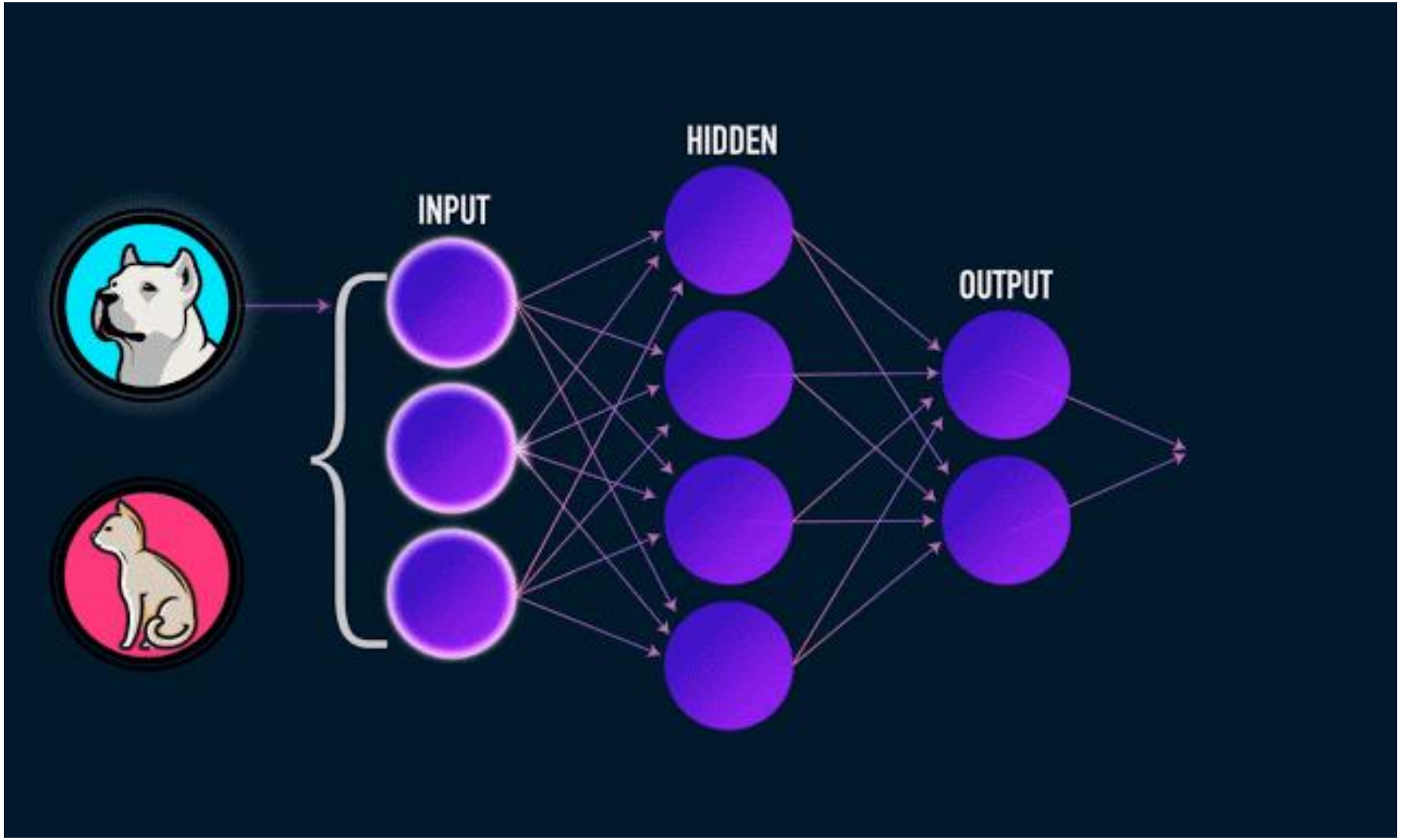
CNN RNN & LSTM

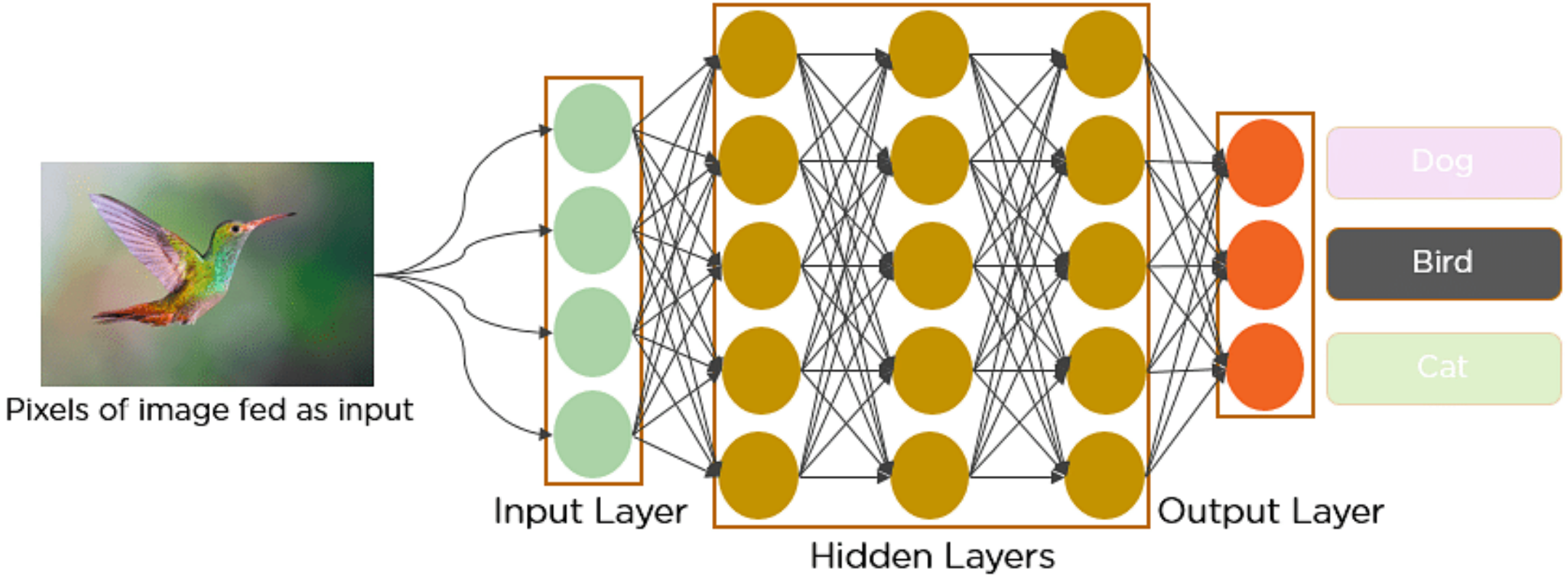
KARMUKILAN D K

Deep2Neuron Internship

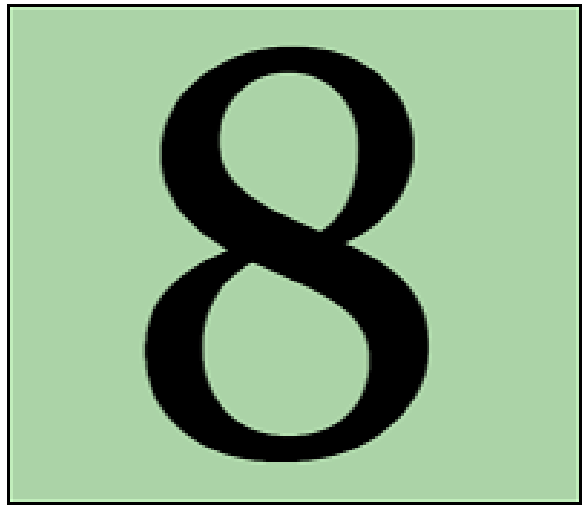
HOW NEURAL NETWORK WORKS ???



