

Convolution Neural Networks for Image classification

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ImageNet visual recognition challenge



mite

container ship

motor scooter

leopard

mite	container ship	motor scooter	leopard
black widow	lifeboat	go-kart	jaguar
cockroach	amphibian	moped	cheetah
tick	fireboat	bumper car	snow leopard
starfish	drilling platform	golfcart	Egyptian cat



grille

mushroom

cherry

Madagascar cat

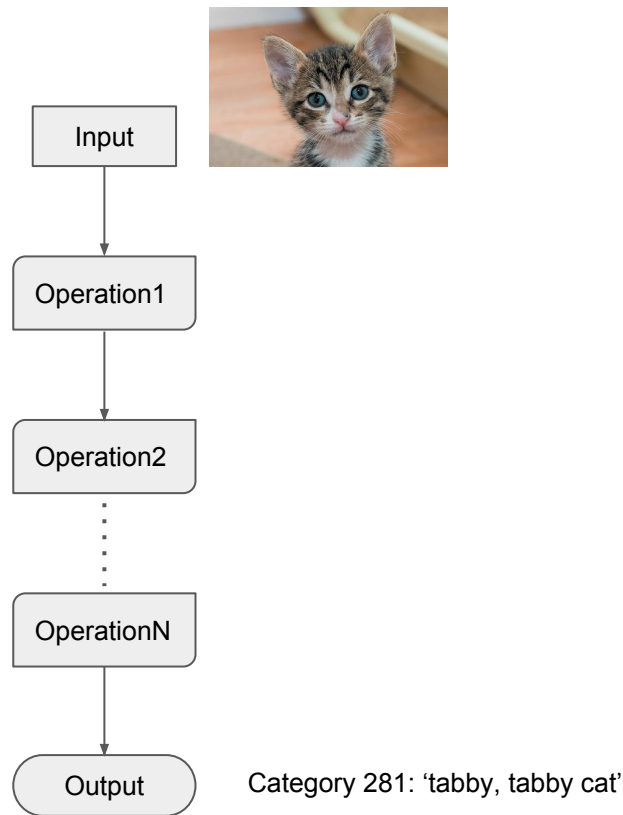
convertible	agaric	dalmatian	squirrel monkey
grille	mushroom	grape	spider monkey
pickup	jelly fungus	elderberry	titi
beach wagon	gill fungus	ffordshire bullterrier	indri
fire engine	dead-man's-fingers	currant	howler monkey

- 1000 image classes.
- 1.2M training images with labels.
- 100k images for testing.

Popular classifier network designs:

- AlexNet (2012)
- GoogleNet (2014)
- ResNet (2015)
- VGGNet (2014)

General architecture of CNN classifier



Directed computational graph. The common operation blocks (layers) are:

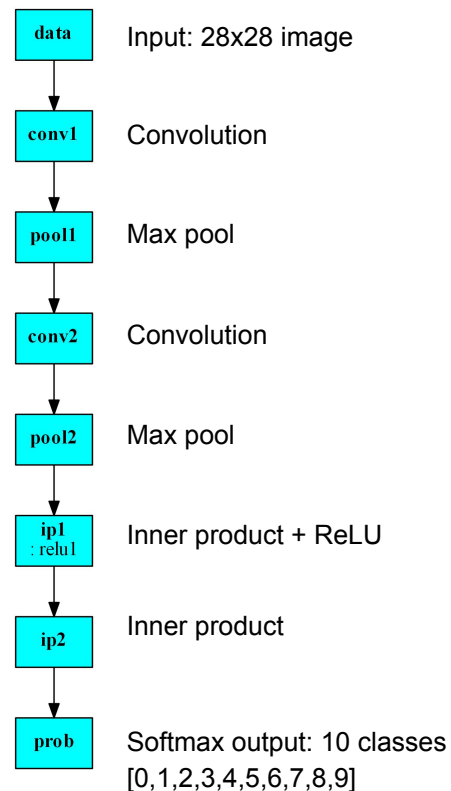
- Convolution
- Pooling
- Inner product or fully connected
- Rectified linear unit (ReLU)

The parameters for the operations are learnt in a training phase. Popular tools for training and design validation are:

- Caffe (Berkeley AI Research)
- Tensorflow (Google)
- PyTorch (Facebook)

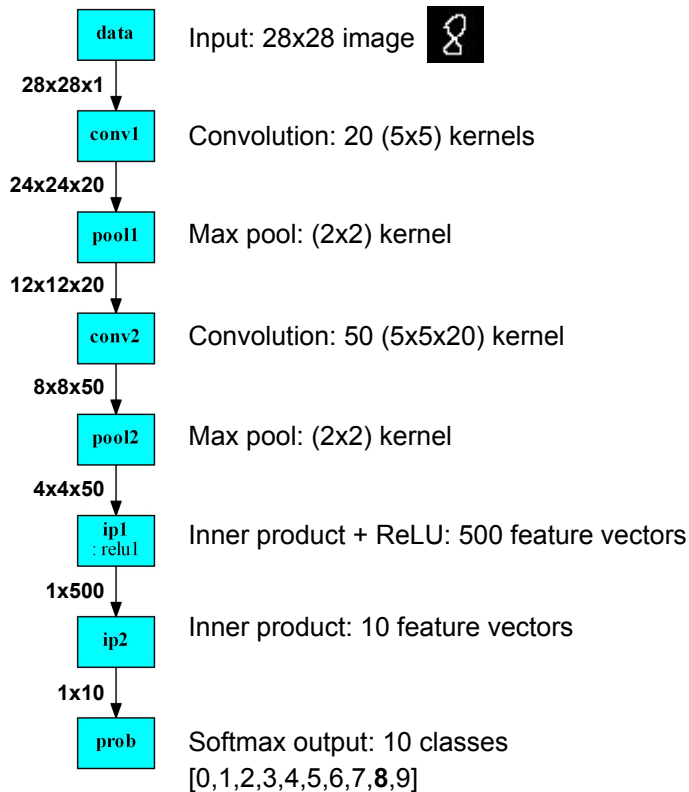
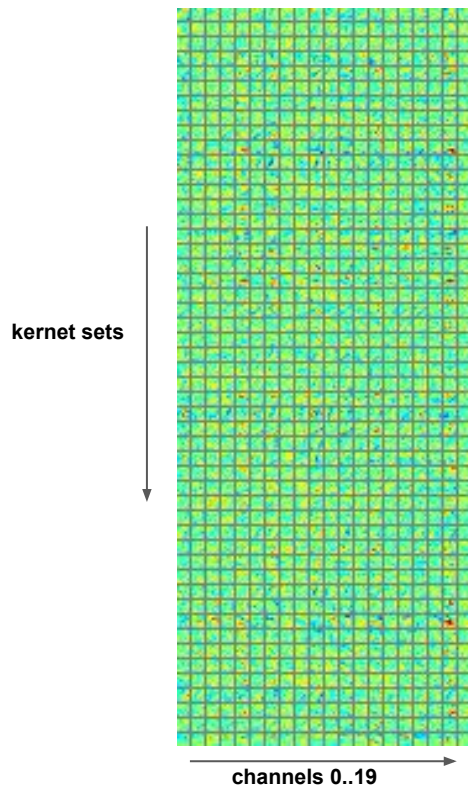
Caffe LeNet: handwritten digit classifier

Train with MNIST dataset



Caffe LeNet: inference

conv2 kernels: 50 (5x5x20)



Convolution in 3D: conv2

