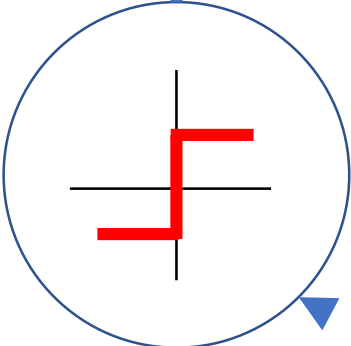


# Neural Network: Single Layer Perceptron

Output

$y$  1 or -1: binary classification

*thresholding*



$x \cdot w + b$

$w$

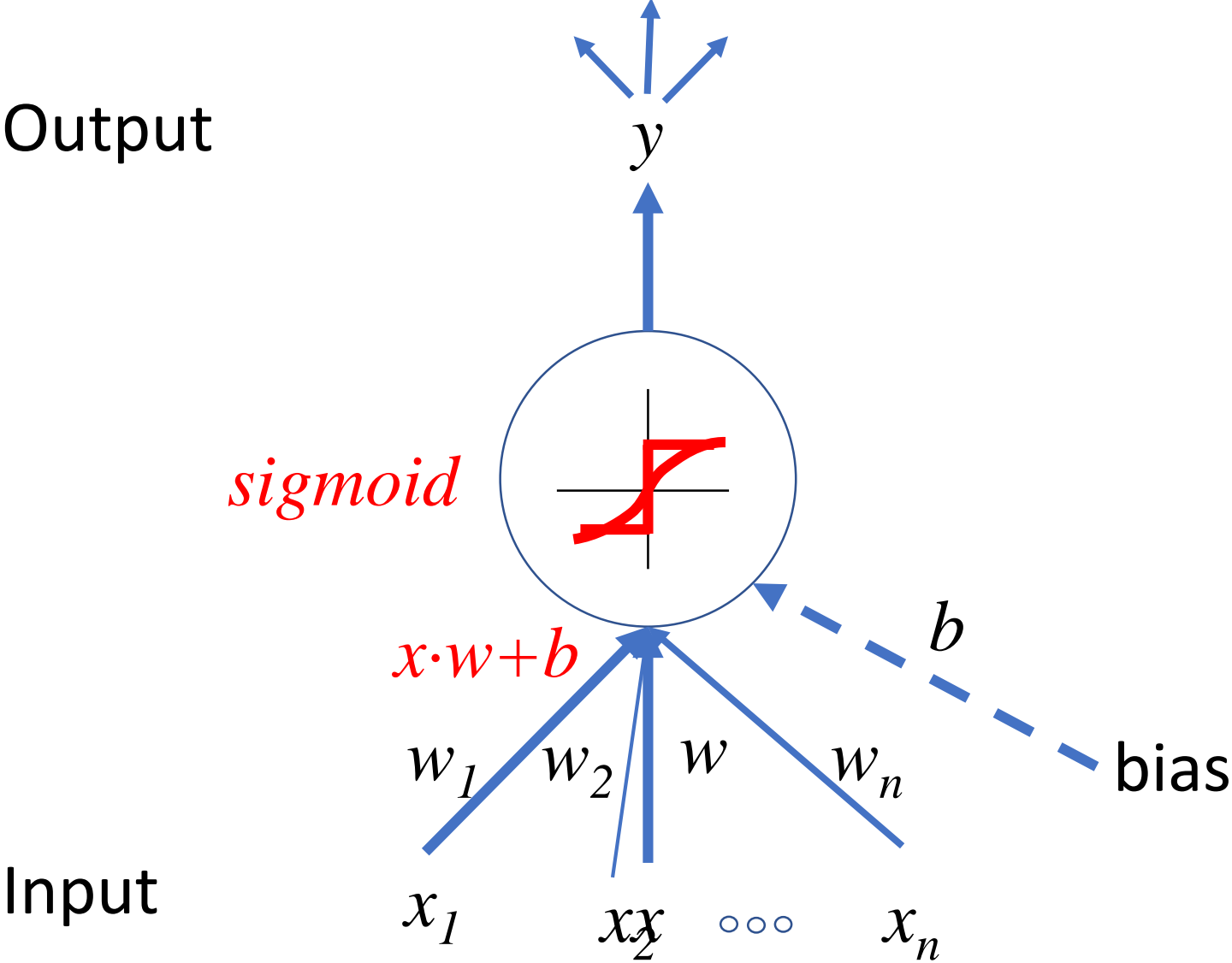
$b$

bias

Input

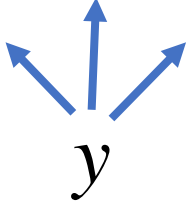
$x$

# Neural Network: Single Layer Perceptron

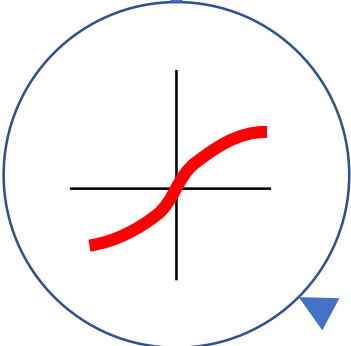


# Neural Network: Single Layer Perceptron

Output



$y$



$w_1$

$w_2$

$w_n$

$b$

bias

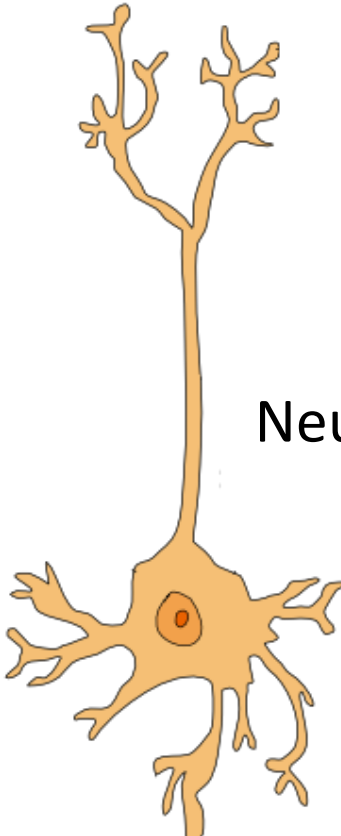
Input

$x_1$

$x_2$

...

