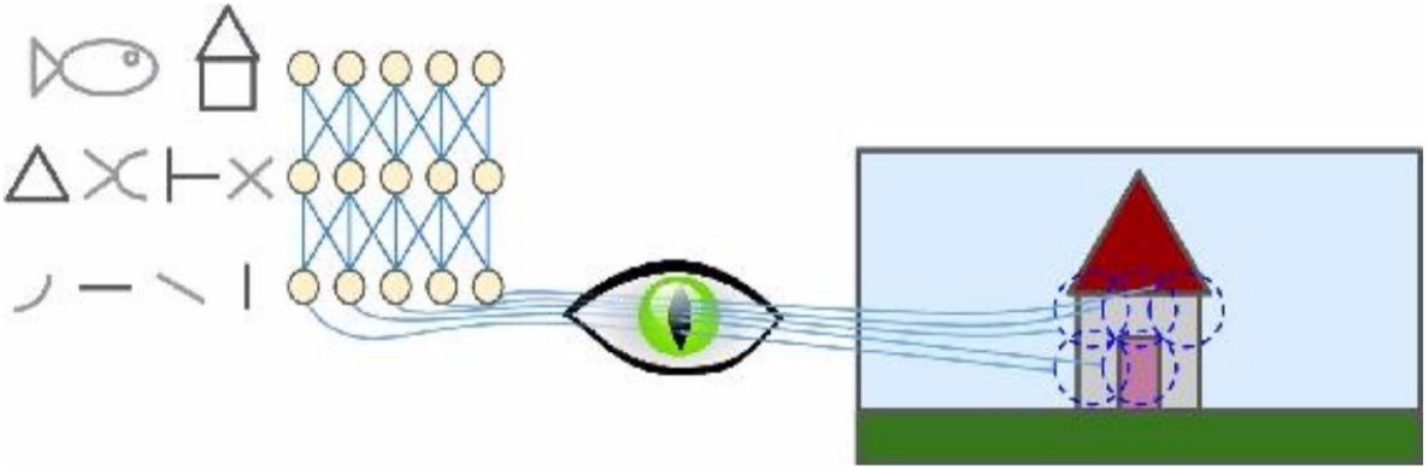
# Convolution Neural Network

1. Human Vision
2. CNNs
3. CNN Architectures

# Human Vision

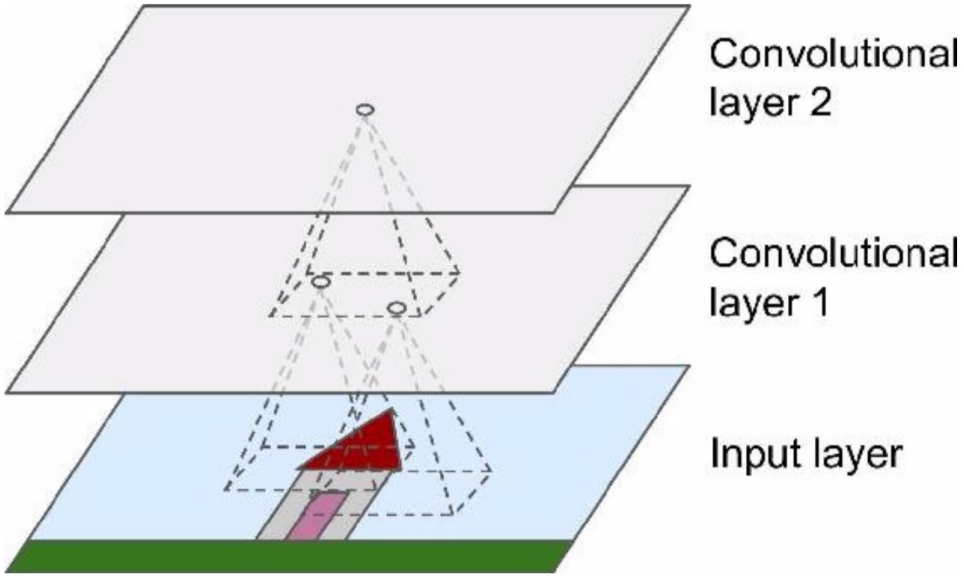
# How Do Humans See Images?