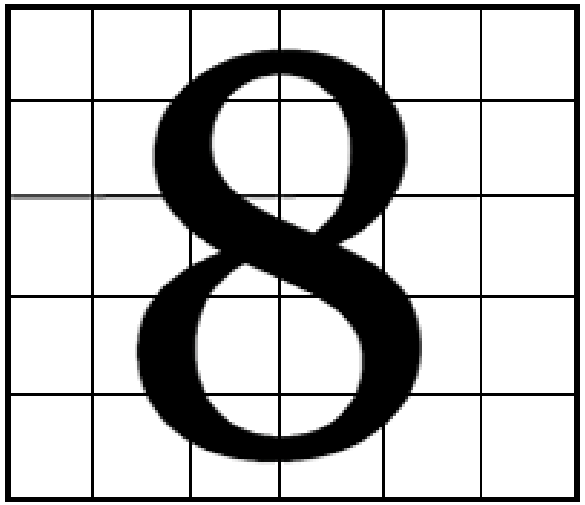
EXAMPLE OF CNN CLASSIFICATION



SINGLE CHANNEL



Real Image of the digit 8

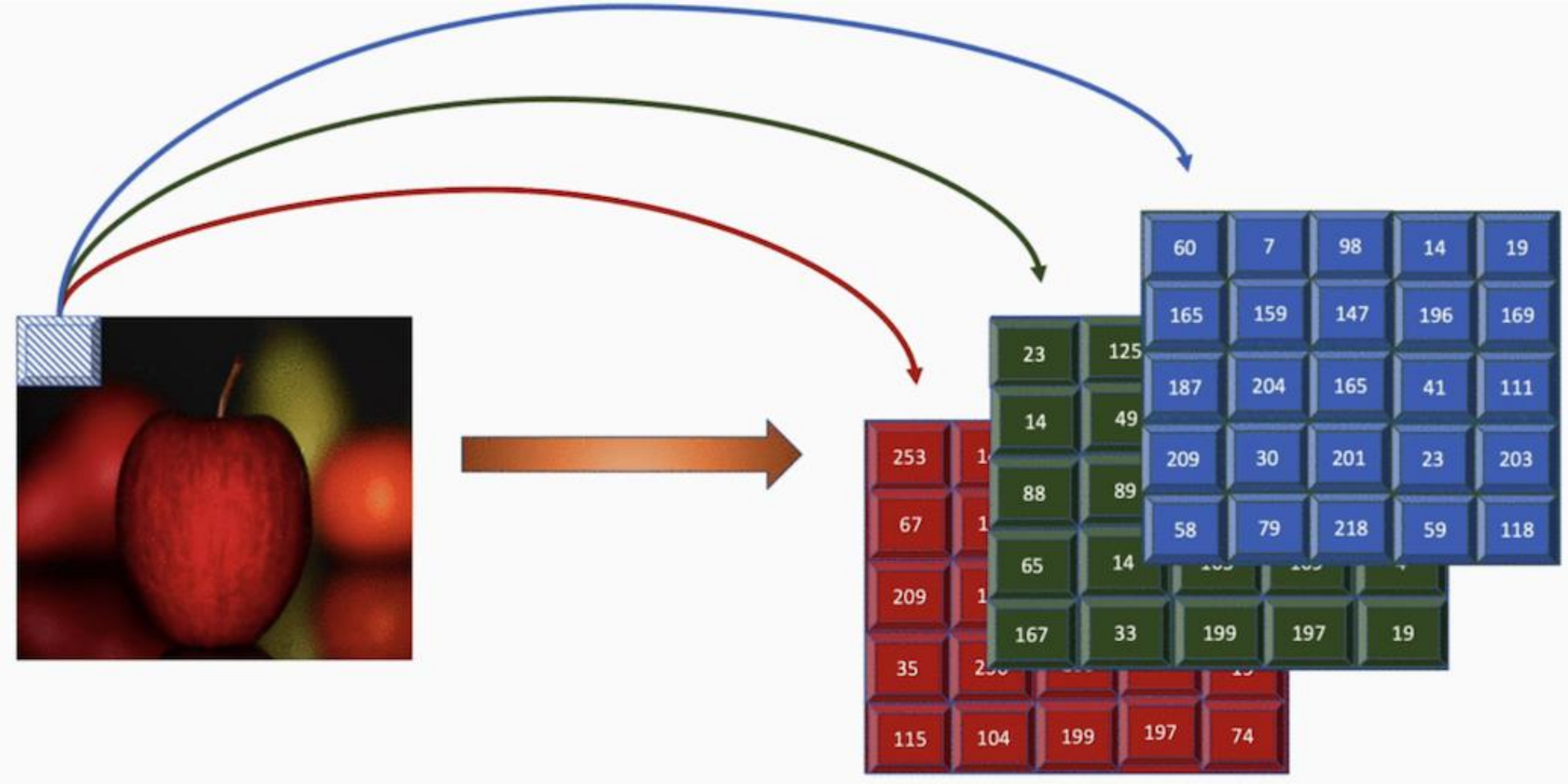


Represented in the form of an array

0	0	1	1	0	0
0	1	0	0	1	0
0	0	1	1	0	0
0	1	0	0	1	0
0	0	1	1	0	0

Digit 8 represented in the form of pixels of 0's and 1's

THREE CHANNEL -RGB



253	144	120	251	41
67	100	32	241	23
209	118	124	27	59
35	236	105	169	19
115	104	199	197	74

23	125	233	201	98
14	49	32	241	59
88	89	124	27	19
65	14	105	169	4
167	33	199	197	19

60	7	98	14	19
165	159	147	196	169
187	204	165	41	111
209	30	201	23	203
58	79	218	59	118

How Does CNN Recognize Images?

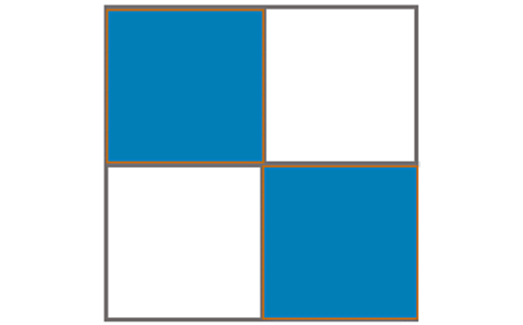


image for the symbol \

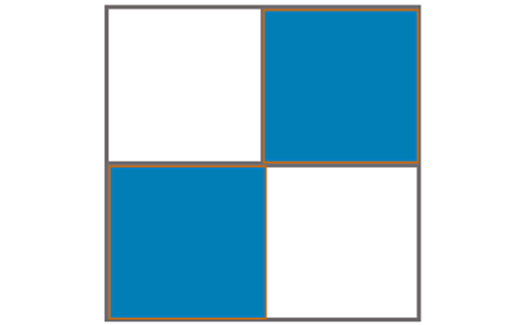
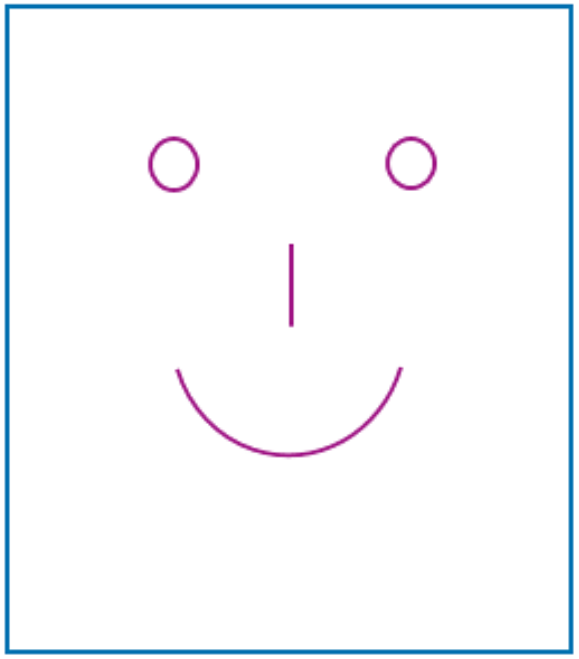


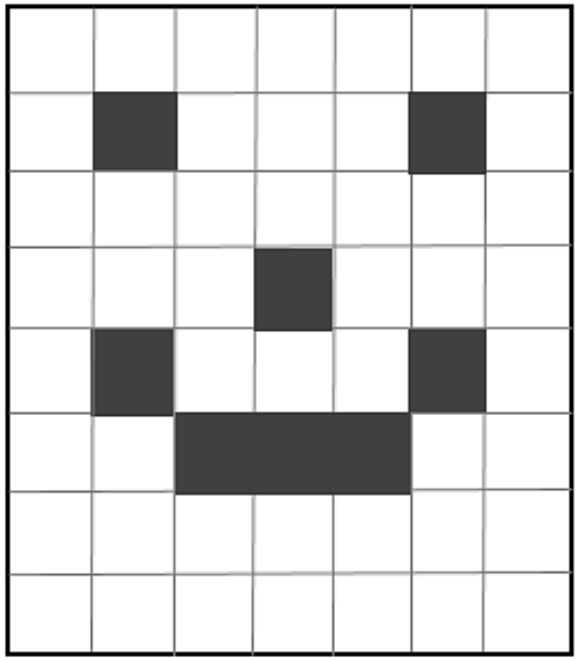
image for the symbol /

Have you noticed what happens behind the computer ???

another example...



Real Image



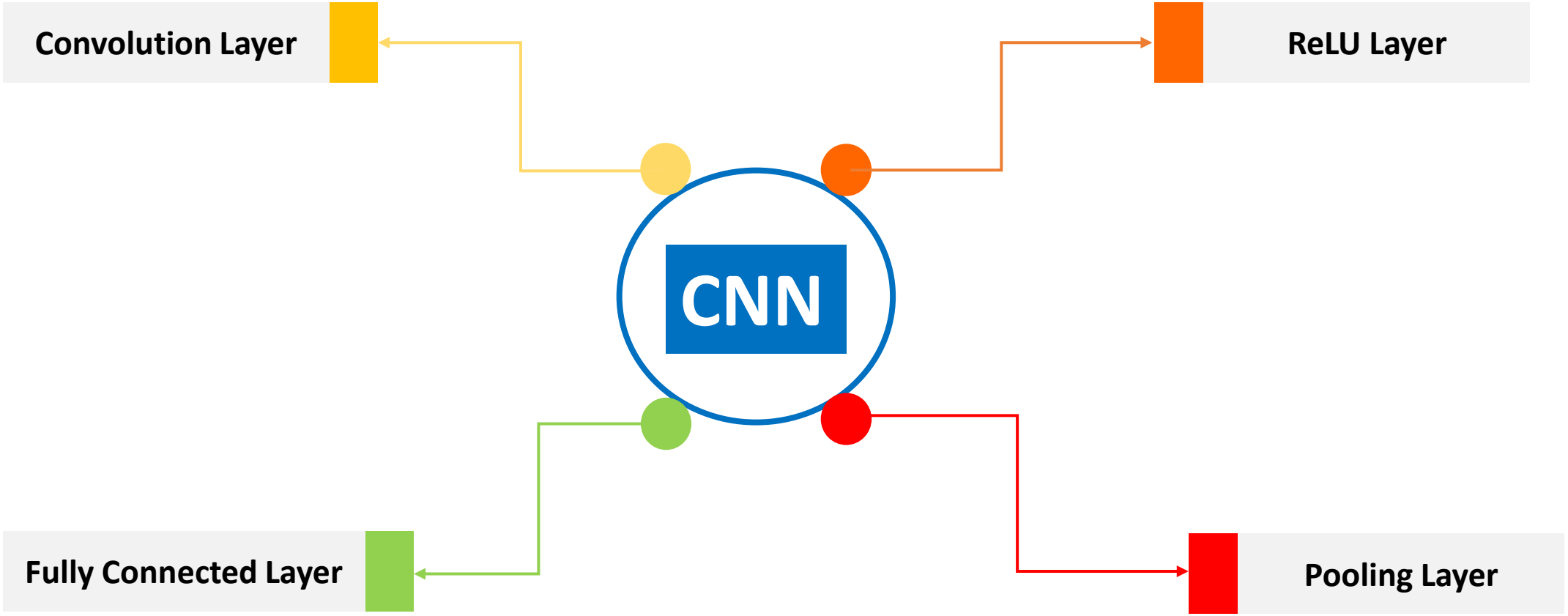
Represented in the form of black and white pixels

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

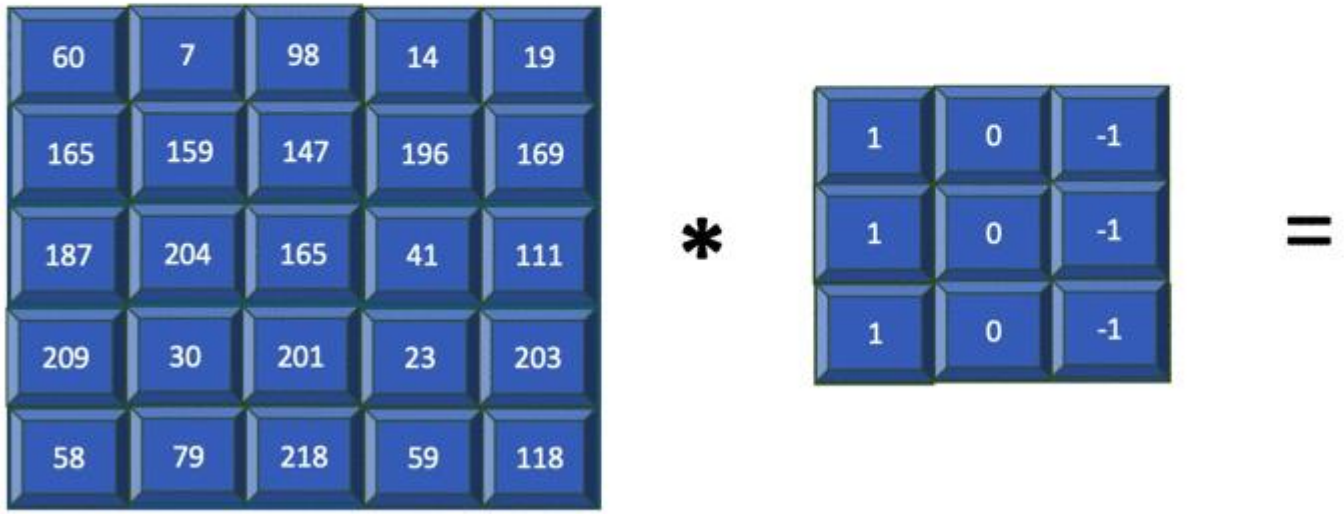
Image represented in the form of a matrix of numbers

As you can see from the above diagram, only those values are lit that have a value of 1.