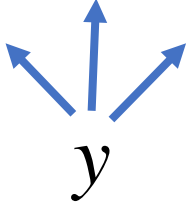
$x_n$



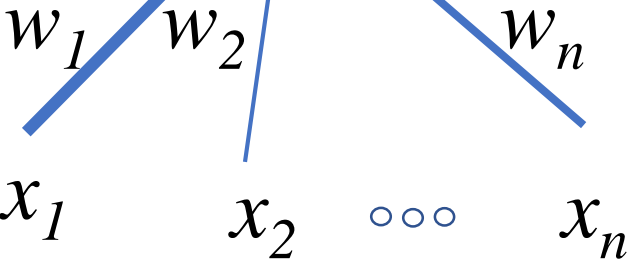
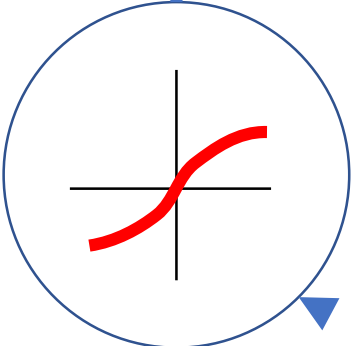
Neuron

# Neural Network: Single Layer Perceptron

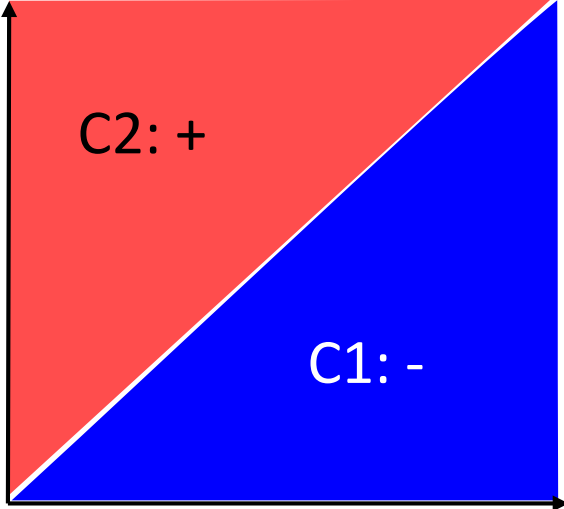
