ML Monday
Week 3

Presented by Kyle Dampier

Agenda

- What are Neural Networks?
- What are Convolutions?
- Find and Collect Images
- Import Image Data
- *Constructing our first Neural Network (if time)*

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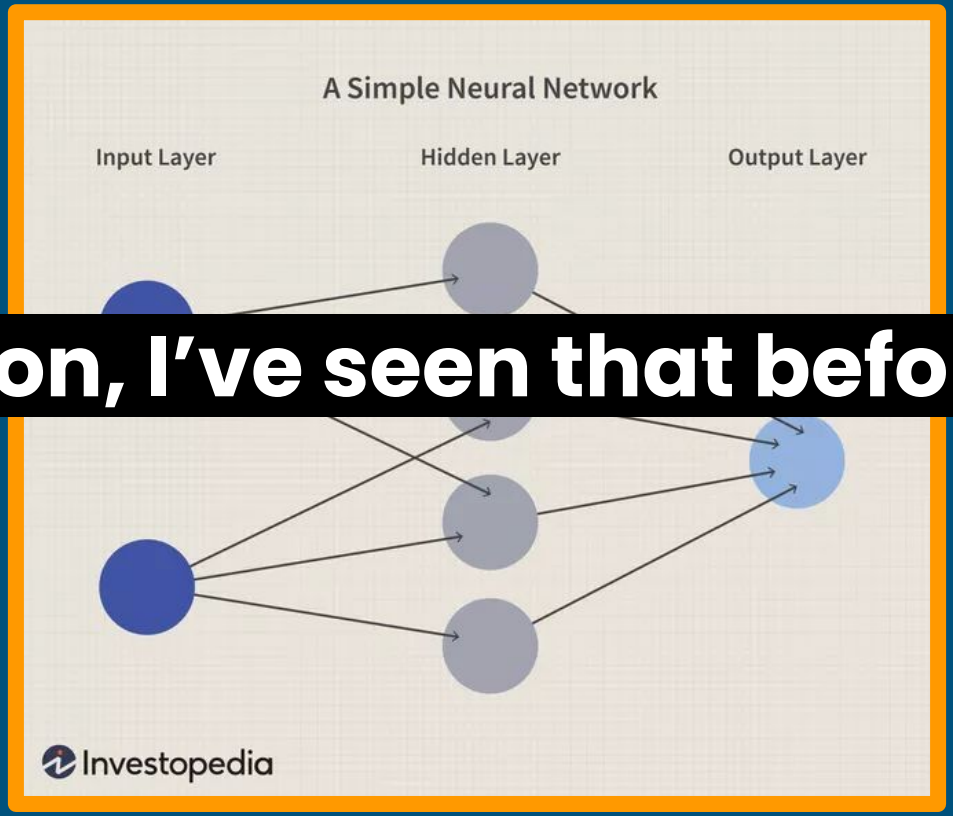
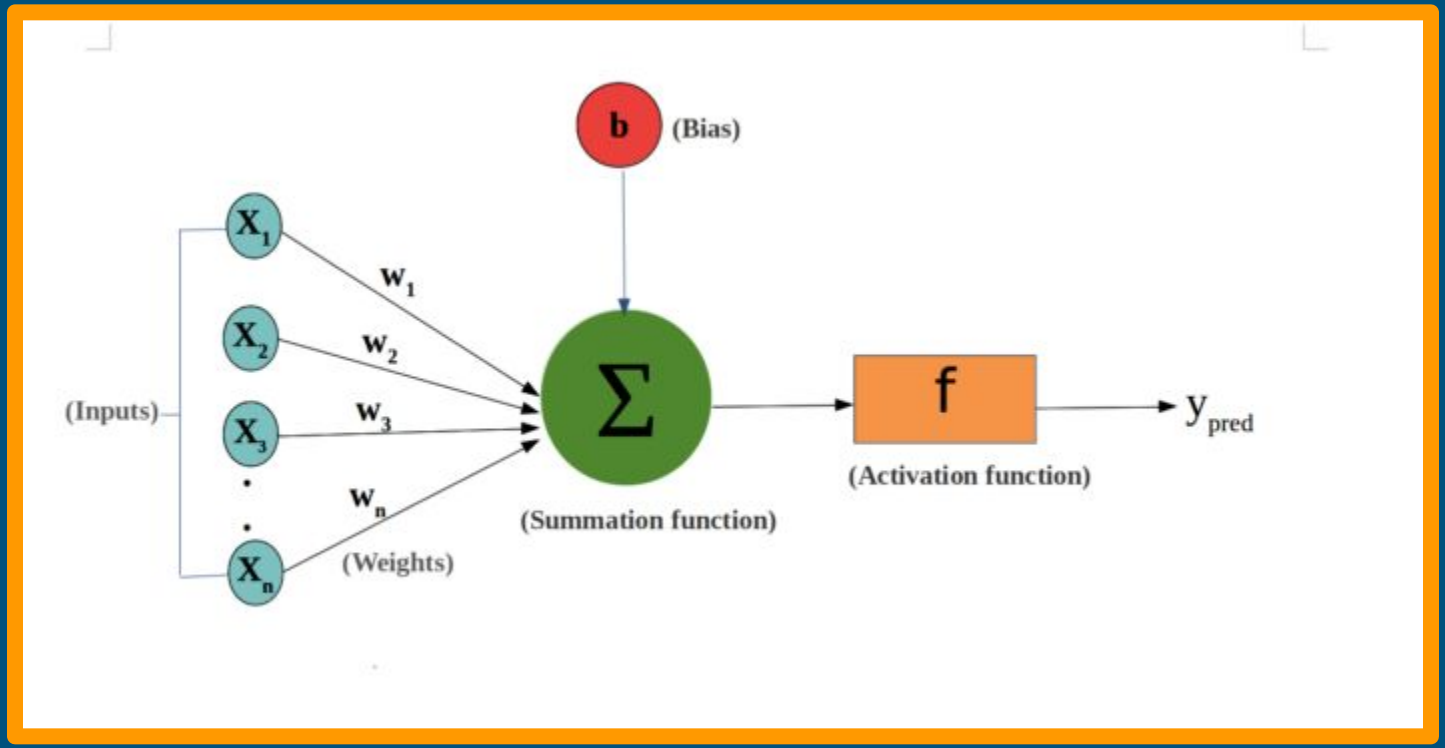
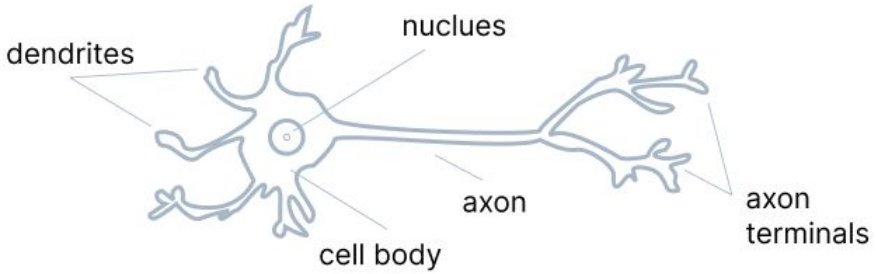
Basic Neural Network

