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Project 3 : CNN Training & Testing Report

CSE 575: Statistical Machine Learning

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1. Requirements

This project required the full understanding of the process of compiling different layers – Convolutional Layer, Fully-Connected Layer, Pooling Layer, Activation Layer, Loss function of a simple Convolutional Neural Network (CNN) for the visual classification task. The code for building a CNN and training it was given, the requirement was to write the code to evaluate the CNN by computing the accuracy and the loss function of a training and testing subset, each subset was unique to a student, tailored to her specific student ID.

2. Evaluate function

```
def evaluate(net, images, labels):
    acc = 0
    loss = 0
    batch_size = 1


    for batch_index in range(0, images.shape[0],
batch_size):
        x = images[batch_index]
        y = labels[batch_index]

        for l in range(net.lay_num):
            output = net.layers[l].forward(x)
            x = output
        loss += cross_entropy(output, y)
        if np.argmax(output) == np.argmax(y):
            acc += 1

    loss = loss / images.shape[0]
    acc = acc / images.shape[0]

    return acc, loss
```

For each image , the image is forwarded through the CNN to obtain the actual output of the convolutional neural network. Afterwards the loss is computed, by comparing the actual output to the label and using the already computed cross_entropy() function. The accuracy is also incremented if output coincides with label.

Both the loss and accuracy are divided by the number of training/testing samples to normalize their value so that the number of samples don't affect their value.

3. Results

The obtained results after training the CNN for 10 epochs (starting from Epoch 0) are:

```
=== Epoch:9 Train Size:2000, Training Acc:0.846, Training Loss:0.406 ===
=== Epoch:9 Test Size:400, Testing Acc:0.802, Testing Loss:0.462 ===
```

The resulted plots are :

CNN Epoch no. Vs. Testing Accuracy

CNN Epoch no. Vs. Testing Loss