Output



$y$



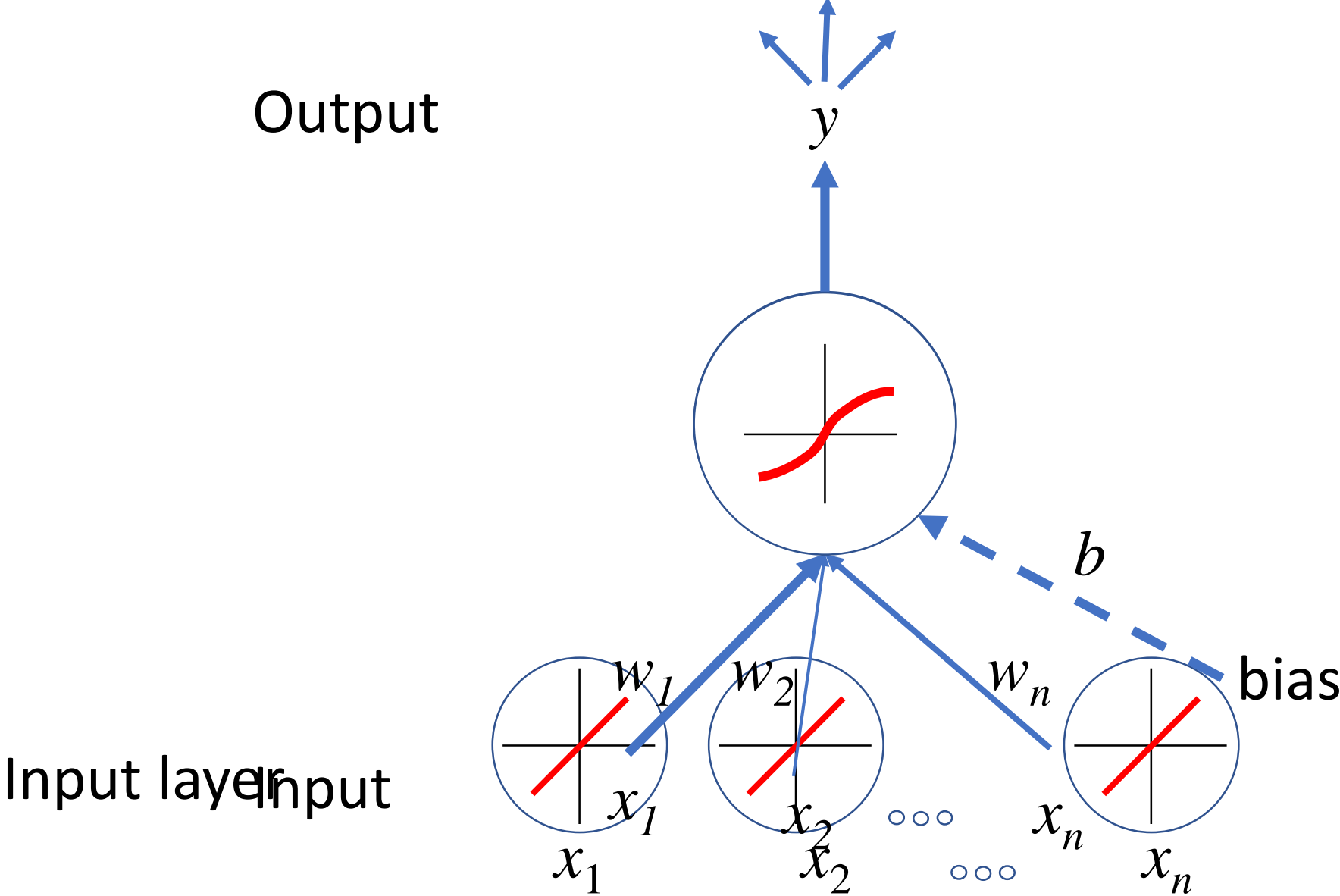
Input



$b$

bias

# Neural Network Single Layer Perceptron



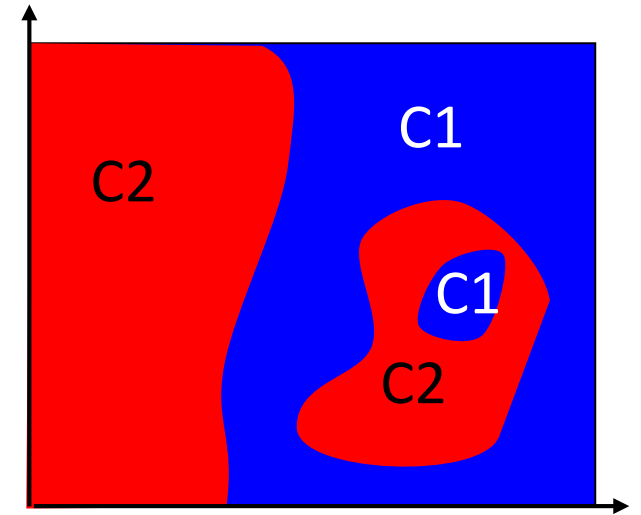
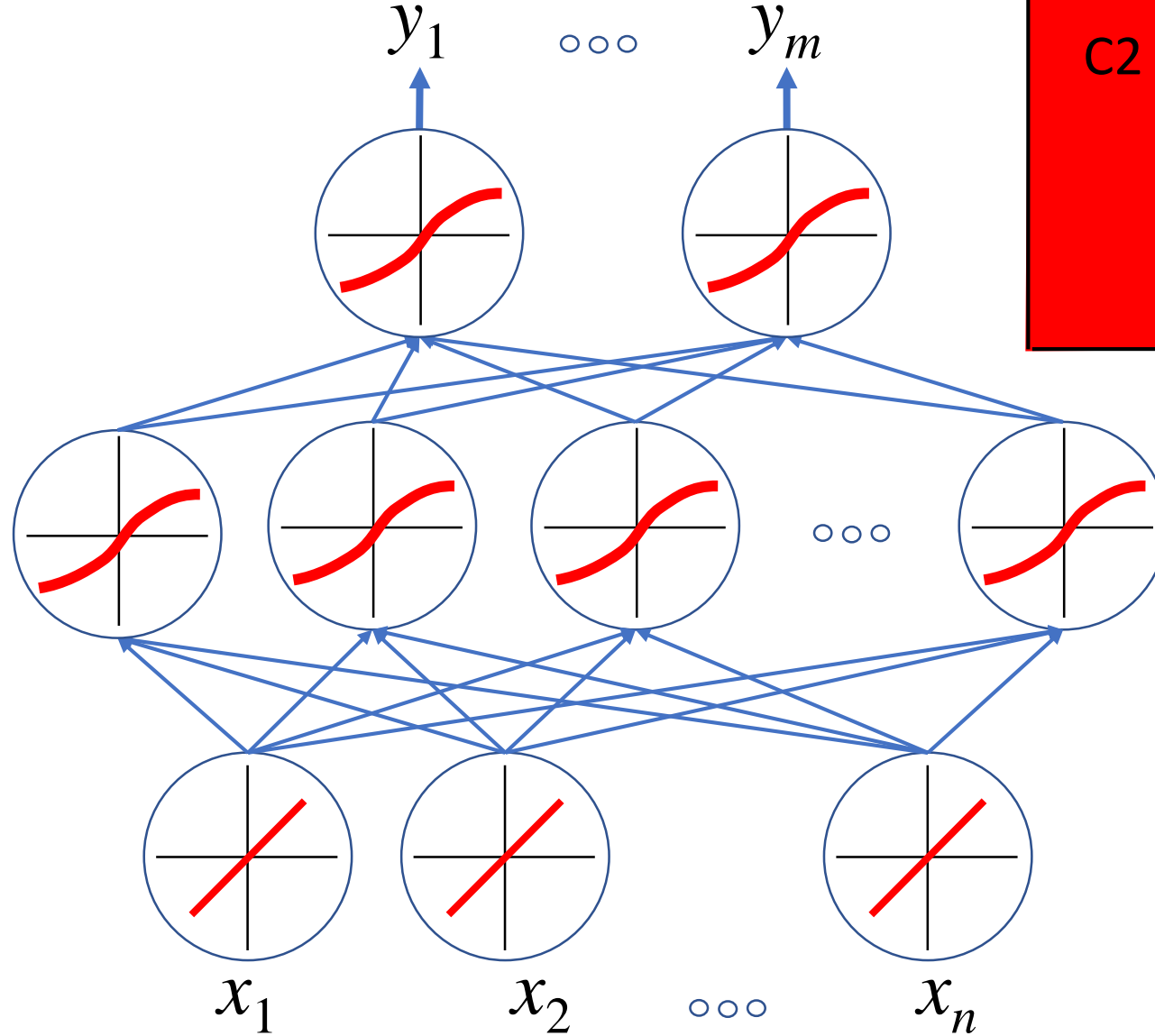
# Neural Network