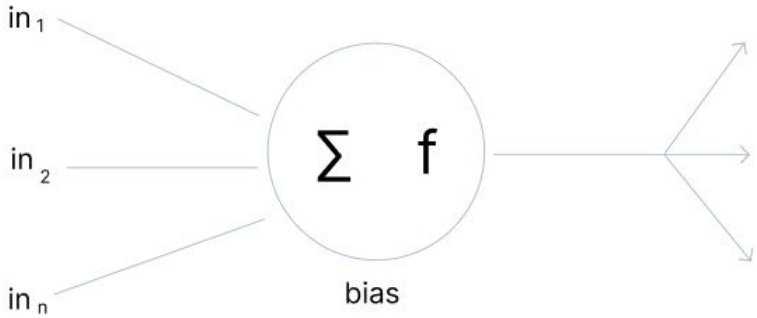


Cmon, I've seen that before...

How about this?



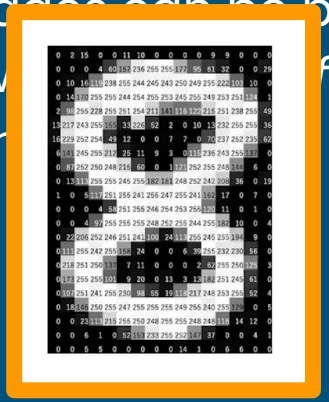

dendrites
nuclues
axon
axon terminals
cell body

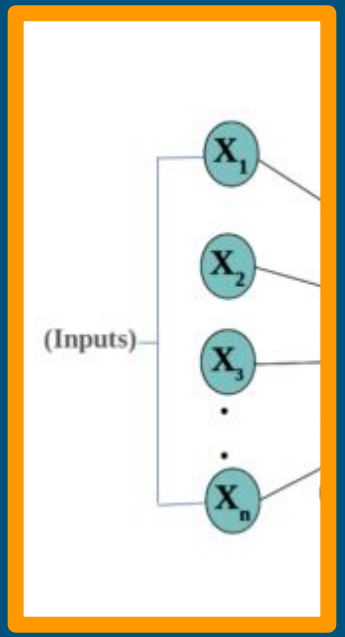

in 1
in 2
in n
Σ f
bias

V7 Labs

Inputs & Outputs

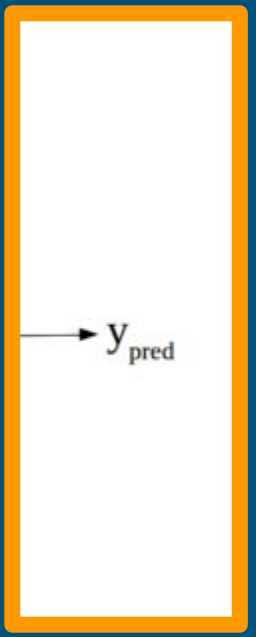
- List of numbers
  - Most of the time
- F(**x**) = y
- F(inputs) = output
- Images can be broken dow… *nur…*





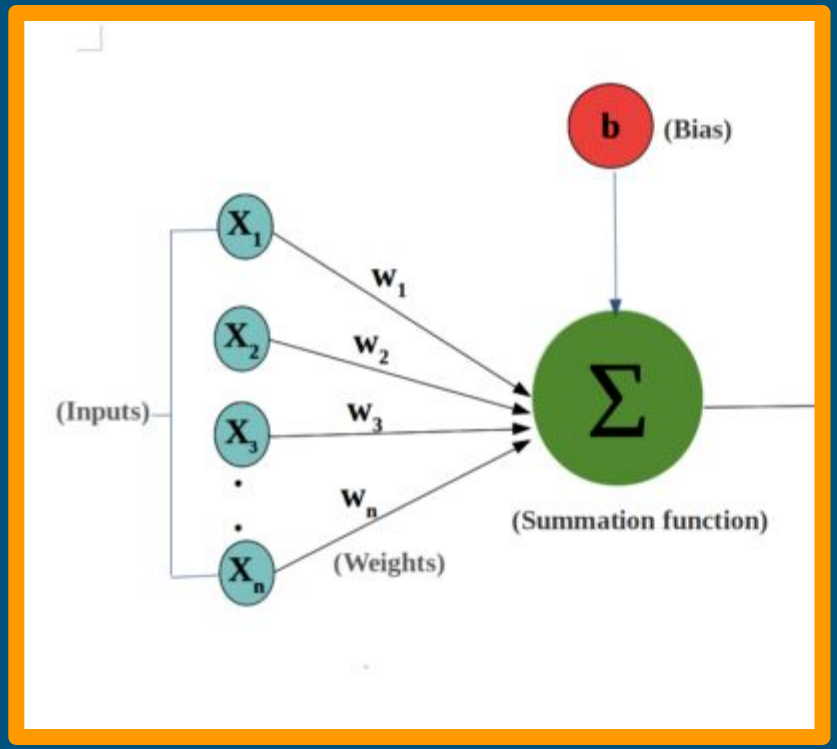
Neural Network

Some Function F



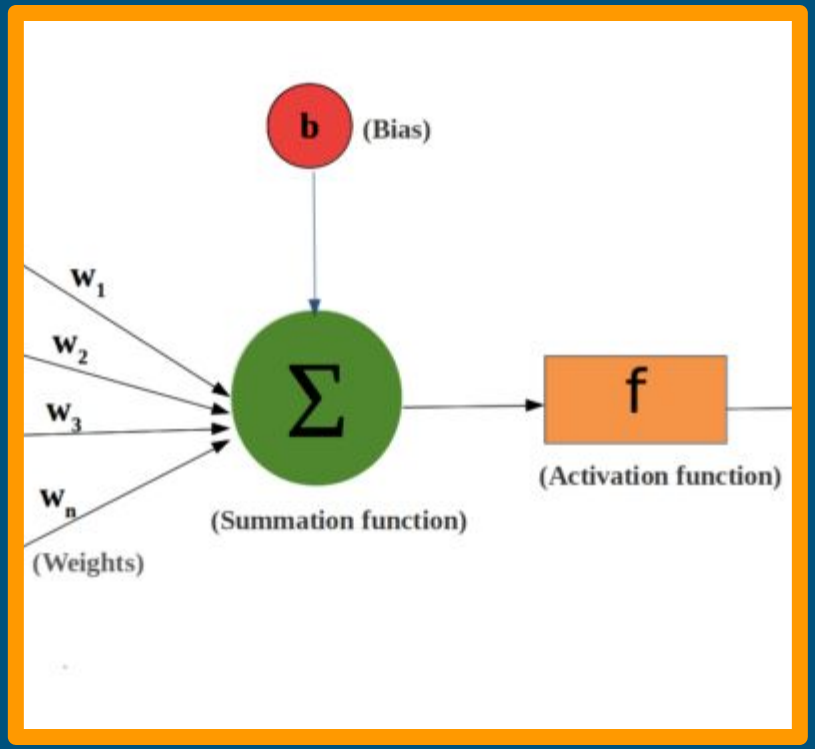
Weights & Biases

- Lines = Weights
  - Scales function
  - F(x * **w**) = y
- Circles = Biases
  - Shifts function
  - F(x * w + x * **b**) = y