# CNN

# Convolution Layer

- In a convolution layer, neurons are connected to pixels in their receptive field of the input image

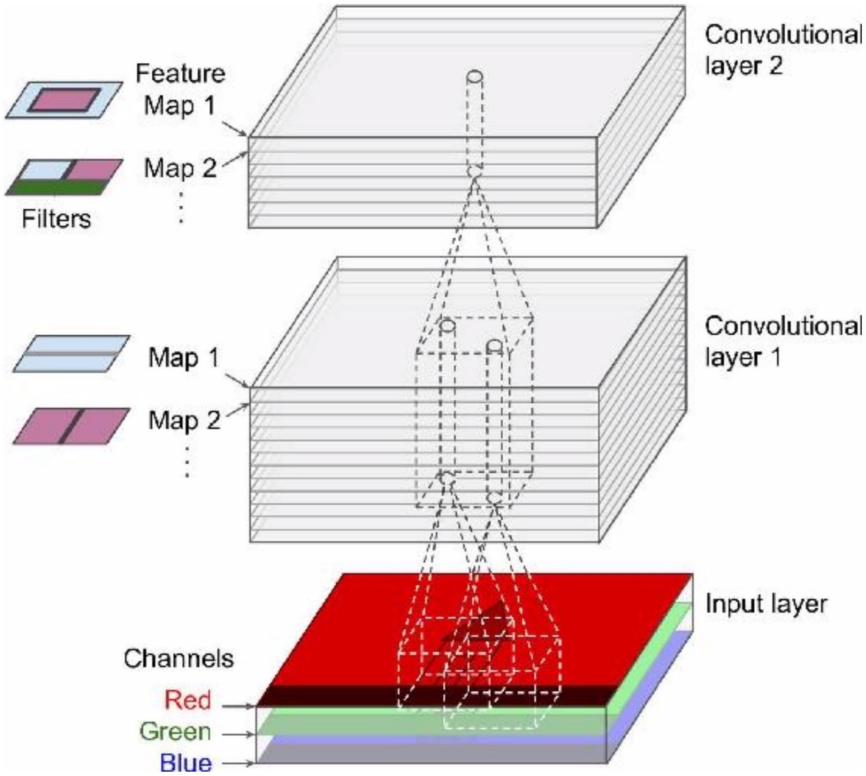



# Attributes of Convolution Layer

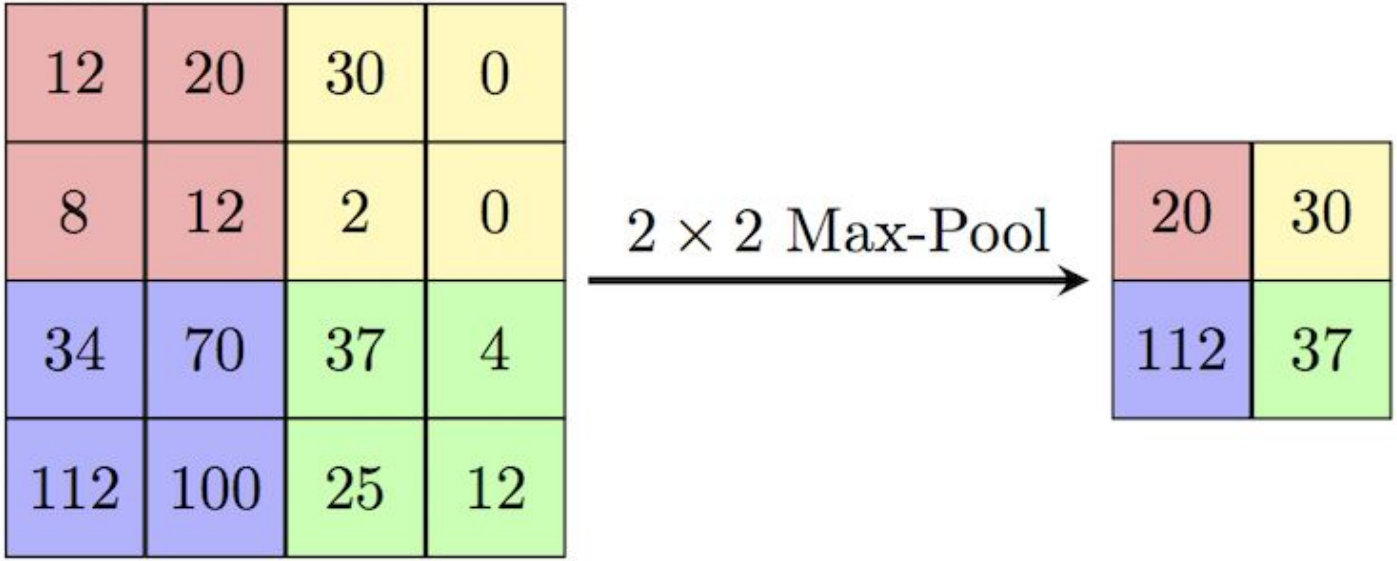
- Stride: distance between two receptive fields
- Filters (aka kernels): the weights that correspond to the receptive fields