Output layer

$y_1$     ...     $y_m$

Hidden layer

Input layer

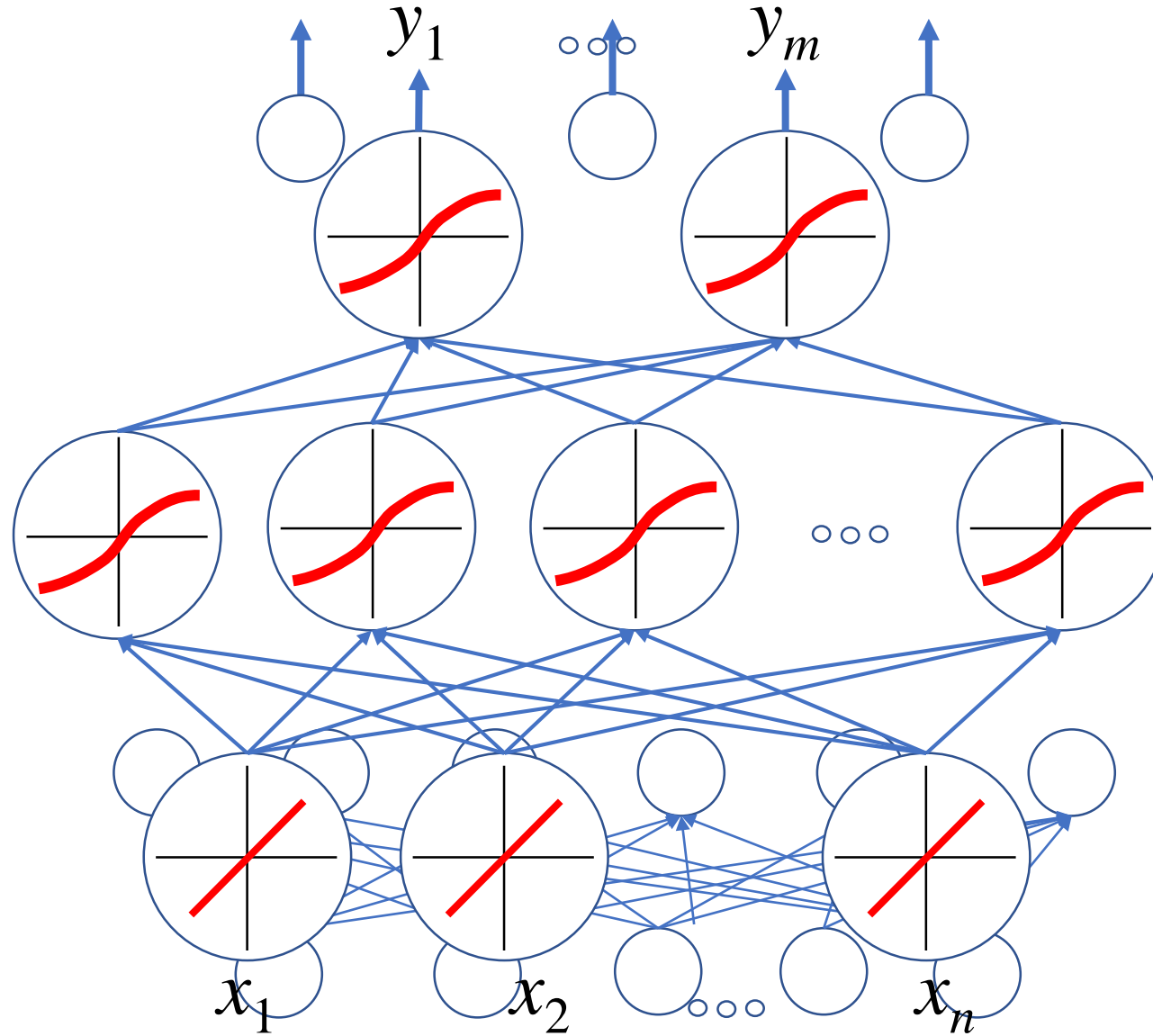


# Deep Neural Network

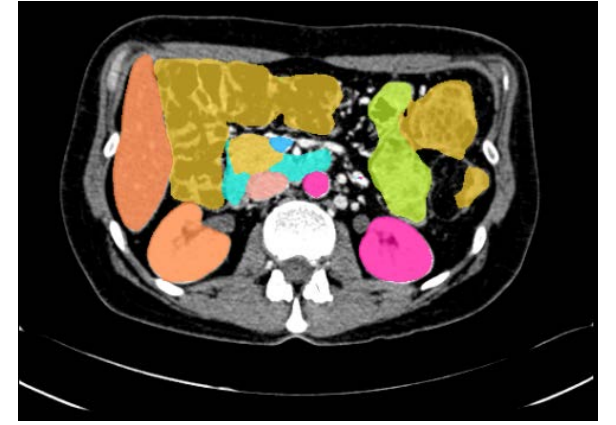
Output layer

Hidden layer