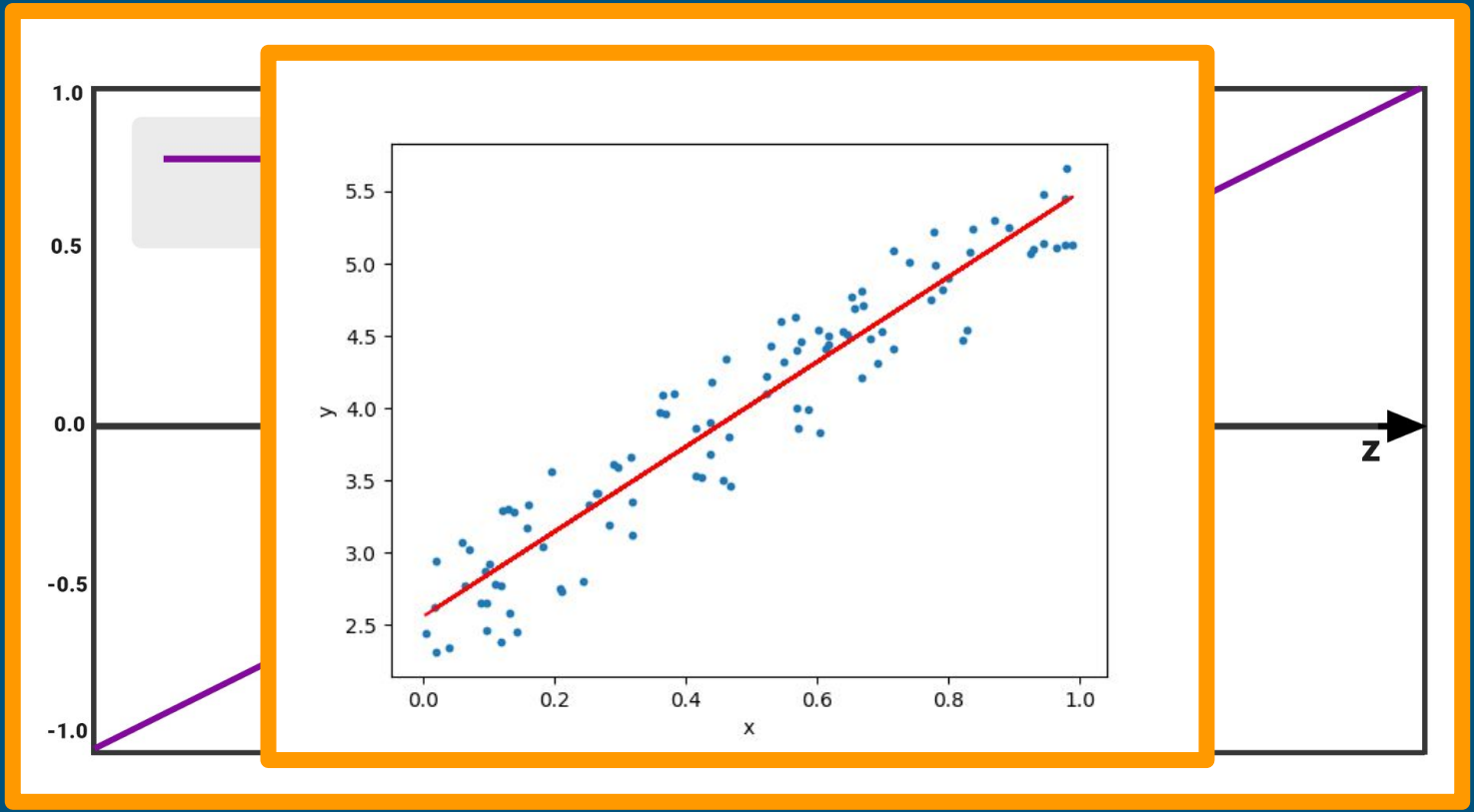
Activation Function

- Tries to **fit** inputs and outputs based on activation function.
- **F**(x) = y
- Different types of activation functions?

