

ECS 170: Introduction to Artificial Intelligence

UC Davis

Summer Session II 2023

Homework 2

1. Instructions

In this assignment, you will construct an image classifier using a Convolutional Neural Network (CNN).

Download the Fashion-MNIST dataset (<https://github.com/zalandoresearch/fashion-mnist>). Normalize the data such that pixel values are floats in $[0, 1]$, and use the normalized data for all of the following questions.

1.1. CNN

Train a convolutional neural network on the training data with the following layer specifications:

- 2D convolutional layer, 28 filters, 3x3 window size, ReLU activation
- 2x2 max pooling
- 2D convolutional layer, 56 filters, 3x3 window size, ReLU activation
- fully-connected layer, 56 nodes, ReLU activation
- fully-connected layer, 10 nodes, softmax activation

Use the Adam optimizer, 32 observations per batch, and sparse categorical cross-entropy loss. Use the train and test splits provided by fashion-mnist. Use the last 12000 samples of the training data as a validation set. Train for 10 epochs.

- Print the number of trainable parameters in the model
- Evaluate training and validation accuracy at the end of each epoch, and plot them as line plots on the same set of axes.
- Evaluate accuracy on the test set.
- Show an example from the test set for each class where the model misclassifies.
- Comment on any other observations about the model performance