Input layer  
Input layer



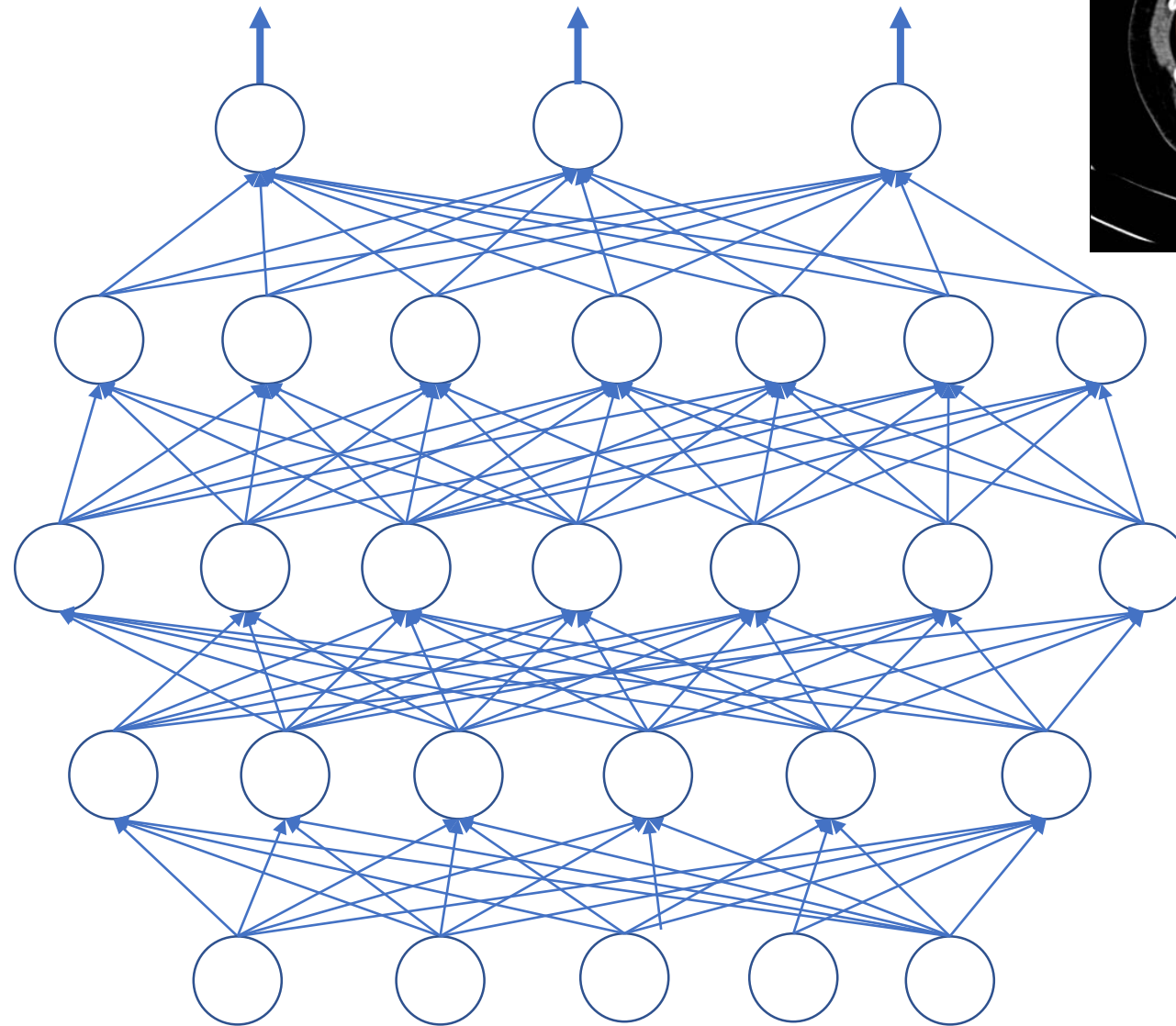
# Deep Neural Network



Output layer

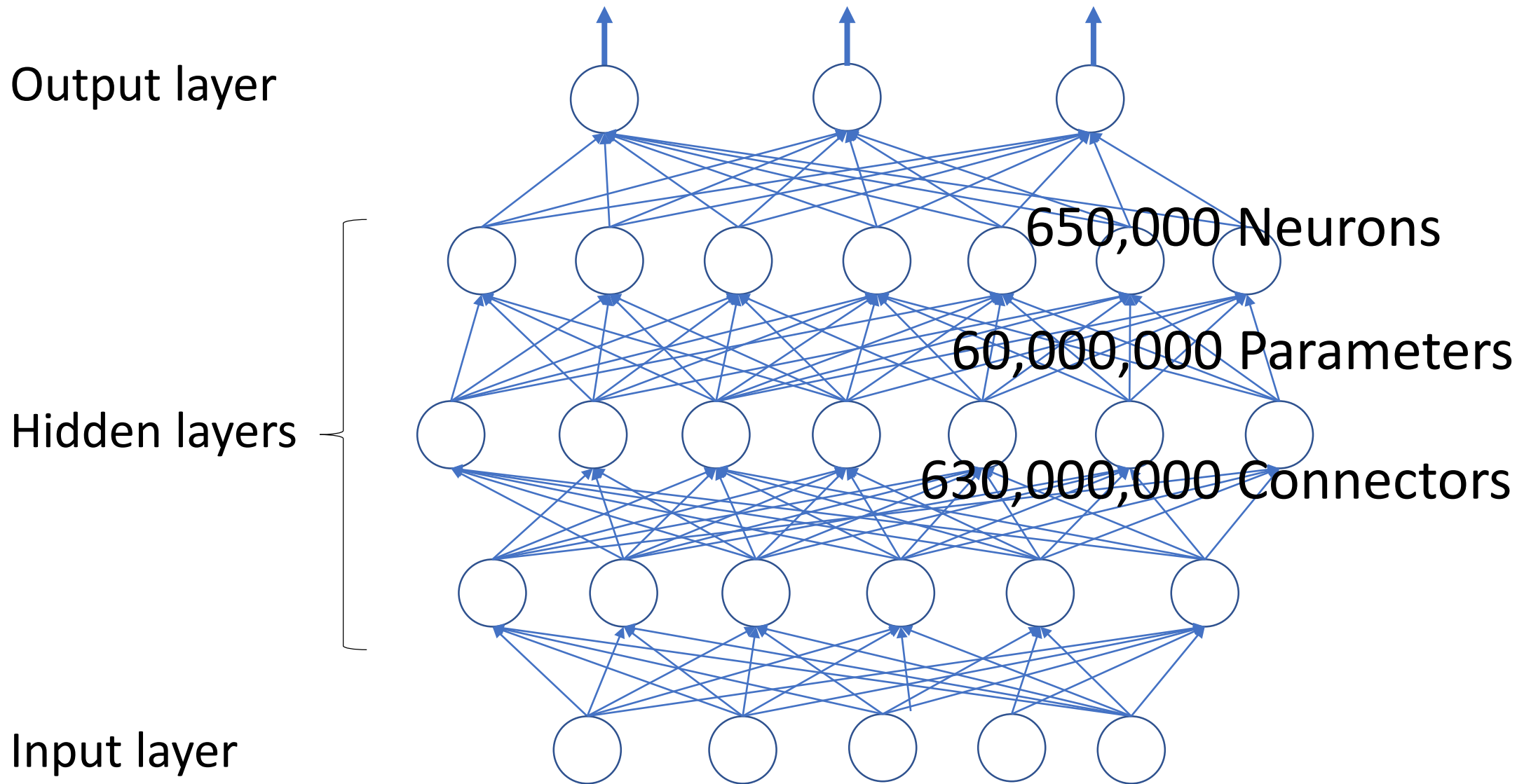
Hidden layers

Input layer