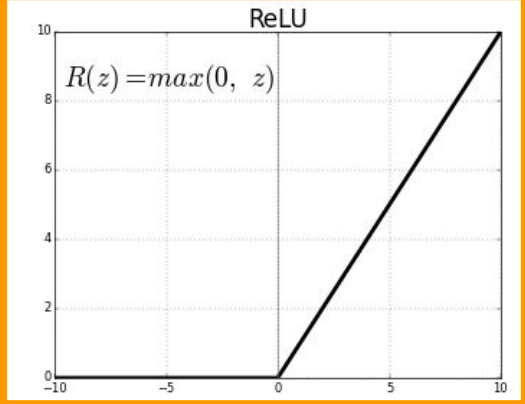


Regression

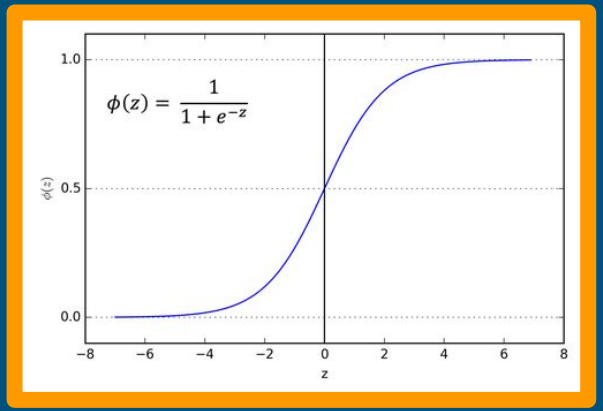
Linear ~~Activation Function~~



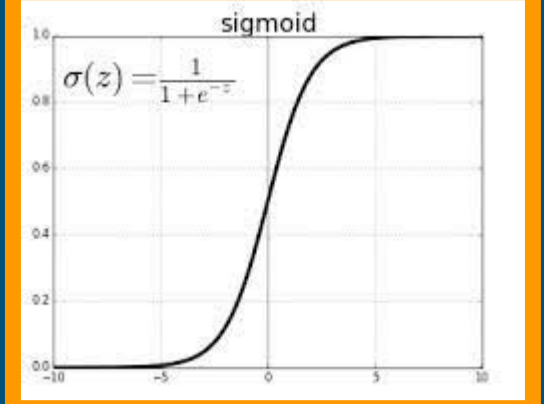
ReLU
Rectified Linear Unit



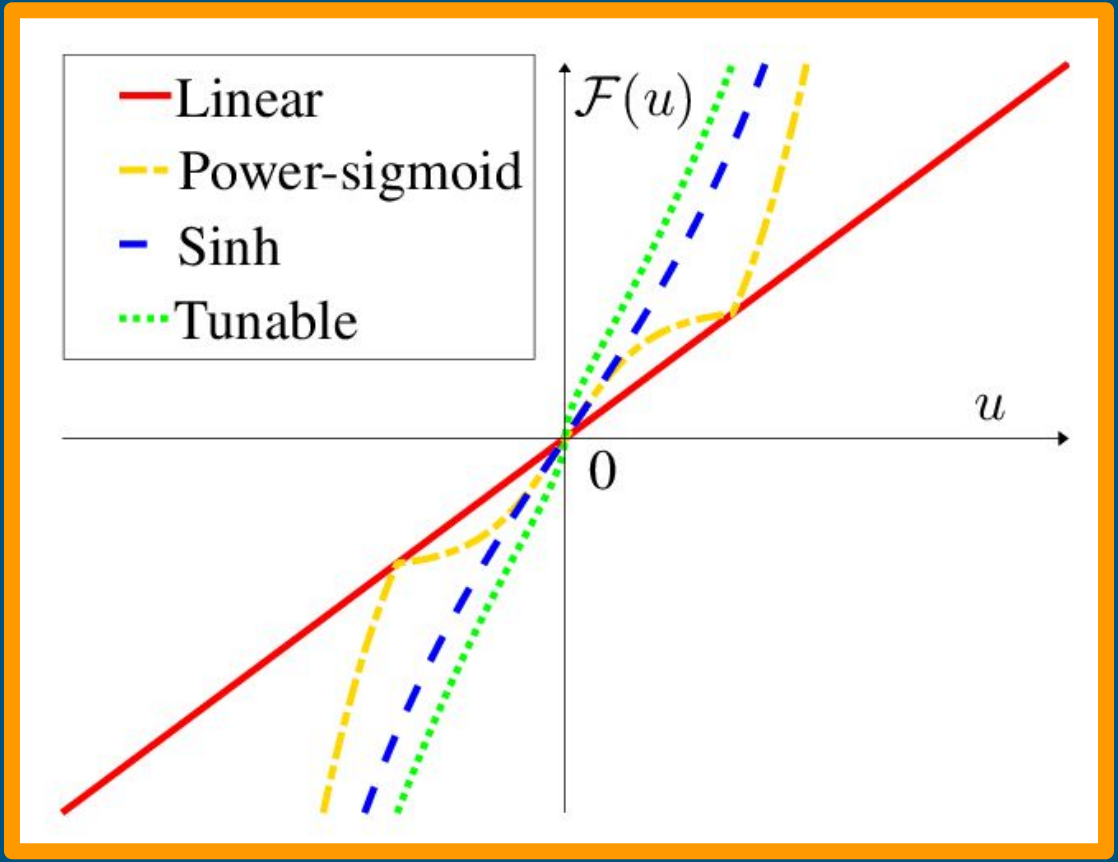
tanh
inverse tangent



Sigmoid
aka Logistic

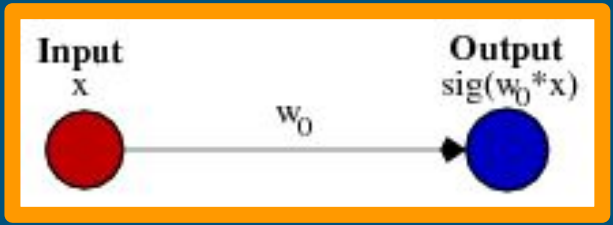


And Many More...



