

SSP100 How Computers See
Skidmore College
Fall 2026
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Some terms:

weights - aka learnable parameters - these are the numeric values that are learned/changed during training

network - refers to an artificial neural network, either regular/dense or cnn (convolutional neural network)

model - refers to the final version of the parameters learned in the network after it has been trained

accuracy - how many correct / total, e.g. 0.955 means 95.5% or 955 out of a 1000 were correctly predicted

loss - a measure of error during training that is to be minimized

Point of today's work:

To allow students to see some of the code that does Machine Learning, and experience actually training networks and see how different networks get different results and why, including:

- getting a data set, specifically the standard mnist dataset of handwritten digits
- understanding that each image in the data set is 28x28 grayscale image, which is 784 values
- reducing the range of the input values (from 0-255 to 0-1) to reduce the computation results from becoming too large during training
- to understand that some of the dataset is used for **training** in a supervised way (that is, with known labels/answers)
- and some of the data is used for **validation** during training

- and the remainder of the data is used for **testing** once the model is learned
- while the model is being trained, all the training data is sent through the network for each **epoch**
- while the model is being trained, after each epoch, the accuracy generally is going up and the loss is generally going down
- once it is fully trained, the test data is then predicted and the test accuracy is reported

When you see reference to number of parameters --- these are the number of weights learned

Comparing mnist_dense1 and mnist_dense2 :

- both ignore the spatial two dimensionality of the images in that they just treat each image as 784 individual input values
- dense1 is a much shallower network than dense2
- and dense2, since it is deeper, gets better results

Comparing those to mnist_cnn1, notice the number of parameters (weights) learned in dense2 is about the same as those learned in cnn1, but because the images are treated maintaining their spatial two dimensionality and convolution filters are learned cnn1 gets better results than dense2

mnist_cnn2 is a much deeper network that takes much longer to train, but gets the best results of the four.