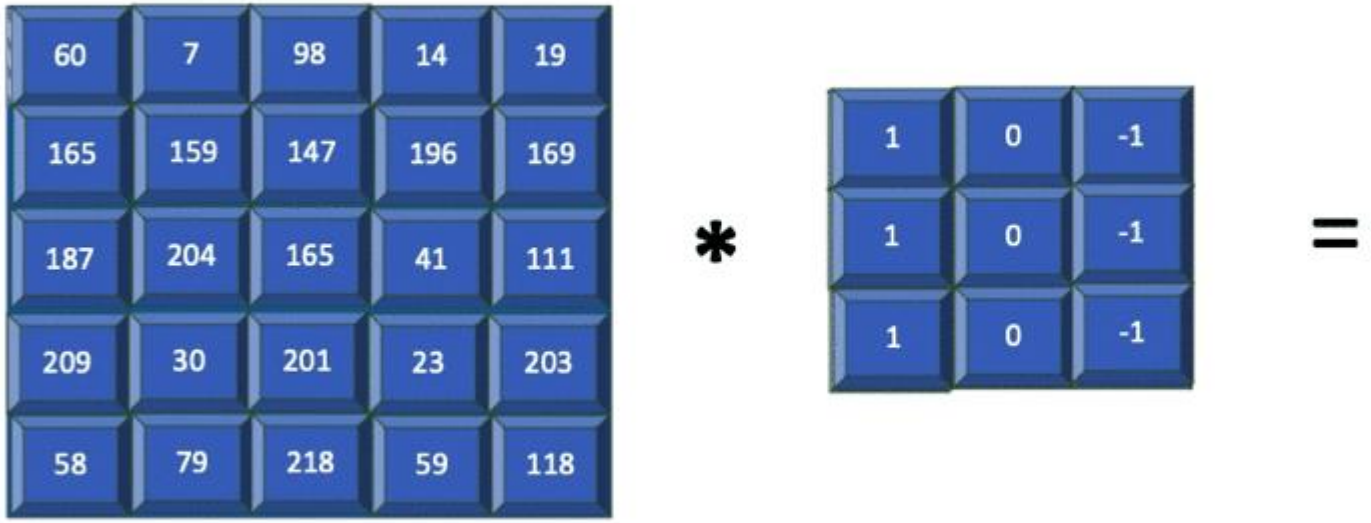
Layers in a Convolutional Neural Network…



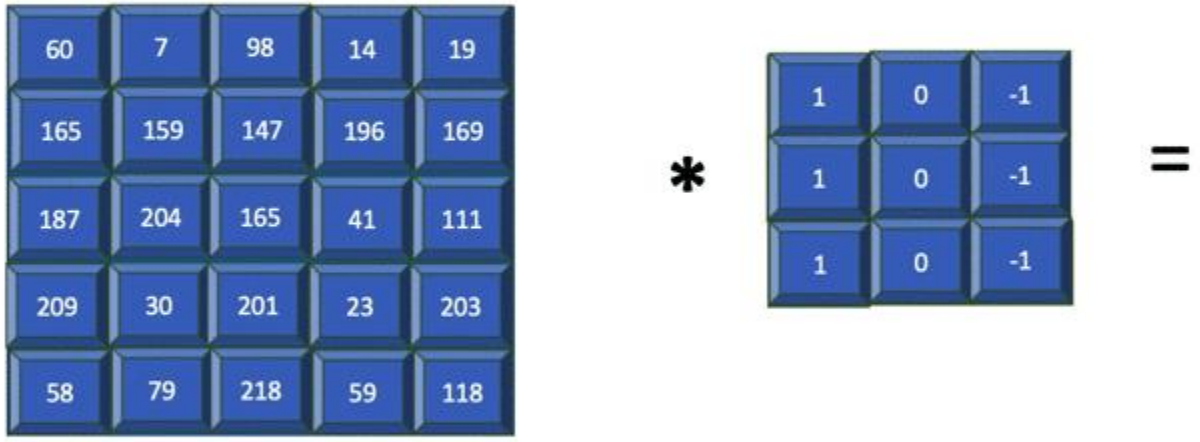
Convolution Layer…



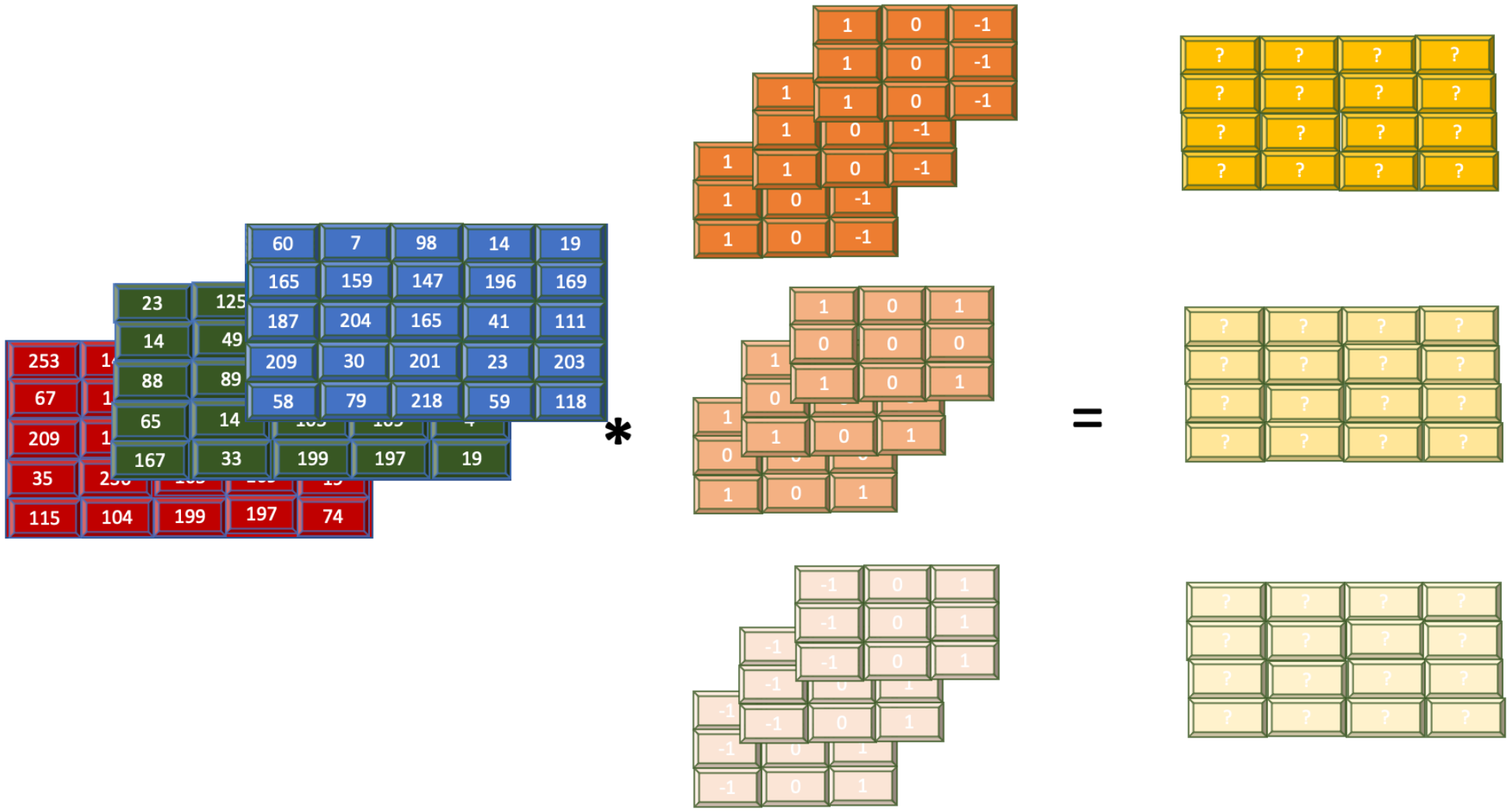
Striding…


60 7 98 14 19
165 159 147 196 169
187 204 165 41 111
209 30 201 23 203
58 79 218 59 118
*
1 0 -1
1 0 -1
1 0 -1
=