I thought this was cool

Changing Weights

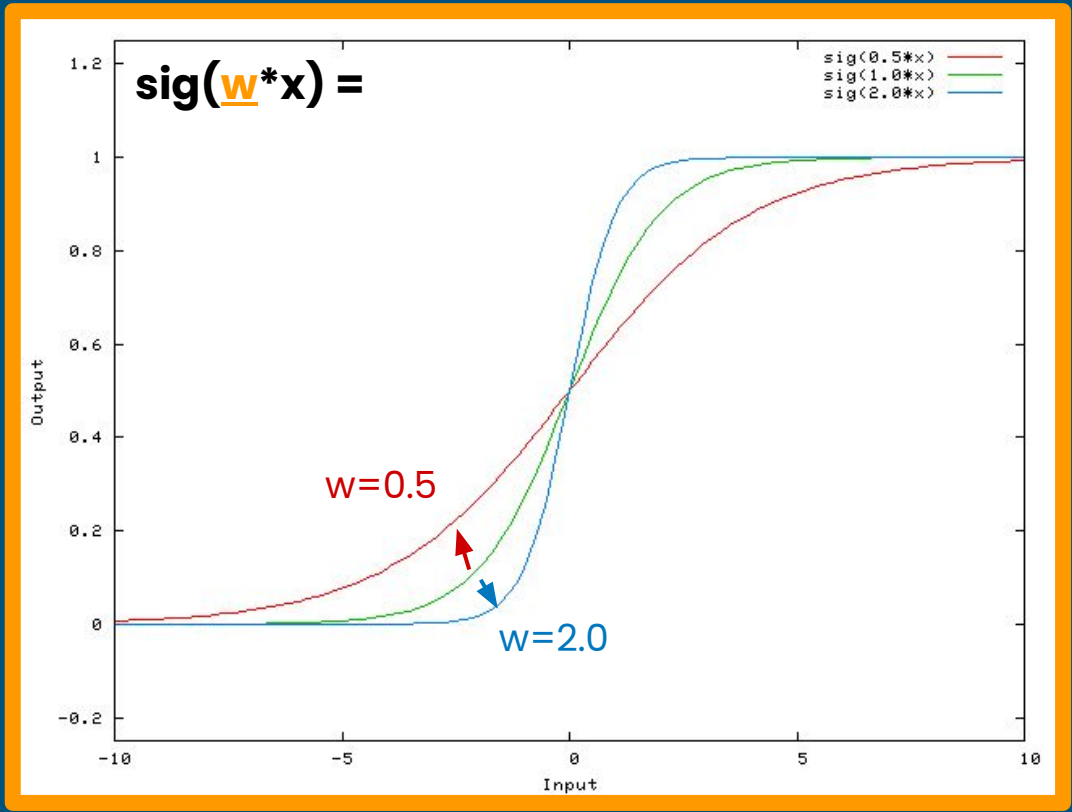


Activation Function: **Sigmoid**

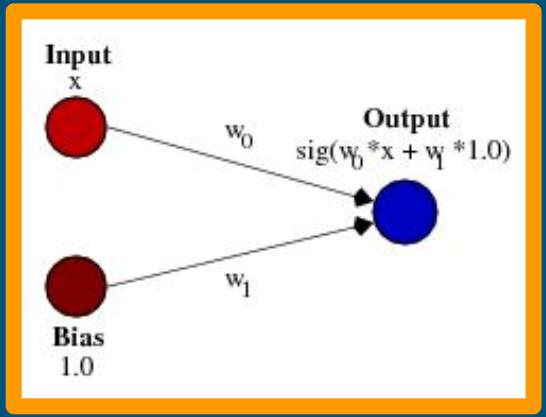
sig(x) = y

Weight = w

Input = x



Changing Biases



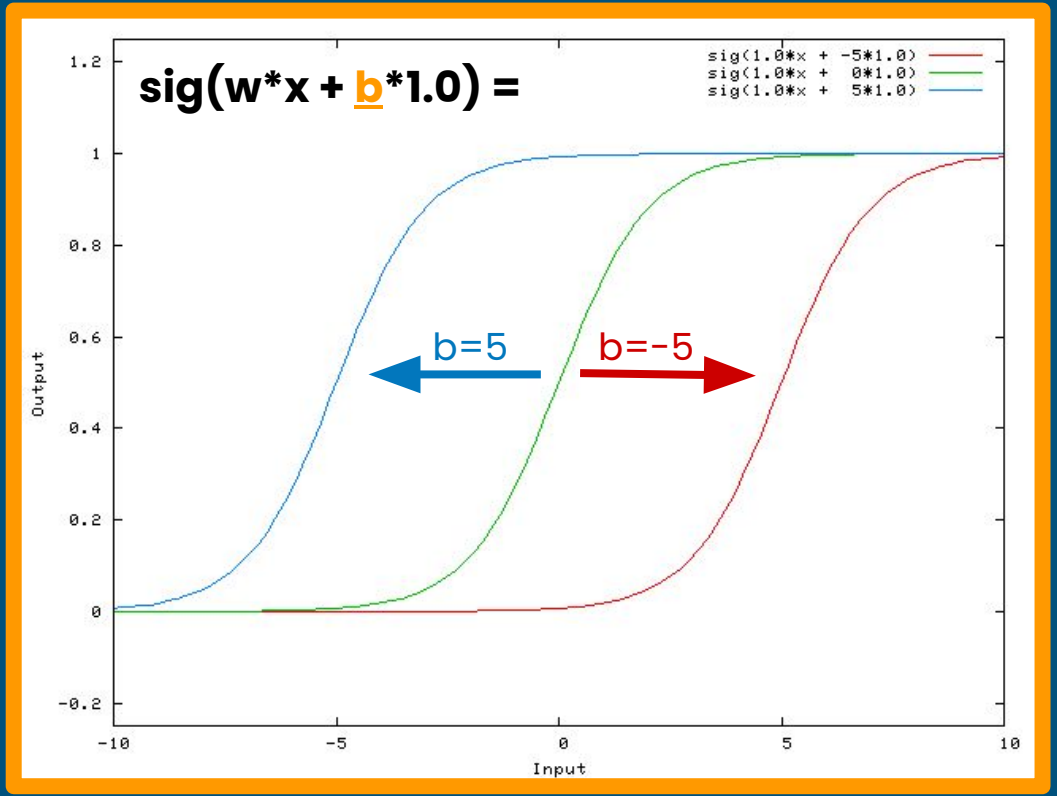
Activation Function: **Sigmoid**

sig(x) = y

Weight = **w**

Input = **x**

Bias = **b**



The Whole Picture...

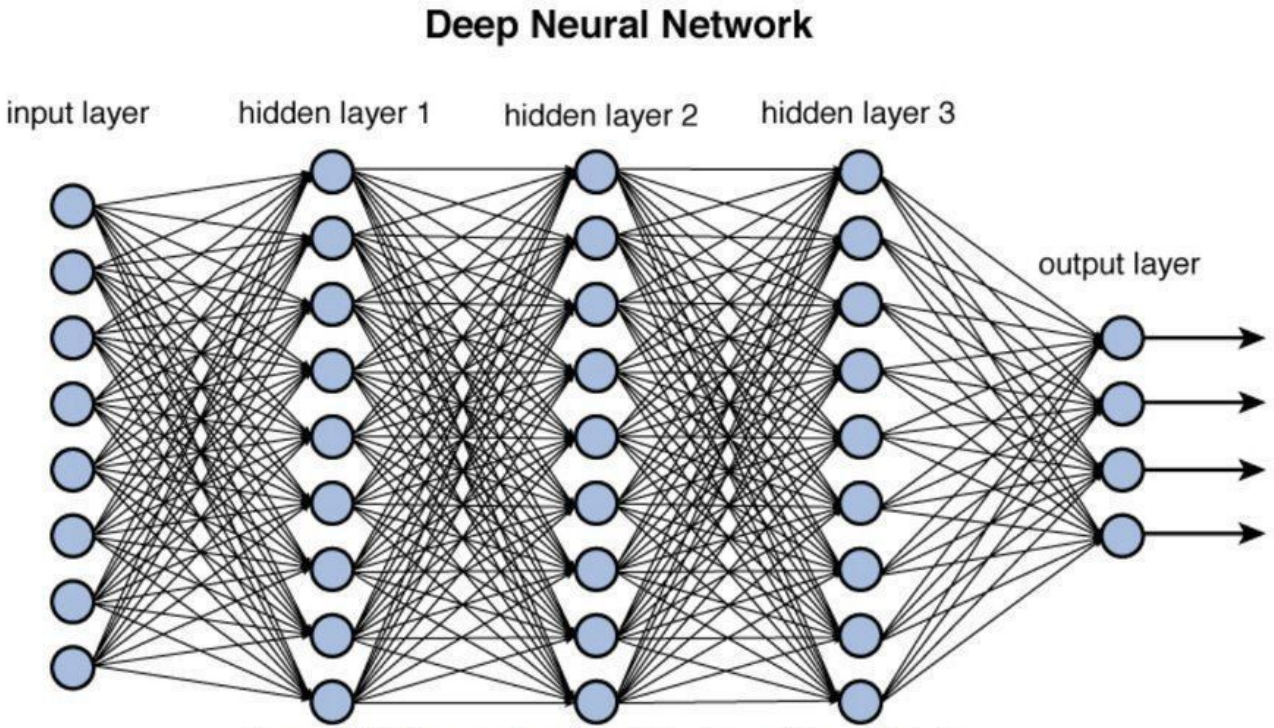


Figure 12.2 Deep network architecture with multiple layers.