# Conceptual model of Deep Neural Network ~~World~~ Deep Neural Network?



# Convolutional Neural Network



Input image

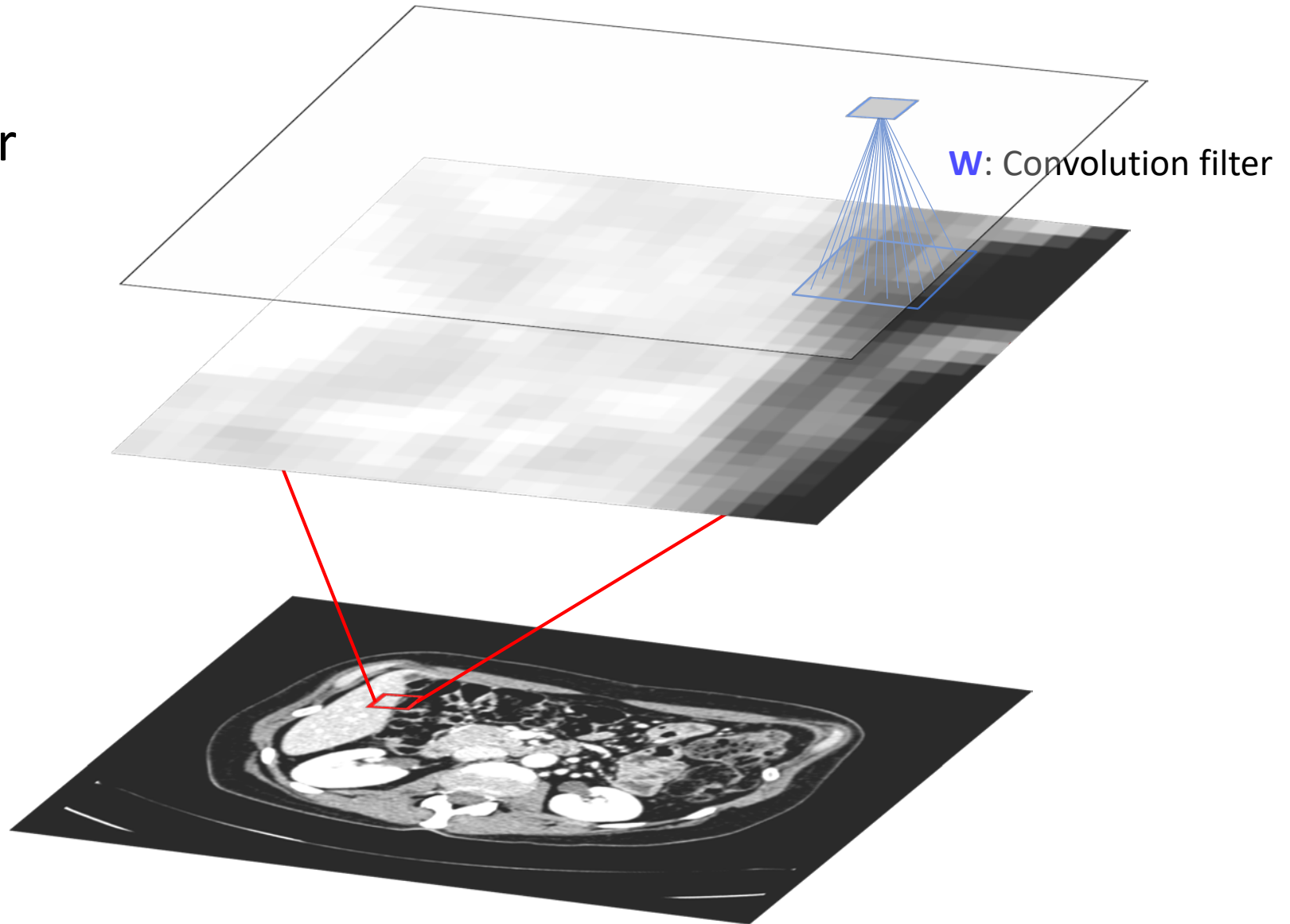
# Convolutional Neural Network



Input layer

