CNN on MNIST-500

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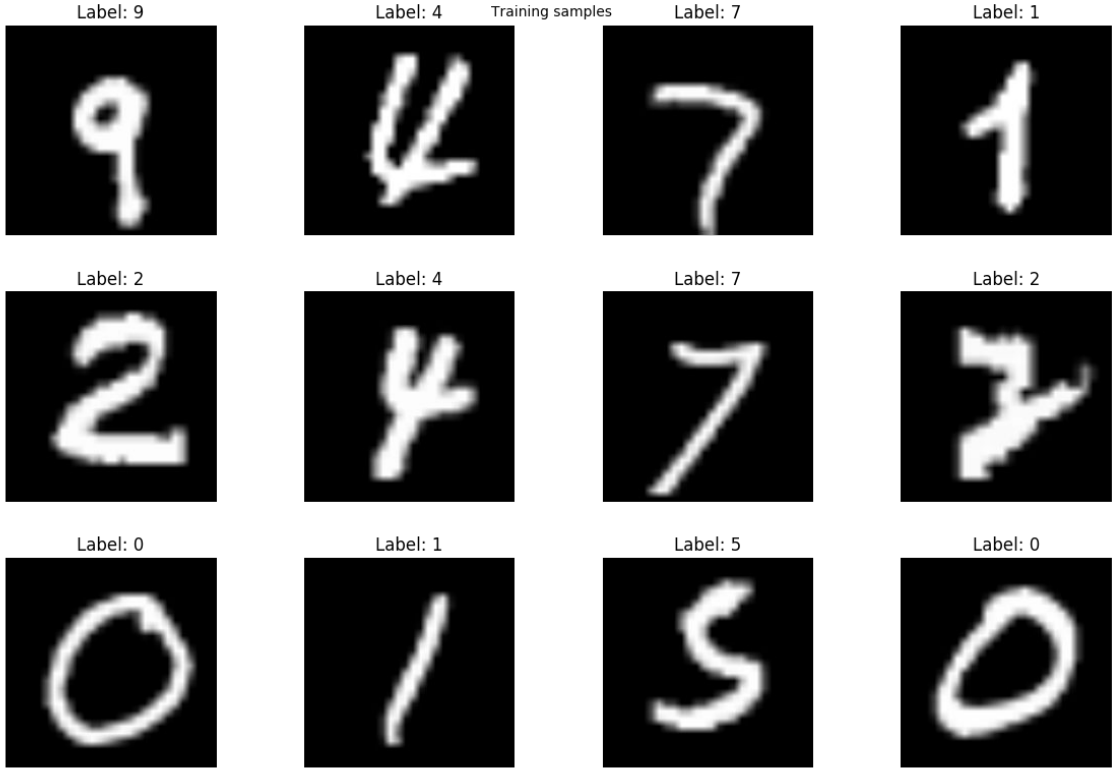
Training data



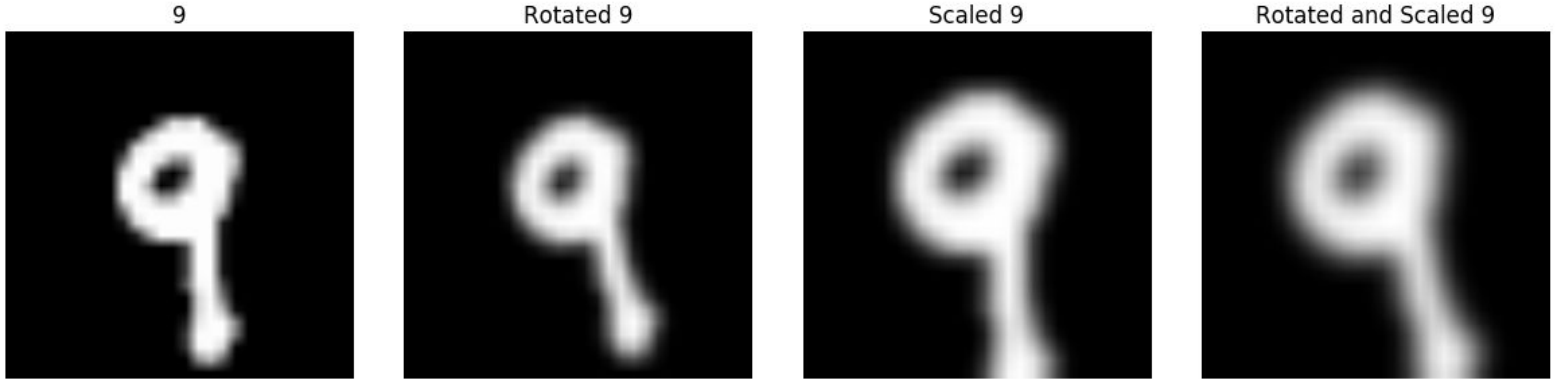
Preprocessing

- Reshape input into 28x28 matrices
- Convert labels into one-hot vectors

    e.g. 3 becomes [0, 0, 0, 1, 0, 0, 0, 0, 0, 0]