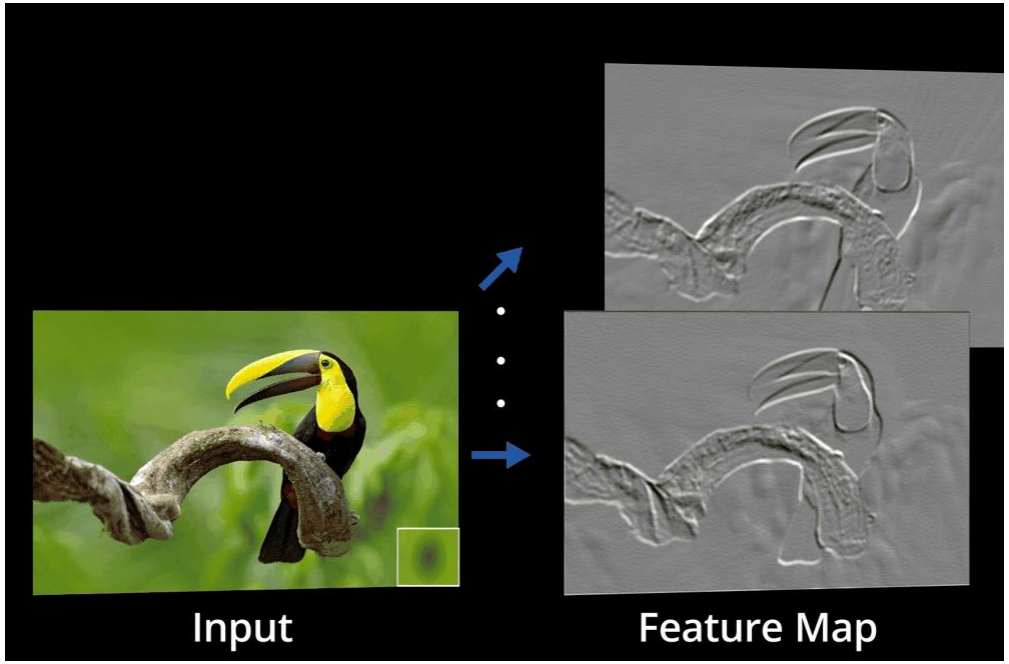
Padding…

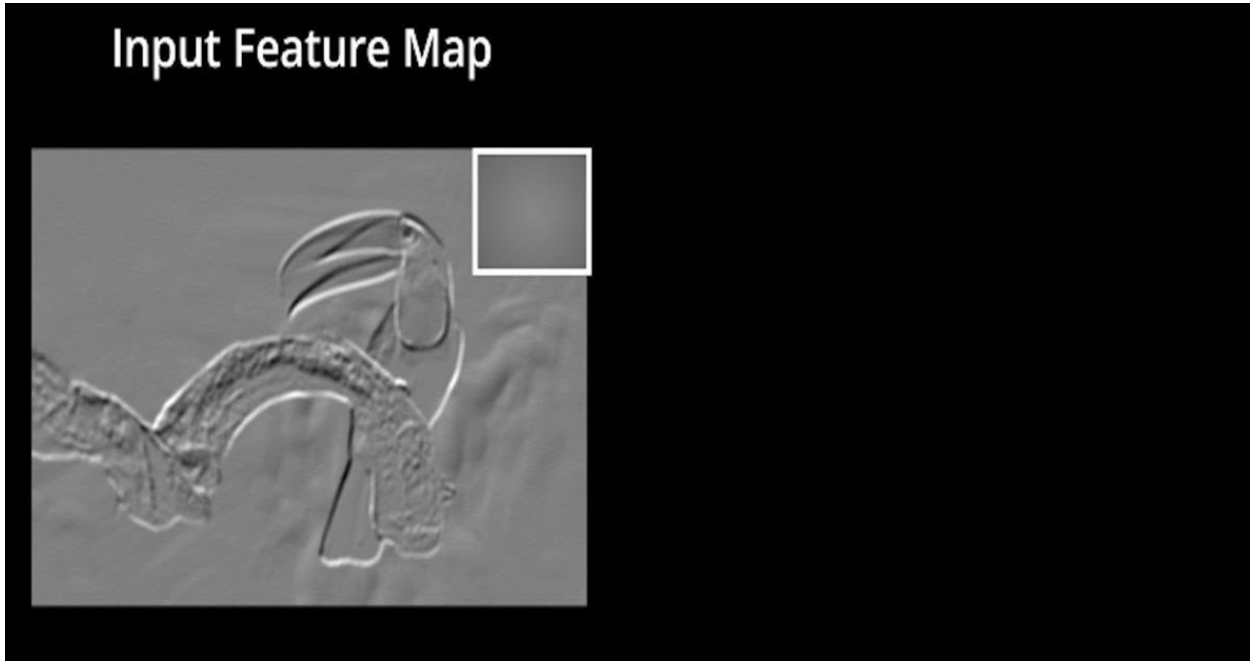

60 7 98 14 19
165 159 147 196 169
187 204 165 41 111
209 30 201 23 203
58 79 218 59 118
*
1 0 -1
1 0 -1
1 0 -1
=

How Convolution applied to more than one filter???