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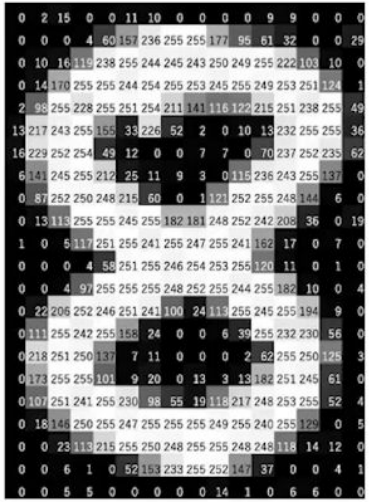
How is Image Data Stored?



How is Image Data Stored?

Colour Image

=

+

+

Blue

141	142	143	144	145
151	152	153	154	155
161	162	163	164	165
171	172	173	174	175
181	182	183	184	185
191	192	193	194	195

R

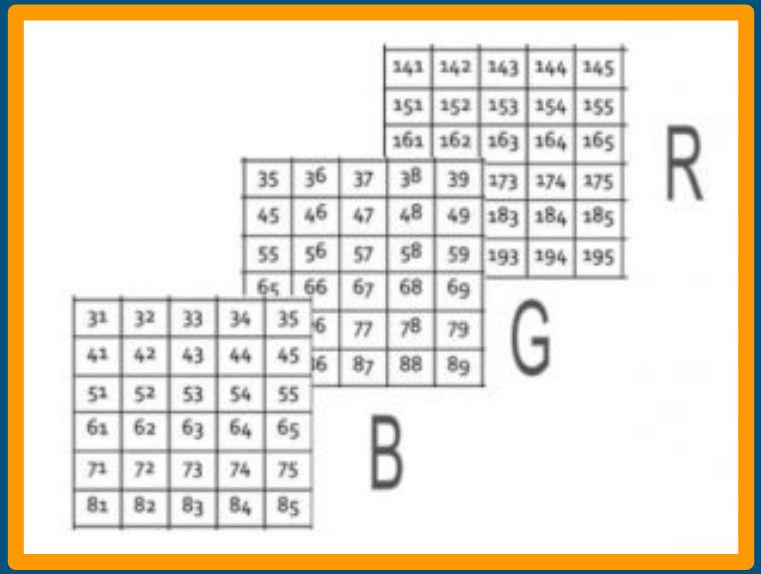
35	36	37	38	39
45	46	47	48	49
55	56	57	58	59
65	66	67	68	69
75	76	77	78	79
85	86	87	88	89

G

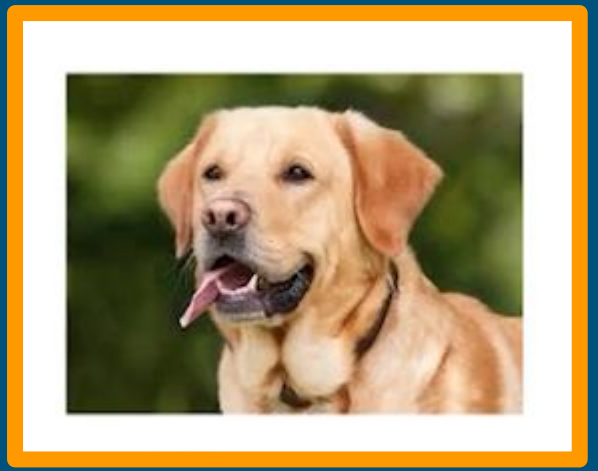
141	142	143	144	145
151	152	153	154	155
161	162	163	164	165
173	174	175		
183	184	185		
193	194	195		

R

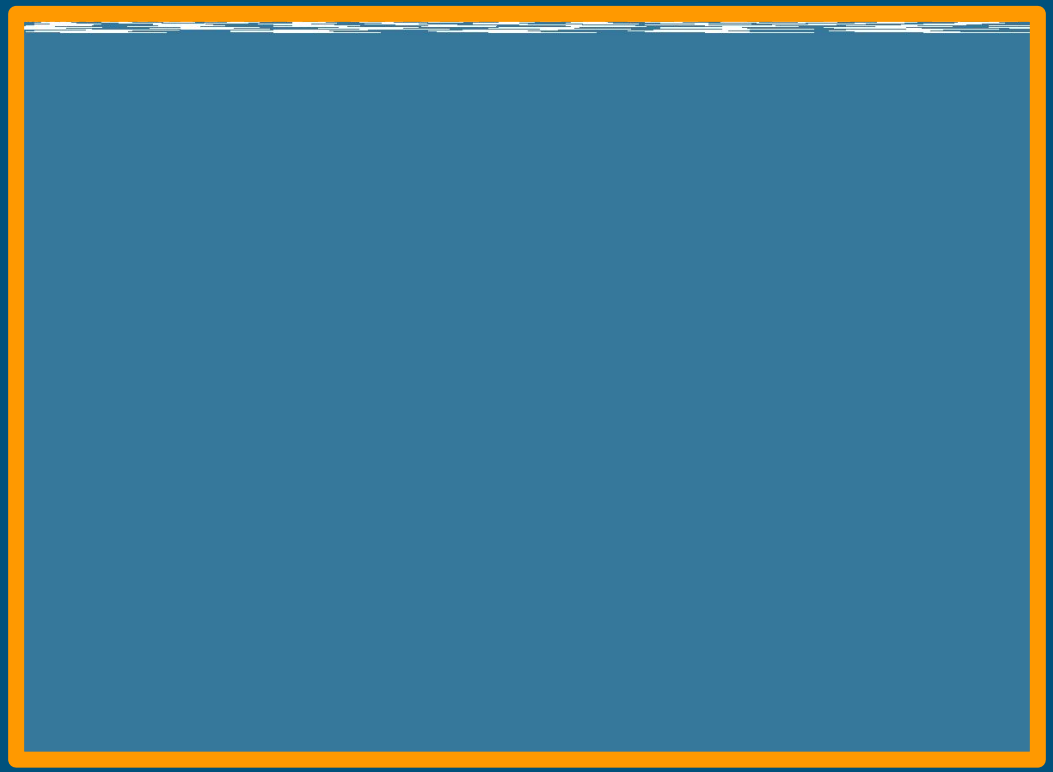
How is Image Data Stored?