# Convolutional Neural Network

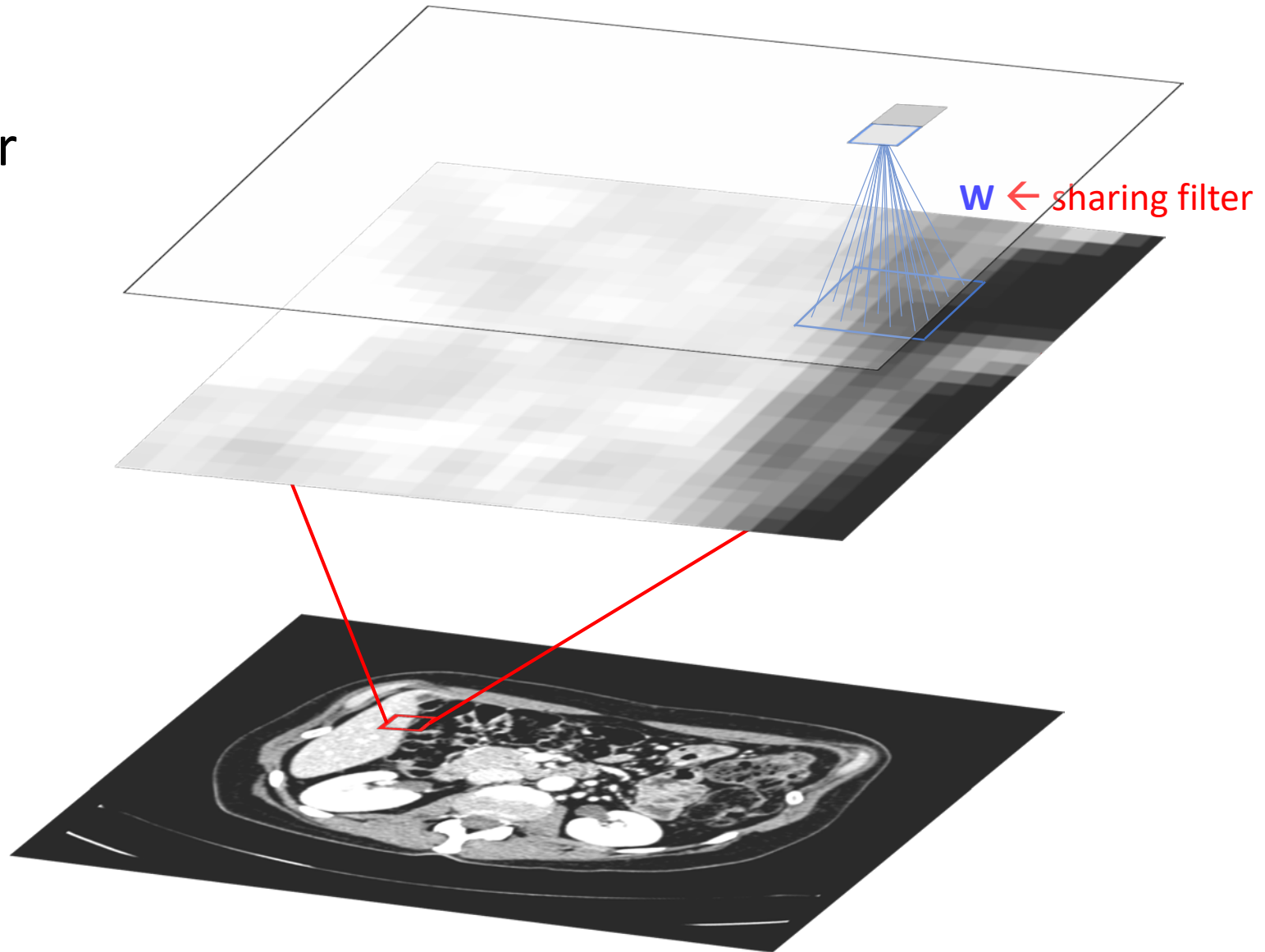
Convolution layer



Input layer

# Convolutional Neural Network

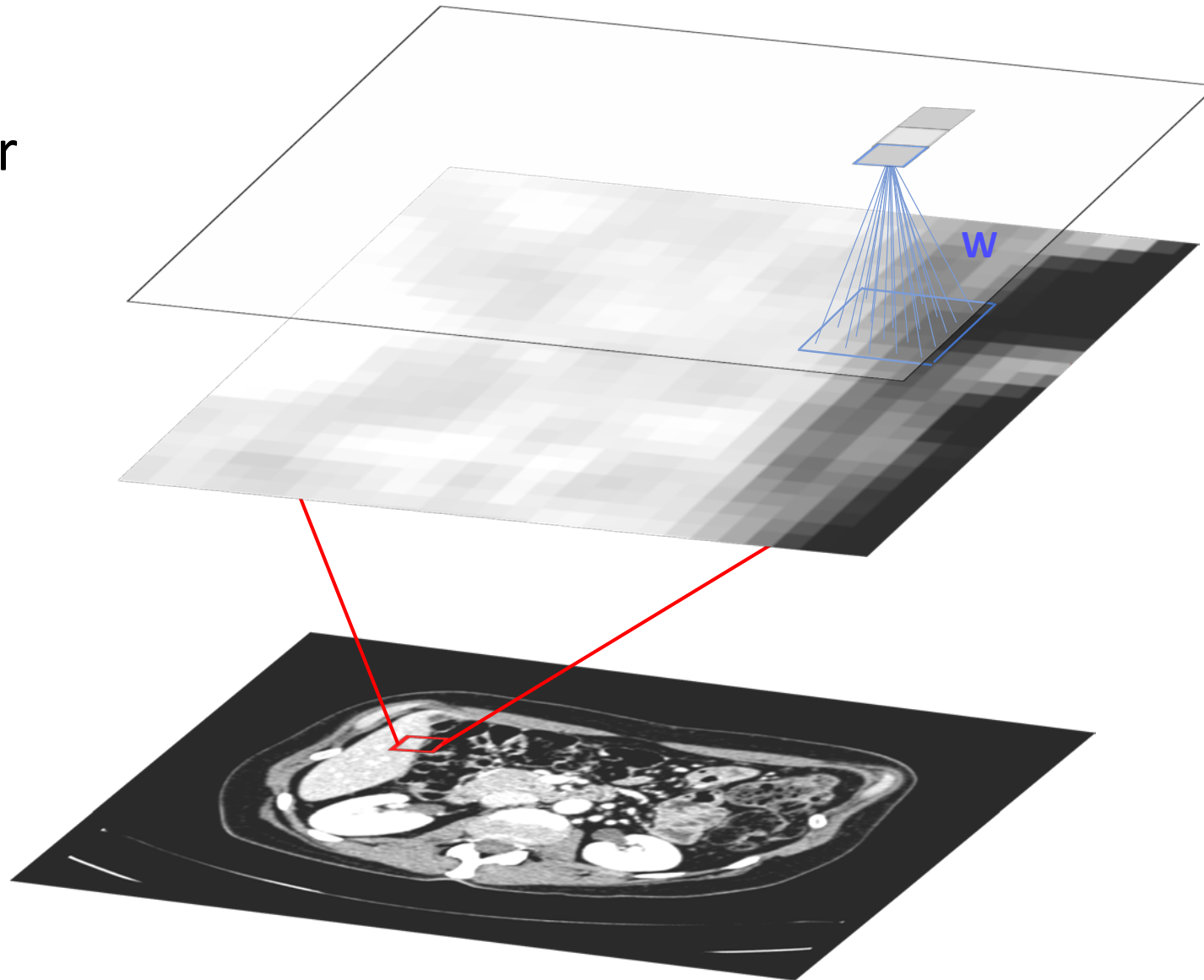
Convolution layer



Input layer