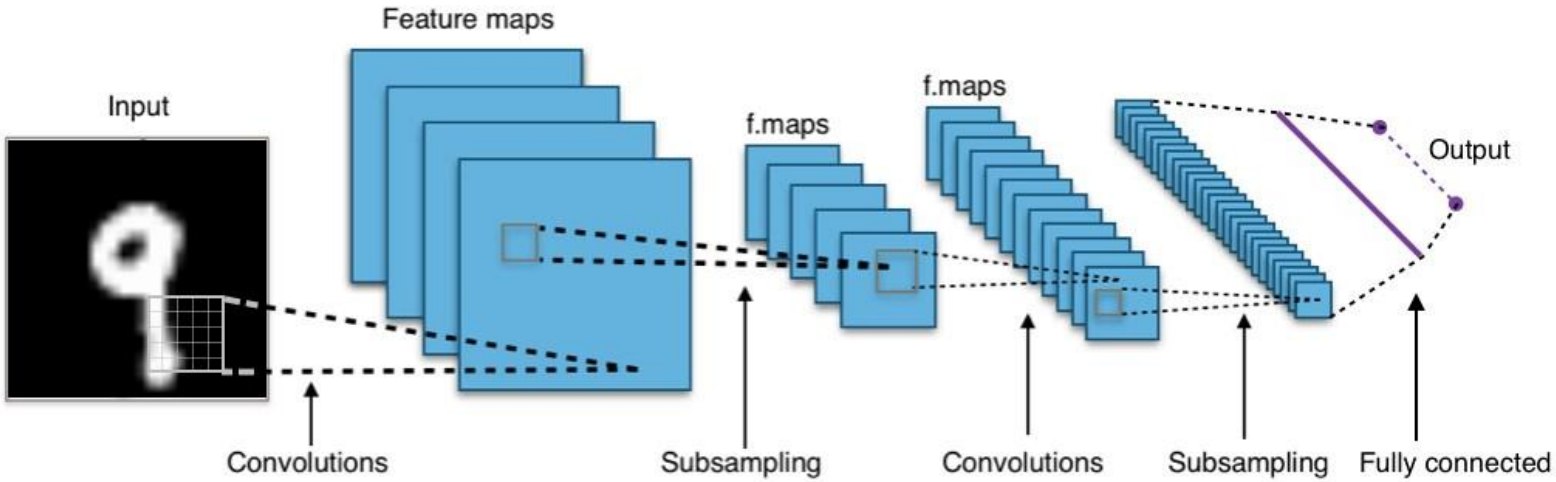
Training

- Generate transformed images → 2000 training images



- Use all images in each of the 230 epochs (took 1 hour)