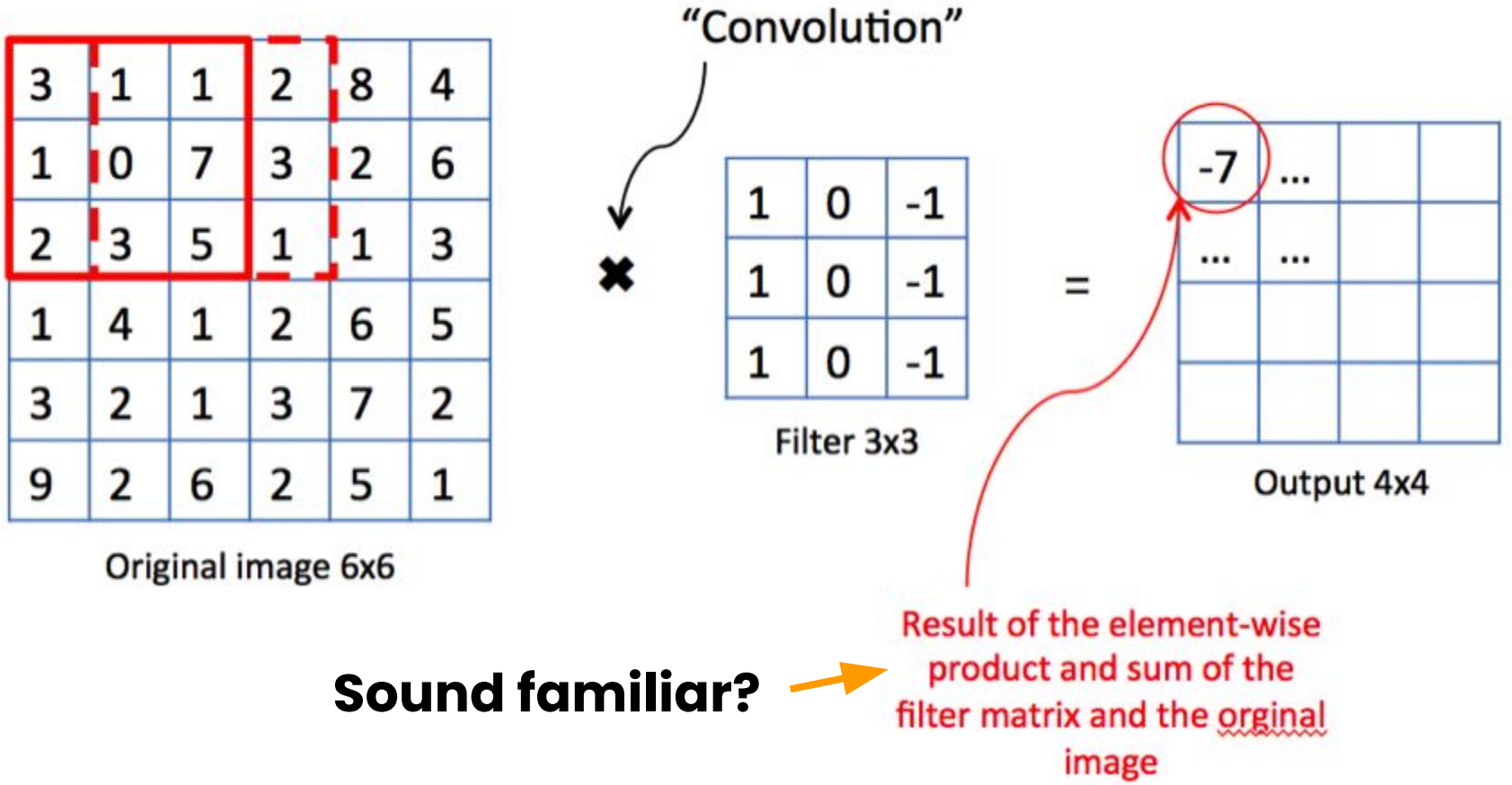


=

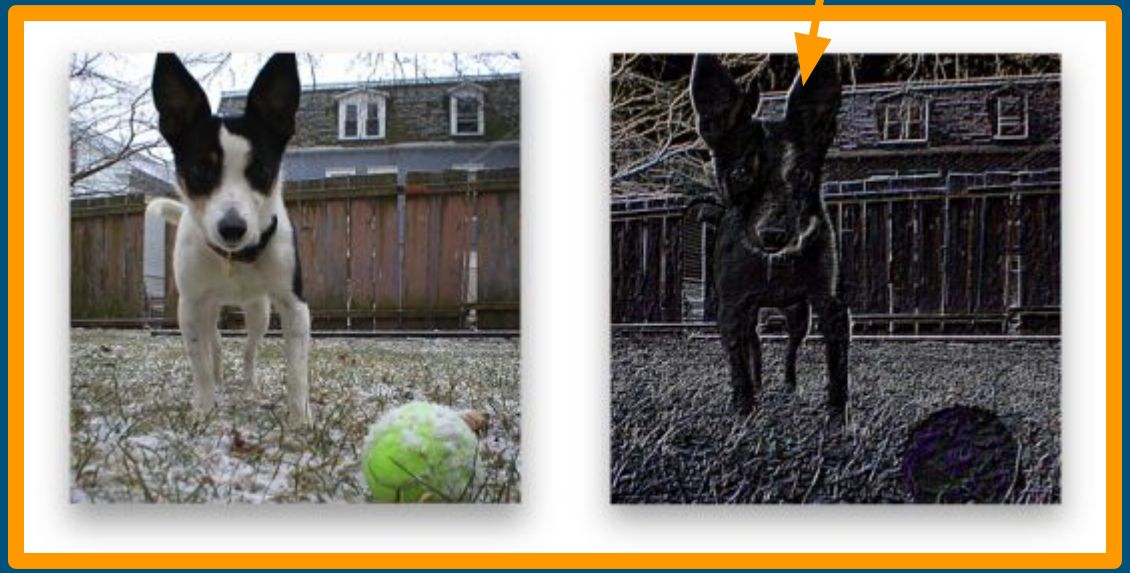


Finally… Convolutions



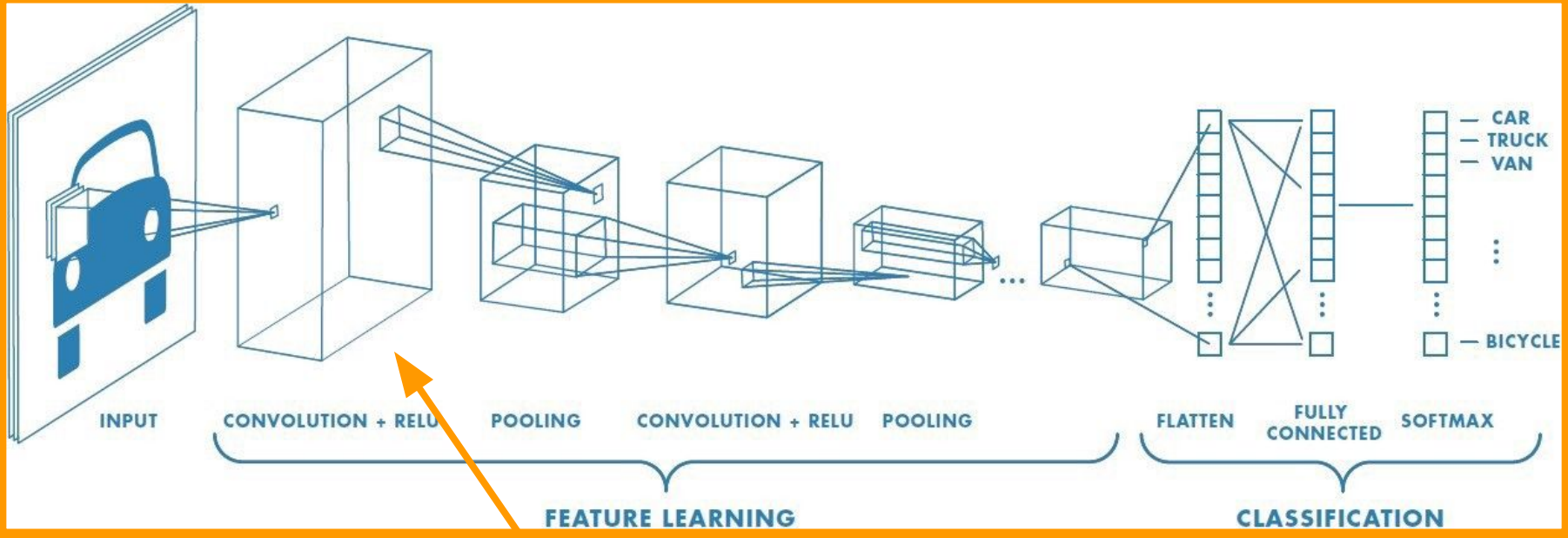

"Convolution"
3 1 1 2 8 4
1 0 7 3 2 6
2 3 5 1 1 3
1 4 1 2 6 5
3 2 1 3 7 2
9 2 6 2 5 1
Original image 6x6
1 0 -1
1 0 -1
1 0 -1
Filter 3x3
=
-7 ...
... ...
Output 4x4
Result of the element-wise product and sum of the filter matrix and the orginal image
Sound familiar?

Extracts Features

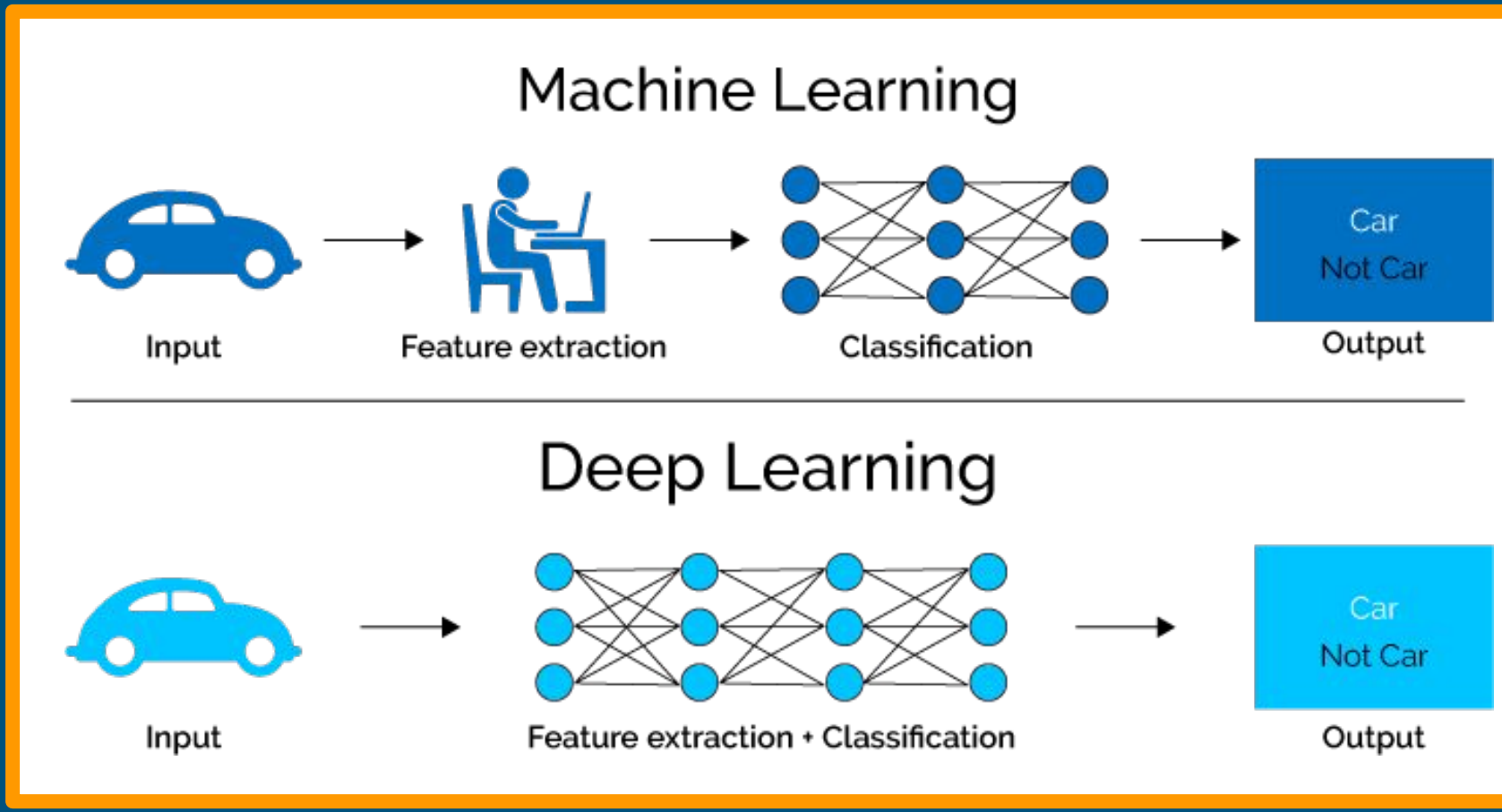


Easier for computer to understand

Feature Learning



What does this do?


Machine Learning
Input
Feature extraction
Classification
Car
Not Car
Output
Deep Learning
Input
Feature extraction + Classification
Car
Not Car
Output

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Finding Image Data

Kaggle

Limited to available datasets

Search Engines

Use Google to find images

Downloading Images

Image Downloader

Google Chrome Plugin

Selenium

Python Library

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Lets Code...