

IE 534, homework 3

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The objective of this homework is training a deep convolution network to classify different images in the CIFAR10 dataset. The dataset is divided into training set and testing set. The convolution network is built on the training set and the performance is evaluated on the testing set. The input image is $X \in \mathbb{R}^{32 \times 32 \times 3}$. The output is a vector of probabilities for the potential images of size 10. The most likely outcome is the outcome with the highest probability.

The convolution network uses dropout with $p = 0.5$, trained with ADAM, and performs data augmentation by randomly vertical flipping and randomly rotating images with maximum 2 degrees. The architecture is

Convolution layer 1: 64 channels, $k = 4$, $s = 1$, $P = 2$. \rightarrow Batch normalization

Convolution layer 2: 64 channels, $k = 4$, $s = 1$, $P = 2$. \rightarrow Max Pooling: $s = 2$, $k = 2$.

Dropout

Convolution layer 3: 128 channels, $k = 4$, $s = 1$, $P = 2$. \rightarrow Batch normalization

Convolution layer 4: 128 channels, $k = 4$, $s = 1$, $P = 2$. \rightarrow Max Pooling: $s = 2$, $k = 2$.

Dropout

Convolution layer 5: 64 channels, $k = 4$, $s = 1$, $P = 2$. \rightarrow Batch normalization

Convolution layer 6: 64 channels, $k = 3$, $s = 1$, $P = 0$.

Dropout

Convolution layer 7: 64 channels, $k = 3$, $s = 1$, $P = 0$. \rightarrow Batch normalization

Convolution layer 8: 64 channels, $k = 3$, $s = 1$, $P = 0$. \rightarrow Batch normalization

Dropout

Fully connected layer 1: 500 units.

Fully connected layer 2: 500 units.

Linear \rightarrow Softmax function

The number of epochs is set to be 50. After 18 epochs, the testing accuracy keeps above 80%. The testing accuracy after each epoch are plotted as below:

