Artificial Neural Nets (ANNs) (Similar to human brain):

are networks of artificial neuron nodes, each of which computes a simple function. It classifies images in analogous to neural nerves.

Components of ANNS:

input layer, an output layer, and "hidden" layers of nodes.

Neural Netw Use cases (Applications):

Pattern Recognition

Time Series Predictions

Signal Processing

Anomaly Detection

Neural Networks attempt to solve problems that would normally be easy for humans but hard for computers

The perceptron:

Simplest Neural network possible. It consists of one or more inputs, a processor, and a single output. It follows the "feed-forward" model
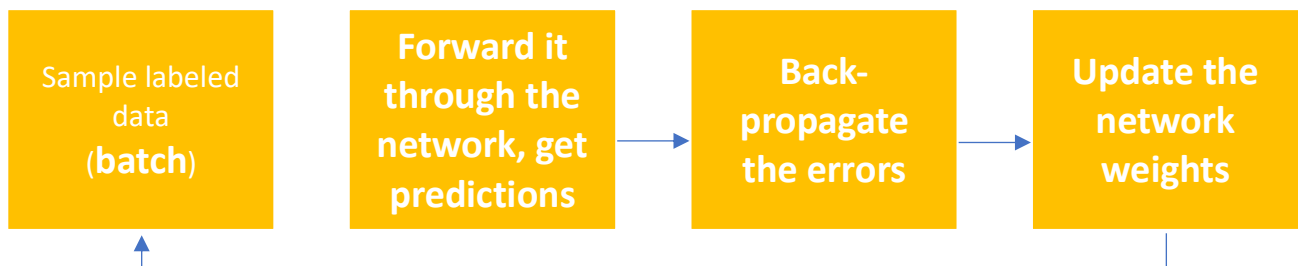
Types of Neural Networks:

(a) Feed-forward networks: mainly used in the areas such as prediction and pattern recognition. It uses using a classifying activation function usually Sigmoid, tanh, ReLU, SoftMax.

(b) Feedback network: mainly used for associative memory and optimization calculation.

(c) Self-organization networks: mainly used for cluster analysis.

Training of Neural Networks:

| Sample labeled data (**batch**) | **Forward it through the network, get predictions** | → | **Back-propagate the errors** | → | **Update the network weights** |

Example for input calculations:

Input 0: x1 = 12   Weight 0: 0.5

Input 1: x2 = 4 Weight 1: -1

Input 0 * Weight 0 ⇒ 12 * 0.5 = 6

Input 1 * Weight 1 ⇒ 4 * -1 = -4

Convolutional Neural Nets (CNNs)

is a feed-forward network that can extract topological properties from an image. They can recognize patterns with extreme variability (such as handwritten characters).

The whole CNN

cat dog ……

Fully Connected
Feedforward network

Convolution

Max Pooling

Convolution

Max Pooling

Flattened
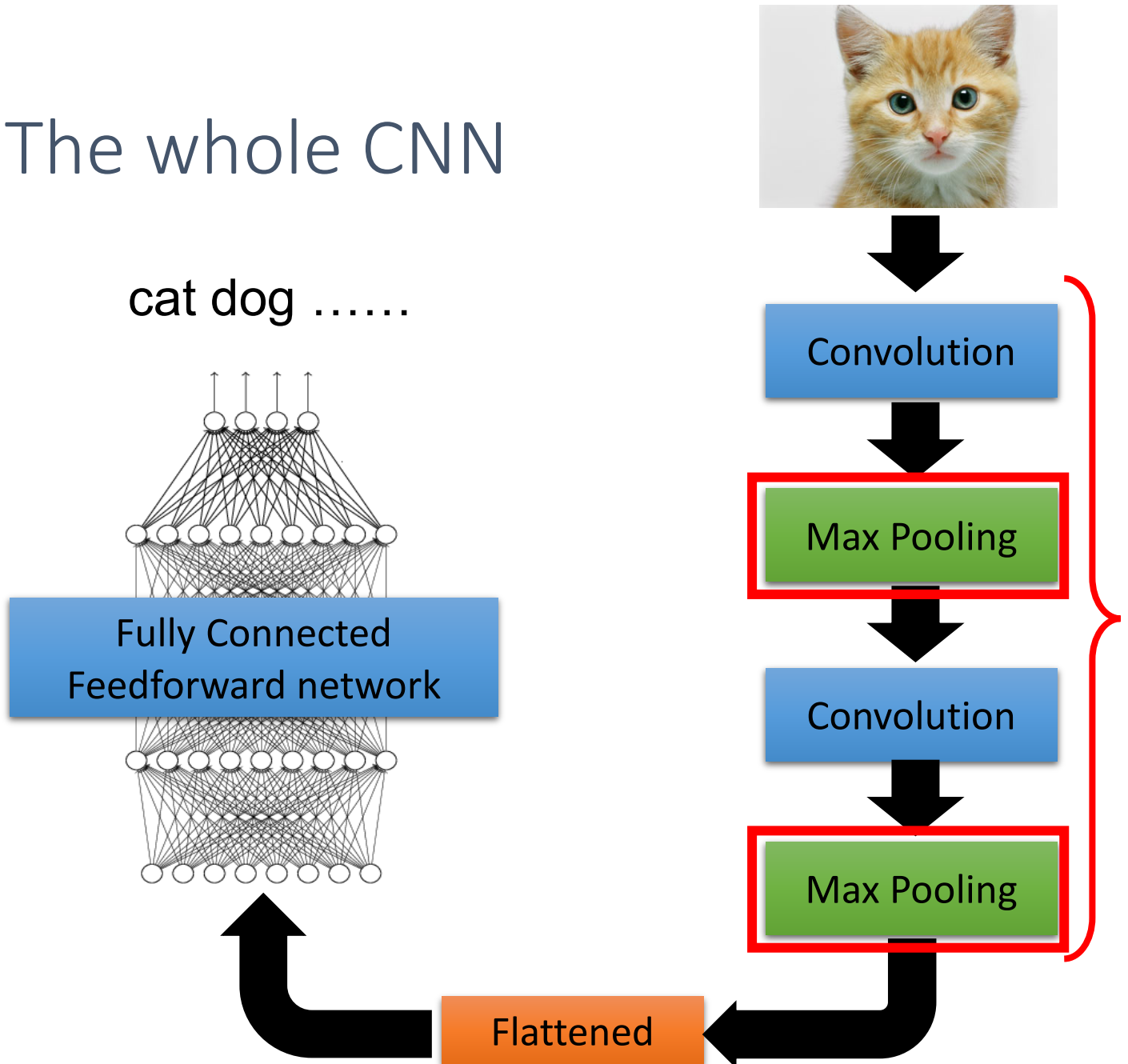
Too low threshold → too many detections → low precision, high recall

Too high threshold → too few detections → high precision, low recall