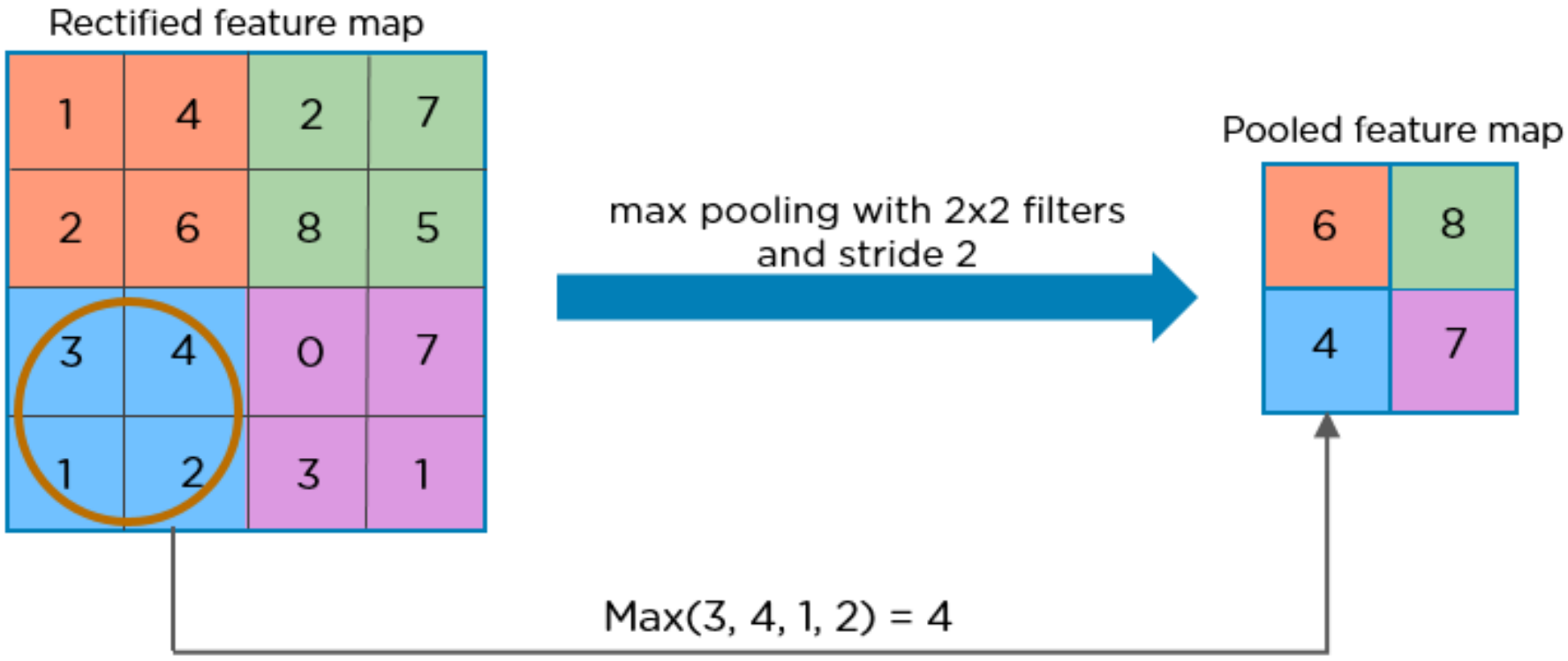


ReLu Layer –Rectified Linear Unit…

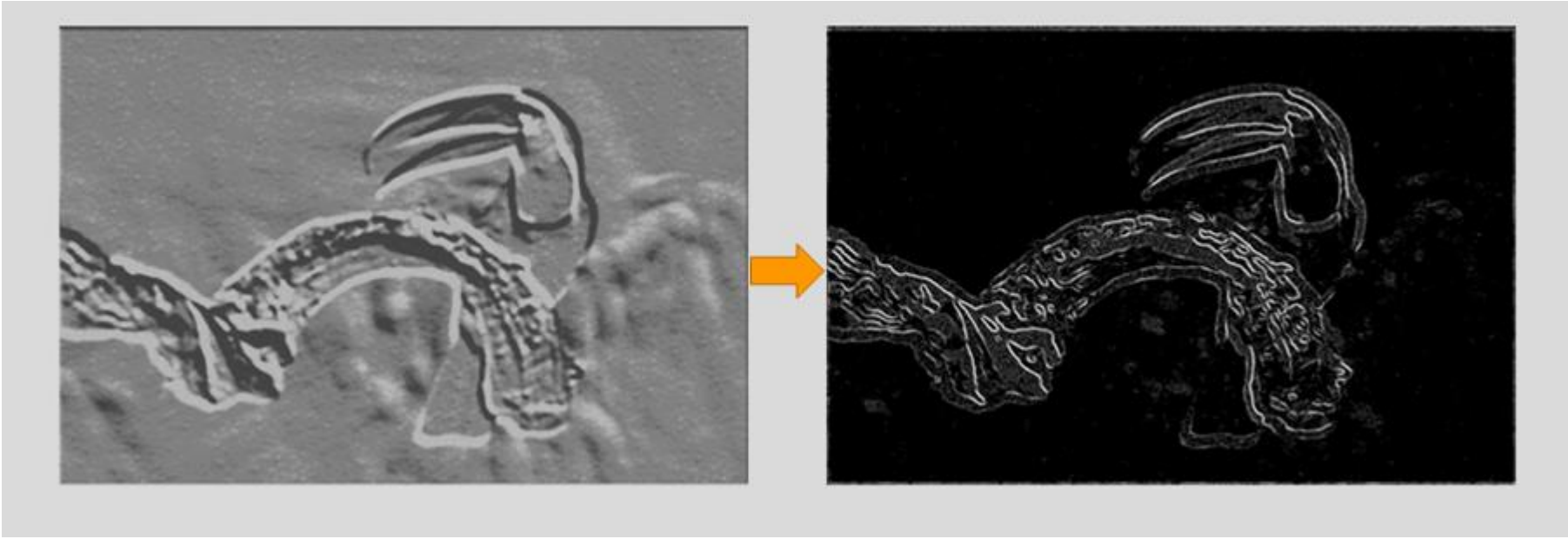




Pooling Layer…

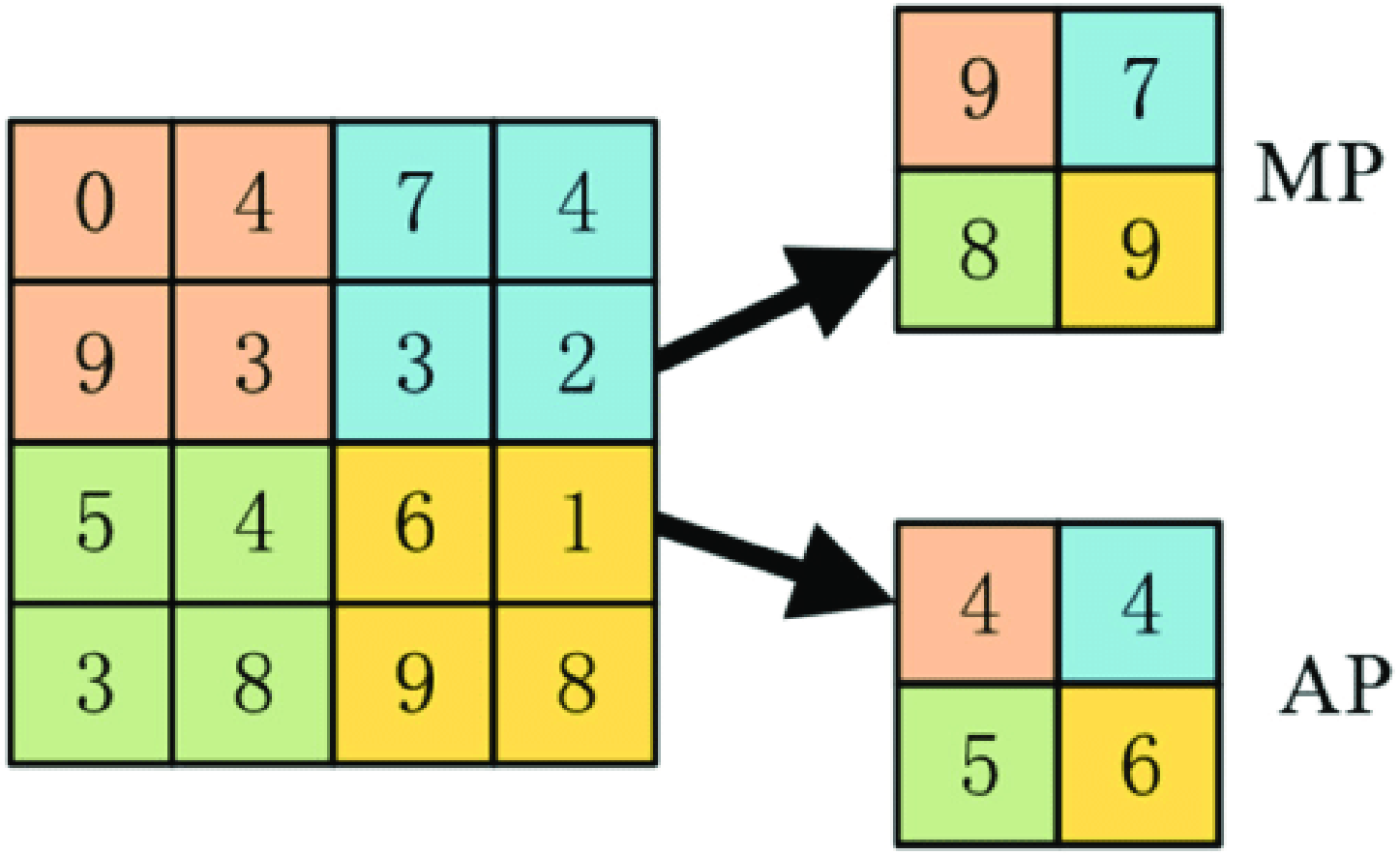


Pooling Layer

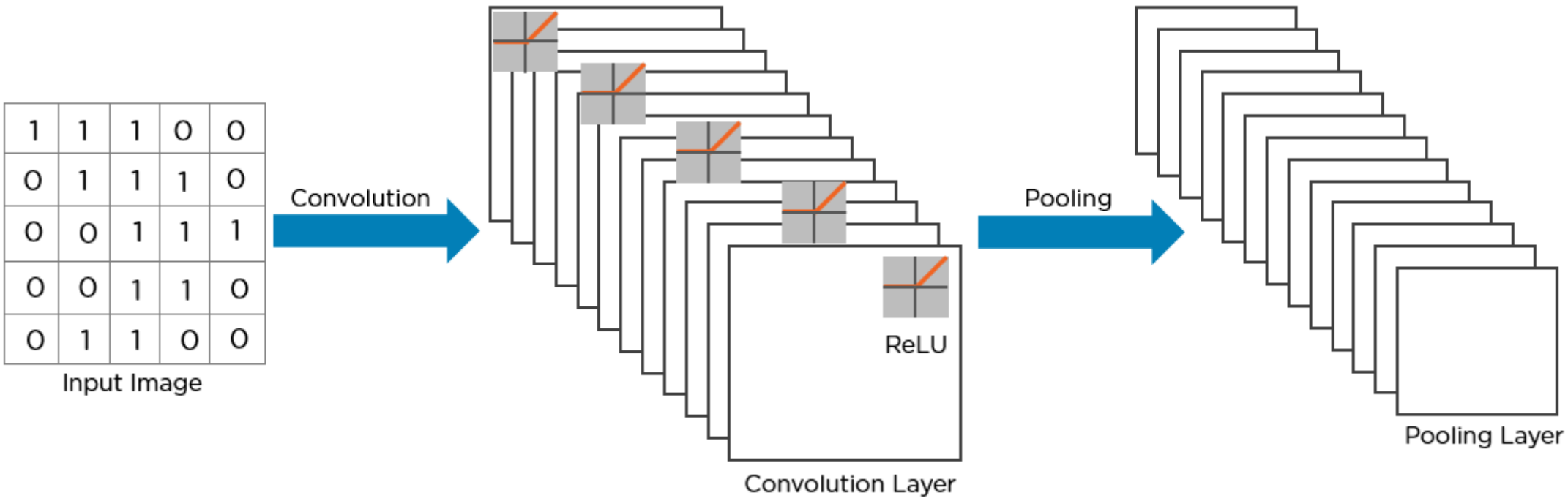


- The pooling layer uses various filters to identify different parts of the image like **edges, corners, body, feathers, eyes, and beak.**