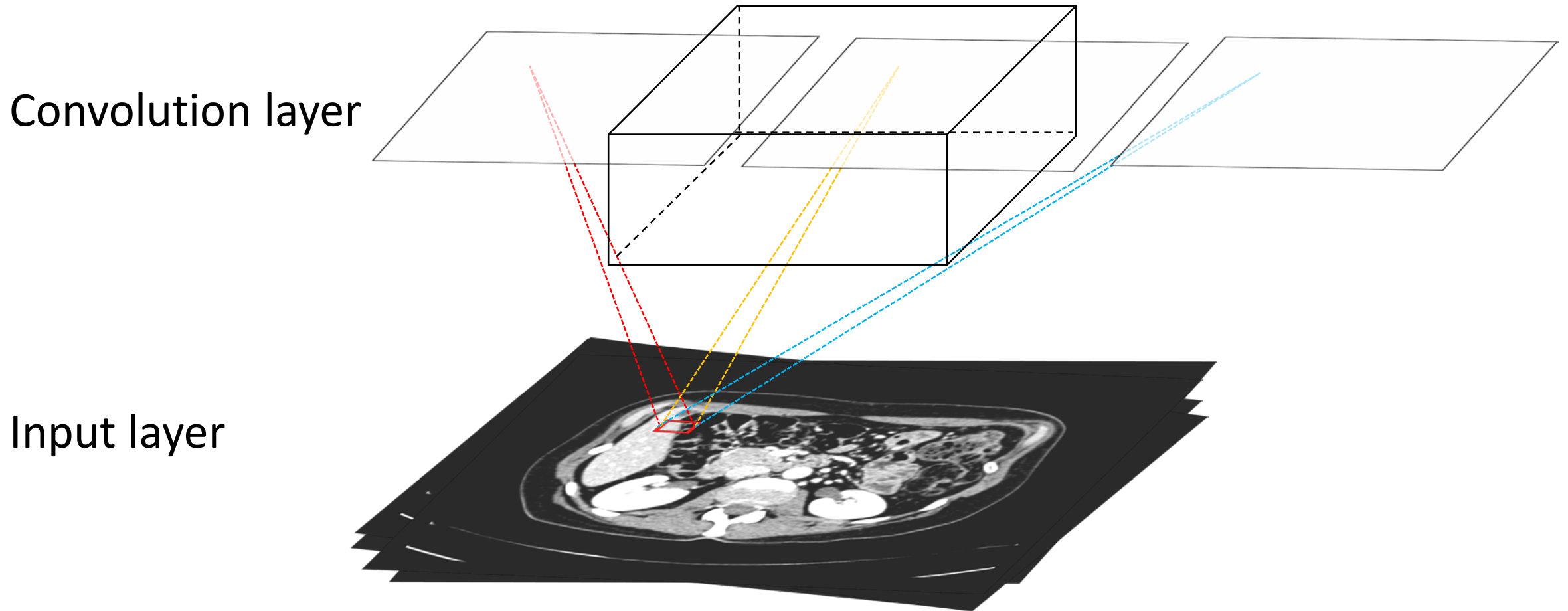
# Convolutional Neural Network

Convolution layer



Input layer

# Convolutional Neural Network



# Deep Convolutional Neural Network

Output layer

Convolution  
Layers

Input layer