# Convolution Layer

# Multiple Feature Maps




# Pooling Layer

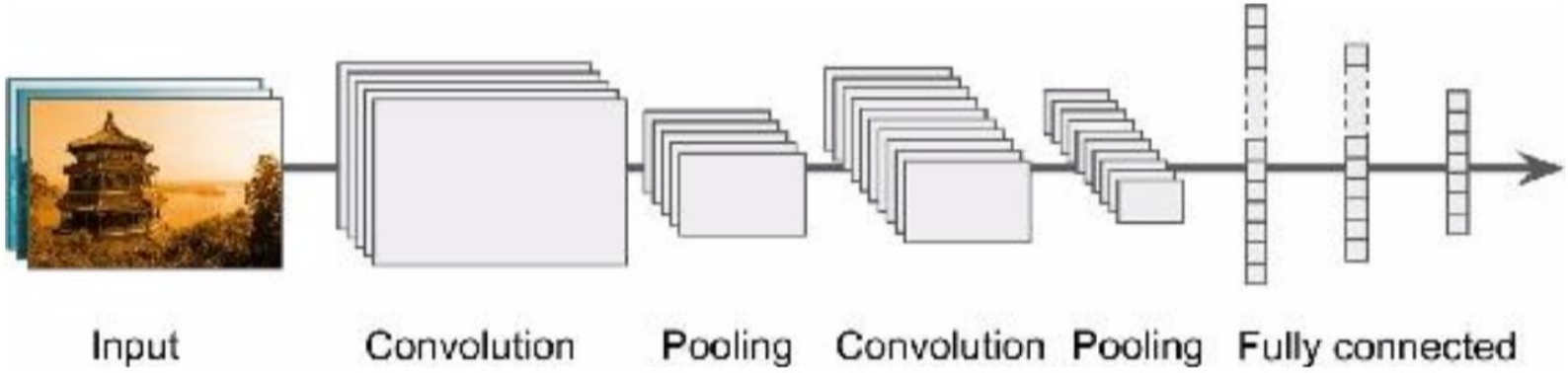



# CNN Architectures

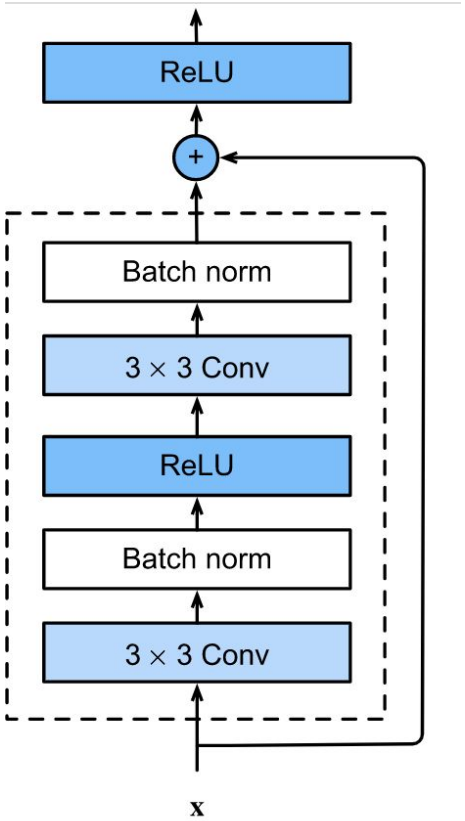
# Stacking Convolution Layers

- We can stack convolution layers and pooling layers in many different ways
- Typical CNN architectures follow:
  - Multiple conv layers, pooling layer, multiple conv layer. Pooling layer, …, flatten, feed forward layer

# Architecture




# ResNet



# Questions to Answer

1. What are the advantages of using a CNN over a regular NN for images?
2. Say our input image is size 10 by 10, our filter is size 3 by 2, and our stride is 2 by 1. We do not use any padding. What is the output size?
3. Say our image is size 10 by 10, our filter size is 5 by 5, and the number of feature maps is 128. How many parameters do we have?