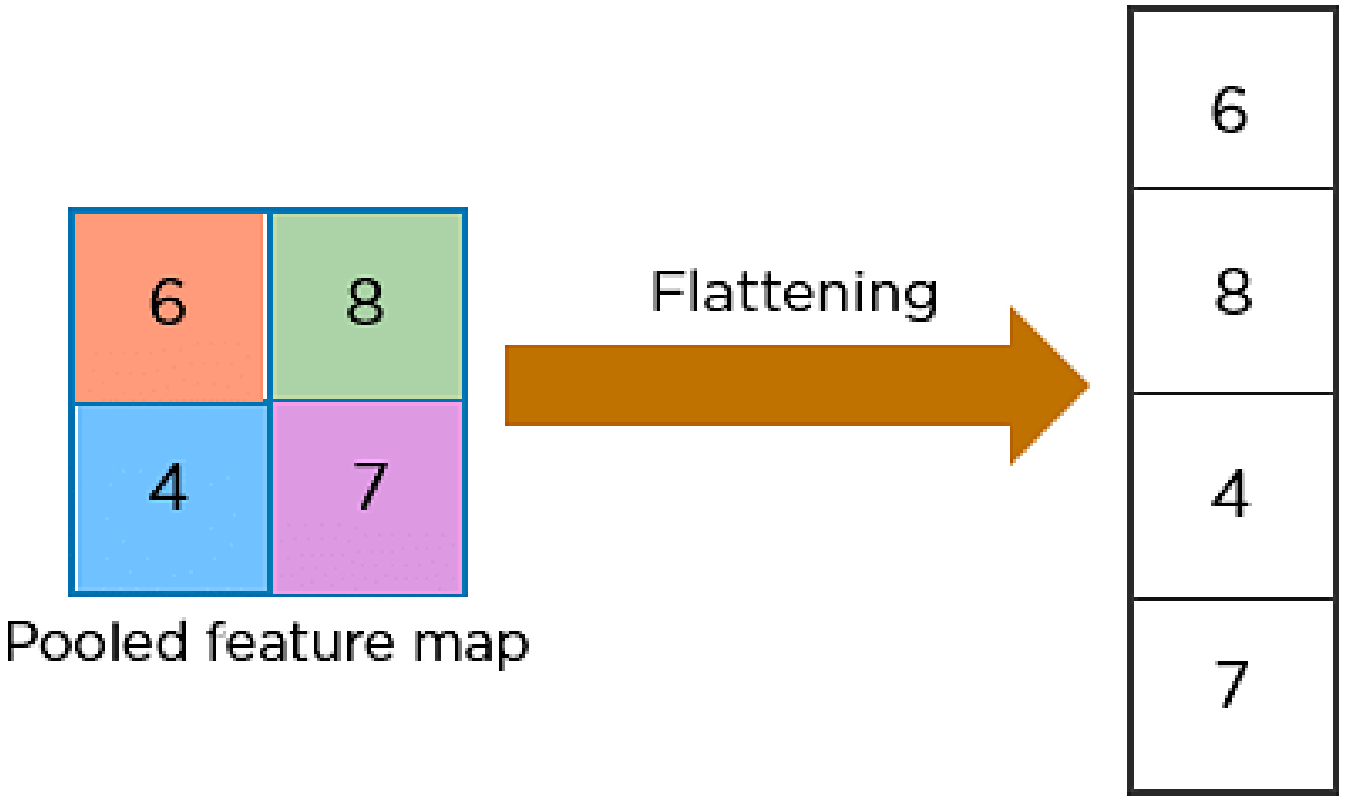
Pooling Layer types…



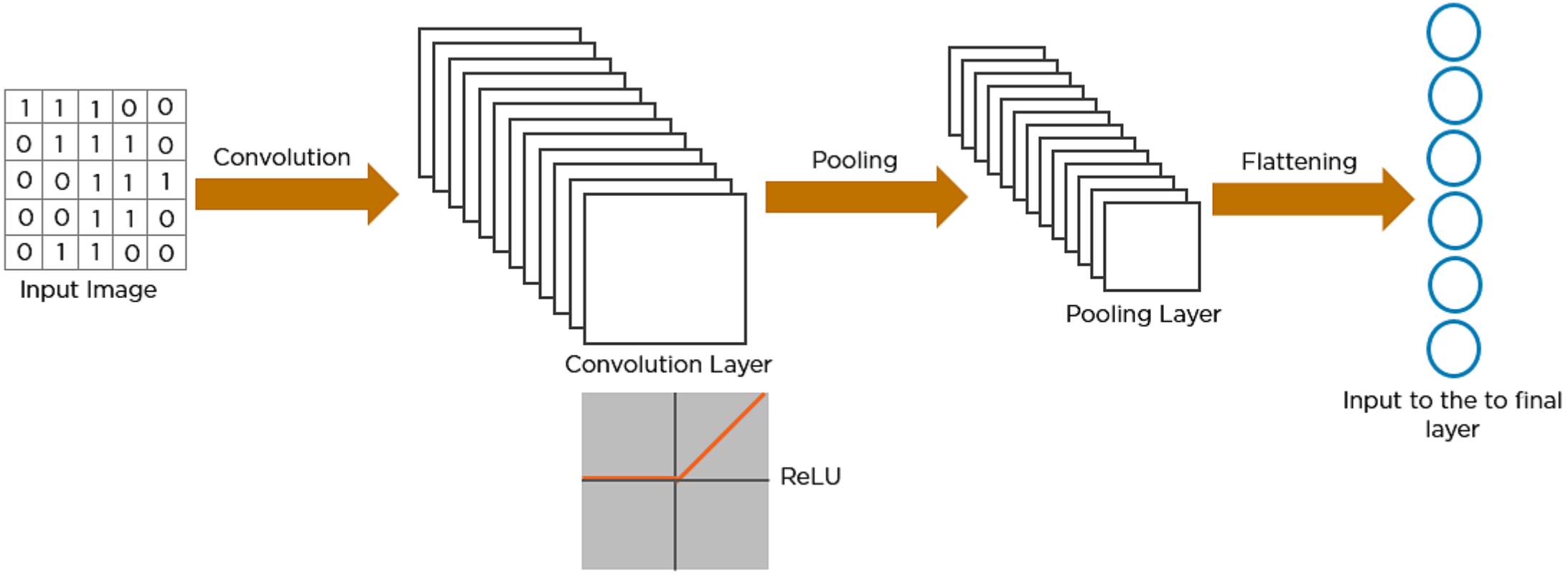
How Convolutional Network look so far…



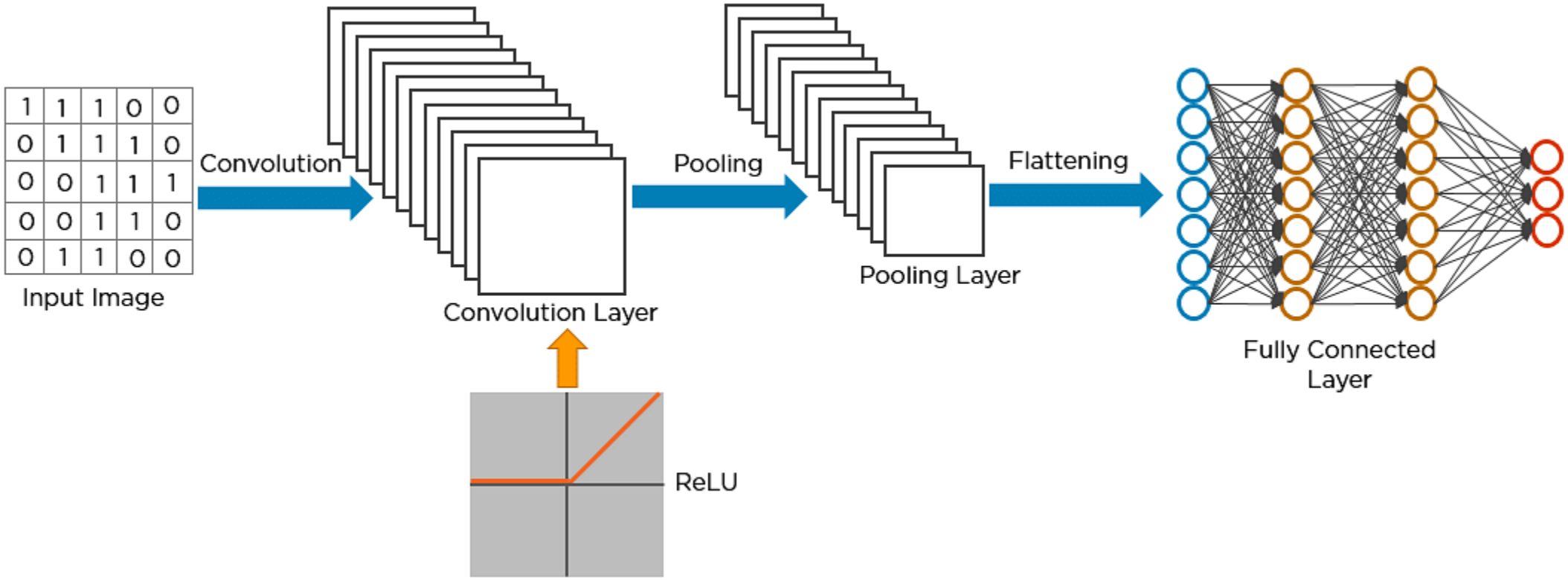
Flattening...