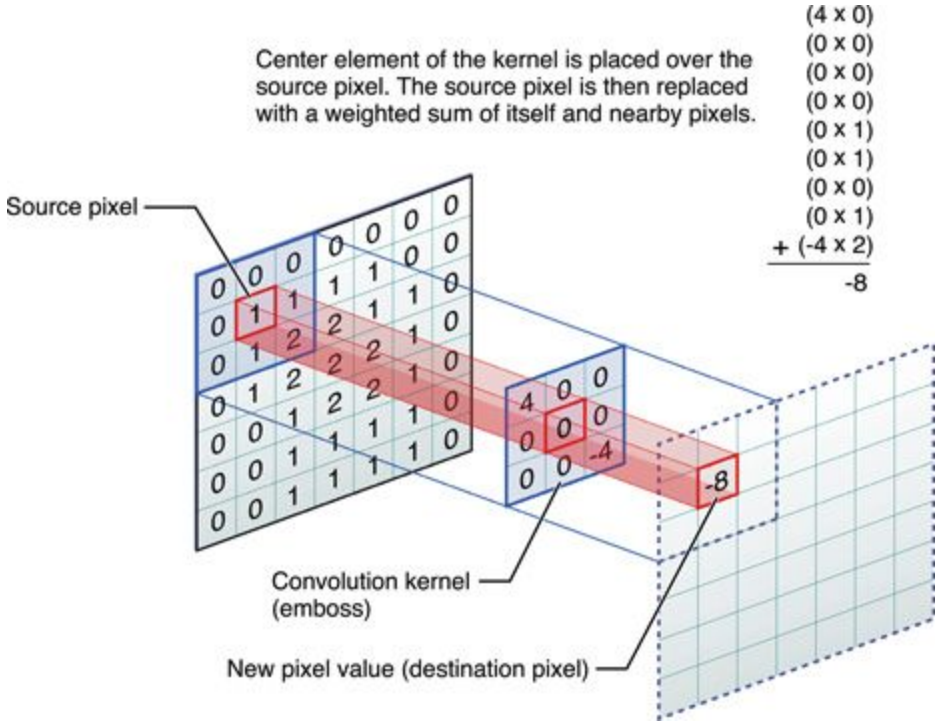
Convolutional Neural Network



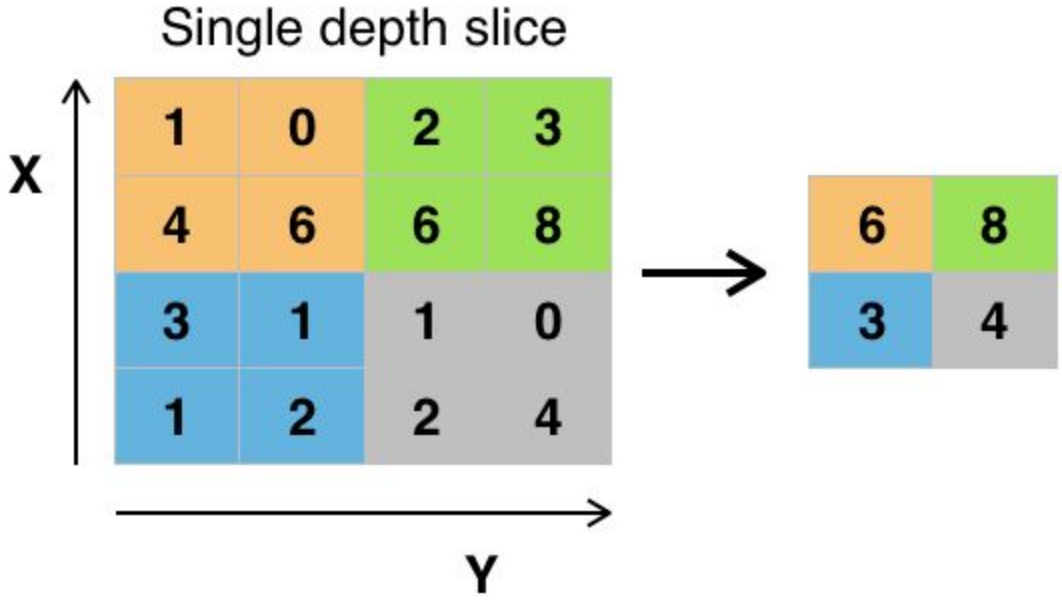
Convolutional Neural Network

- Input: 28 x 28 features
- 1st Convolutional Layer: 5x5 kernel, 32 features
- 1st Subsampling Layer: 2x2 max-pooling (reduces image size to 14x14)
- 2nd Convolutional Layer: 5x5 kernel, 64 features
- 2nd Subsampling Layer: 2x2 max-pooling (reduces image size to 7x7)
- Fully connected Layer: 1024 neurons
- Output Layer: 10 neurons (representing the one-hot vector)

Convolution

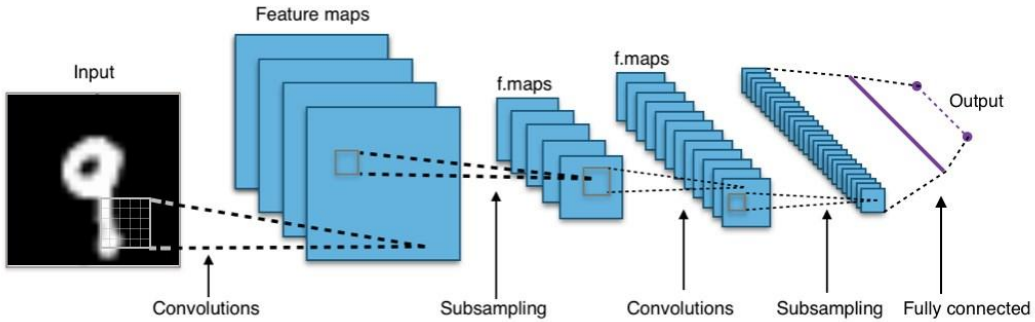


Max-pooling



Results

- For training: 400 train vs 100 test → 100% Accuracy
- For execution: Use all 500 samples



Activation function

- All neurons are **Rectified Linear Units** (ReLUs)
- f(x) = max(0, x)
- Turns out to be faster