Ensuring the dataset structure matched the required format for ImageFolder

- Keeping model dimensions correct when flattening

Suggest one or two ways you could potentially improve the model's accuracy in the future.

Increase the number of epochs might result in better accuracy