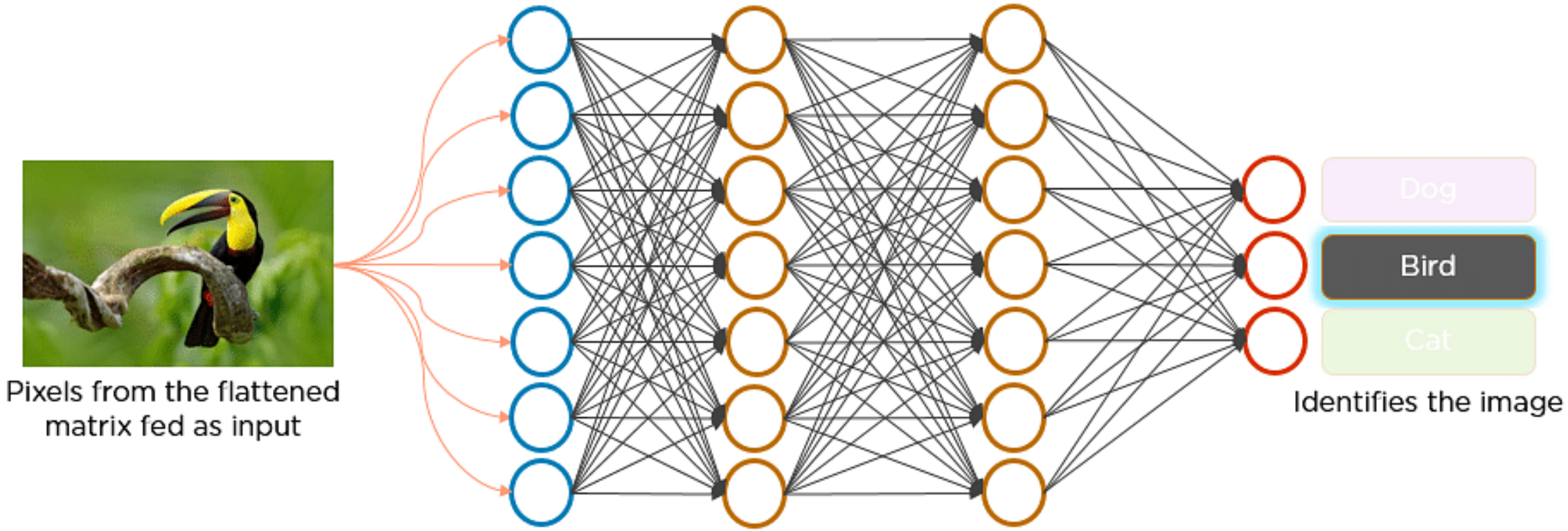
Fully connected Layer…



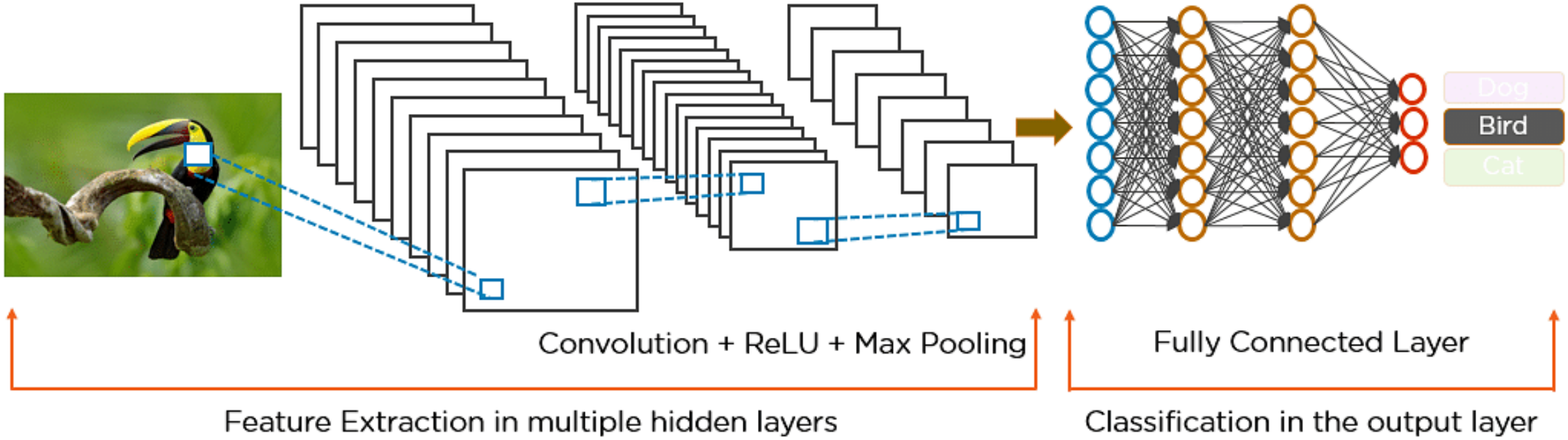
Fully connected Layer…



Fully connected Layer…



How exactly CNN predicts…



USE CASES OF CNN

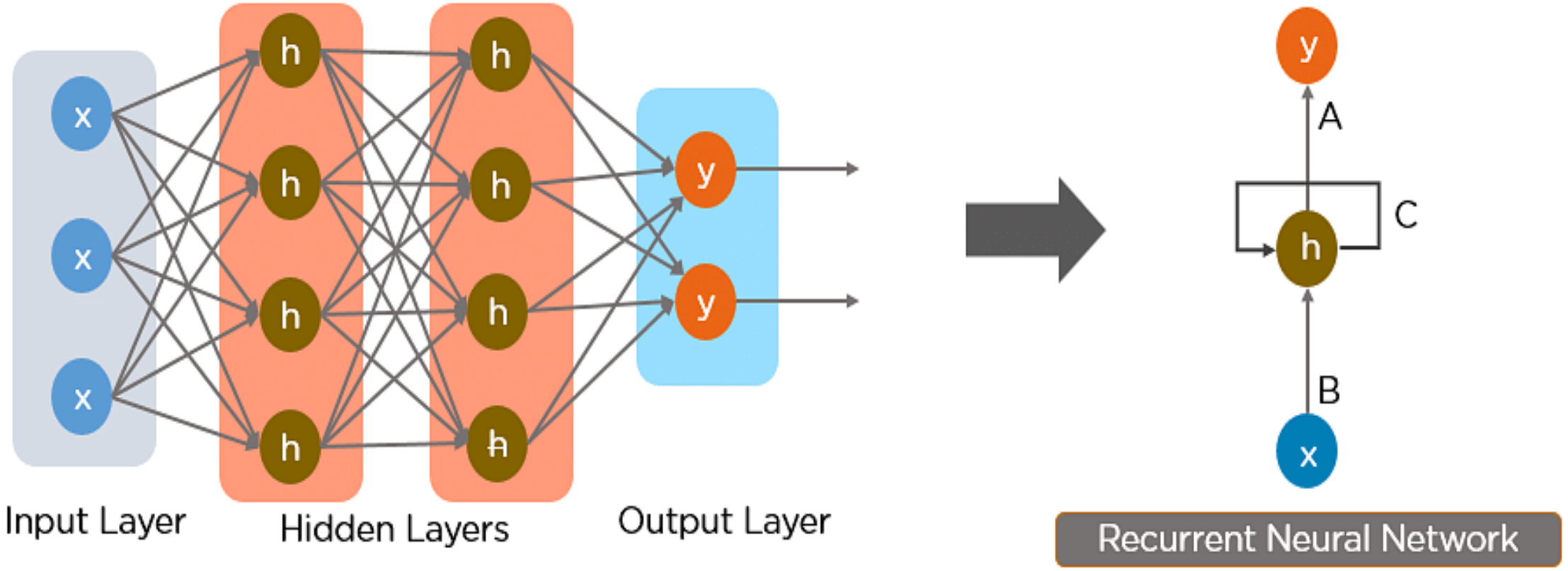
Decoding Facial Recognition

Analyzing Documents

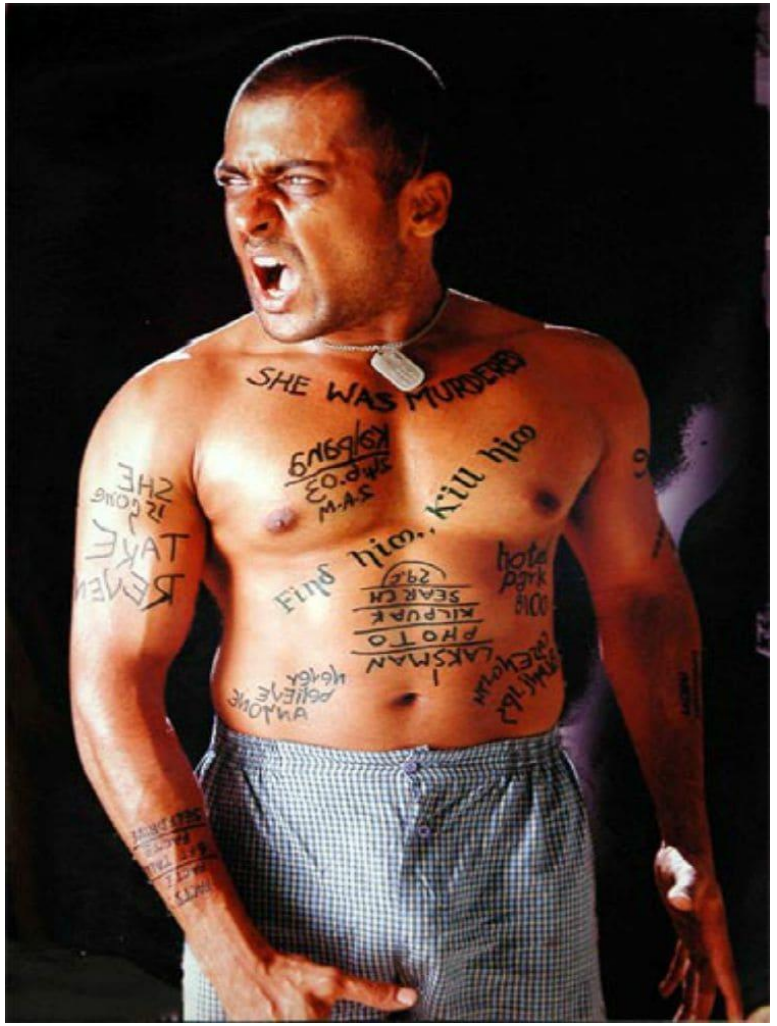
Understanding Climate

Advertising

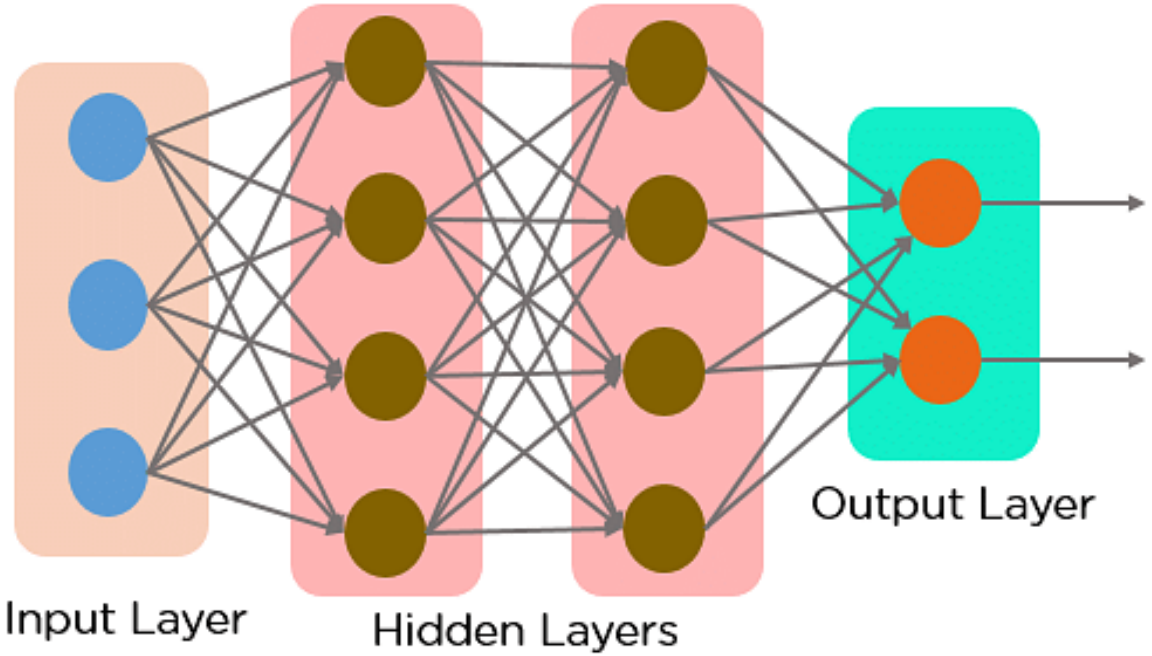
What is a Recurrent Neural Network (RNN)?

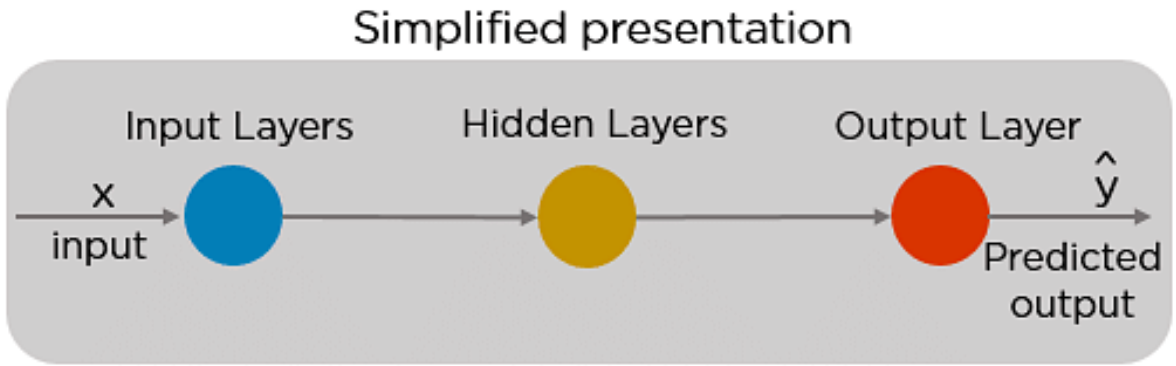


RNN Scenarios...



Feed Forward Neural Network …





"A Dog catching a ball in mid air"

Here the person is speaking in English and it is getting translated into Chinese, Italian, French, German and Spanish languages

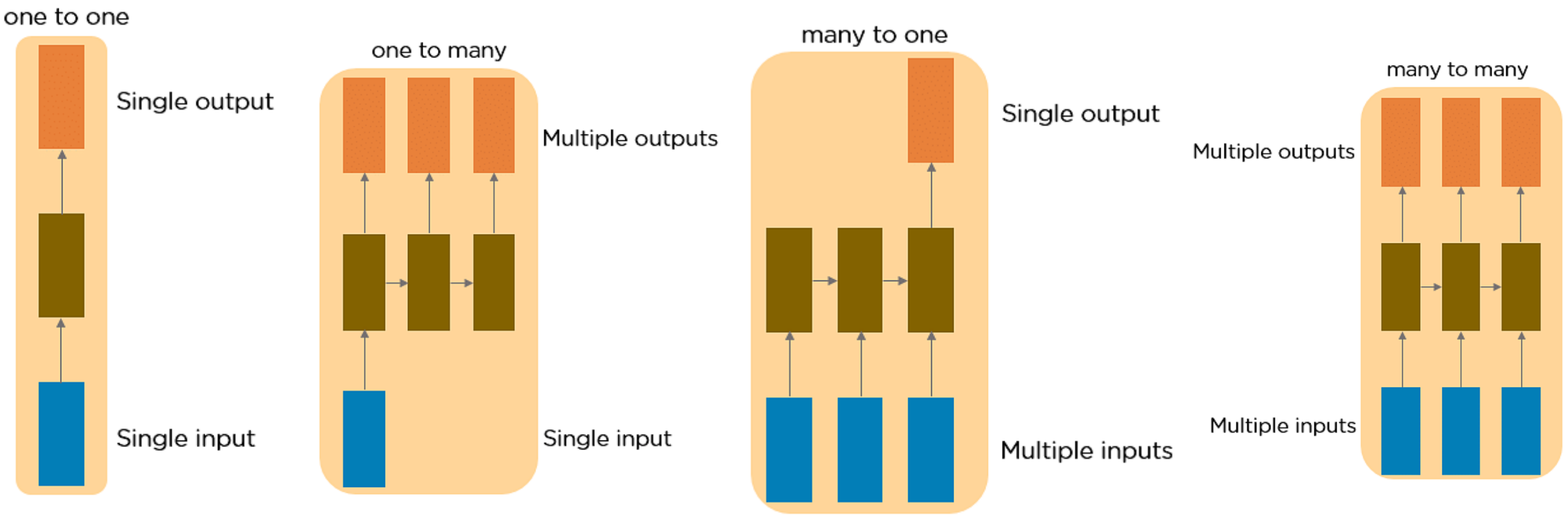
Machine Translation

When it rains, look for rainbows.
When it's dark, look for stars.

Positive Sentiment

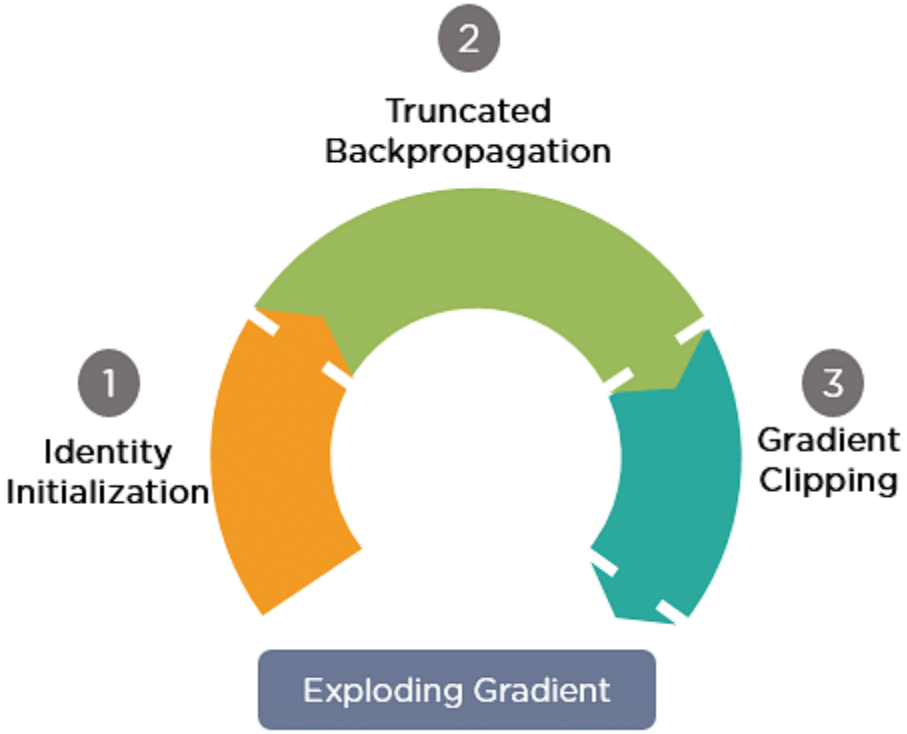
Natural Language Processing

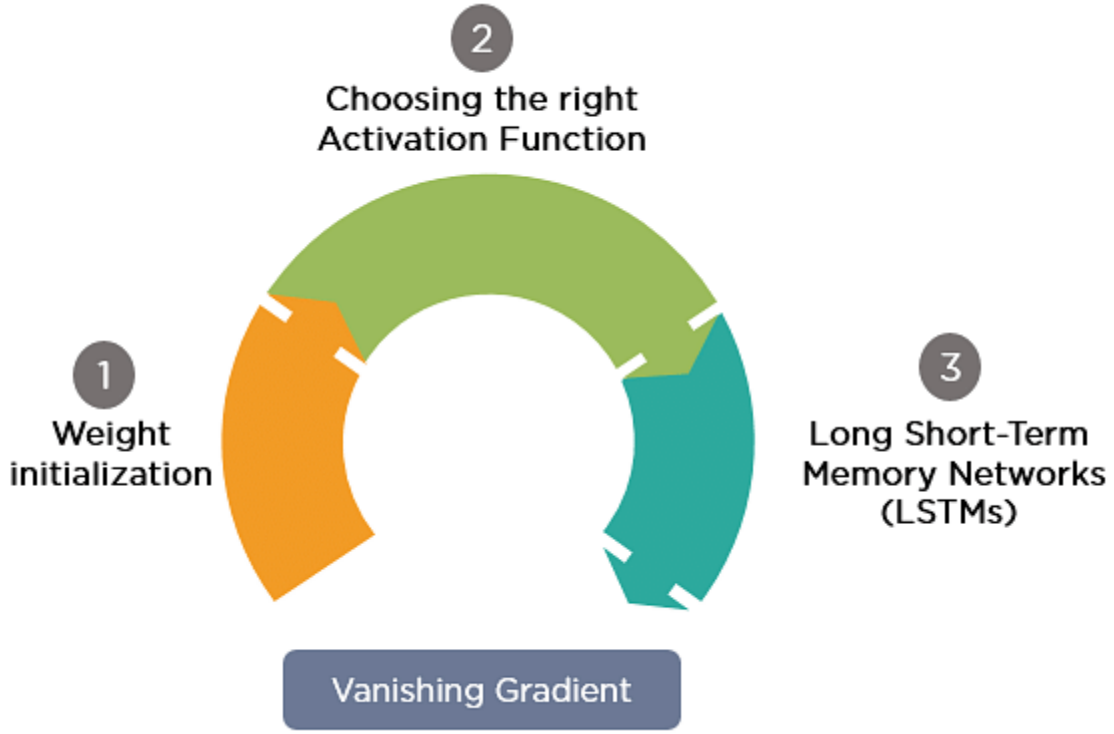
Types of RNN...



Vanilla Neural Network

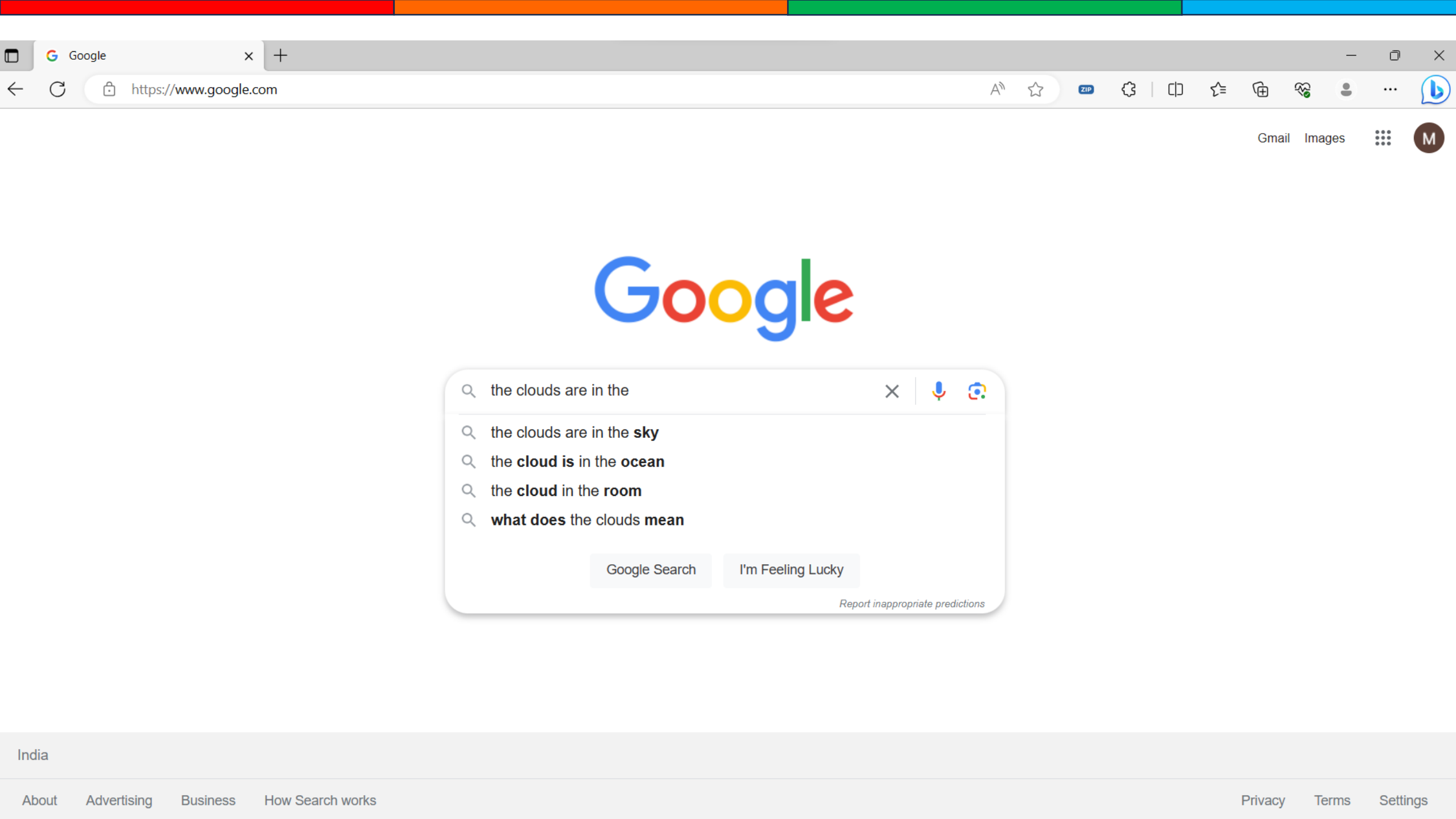
Two Issues of Standard RNNs and Solutions





“The clouds are in the _____.”

“I have been staying in TamilNadu for the last 10 years…I can speak fluent _____.”


Google
https://www.google.com
Gmail
Images
M
Google
the clouds are in the
the clouds are in the sky
the cloud is in the ocean
the cloud in the room
what does the clouds mean
Google Search
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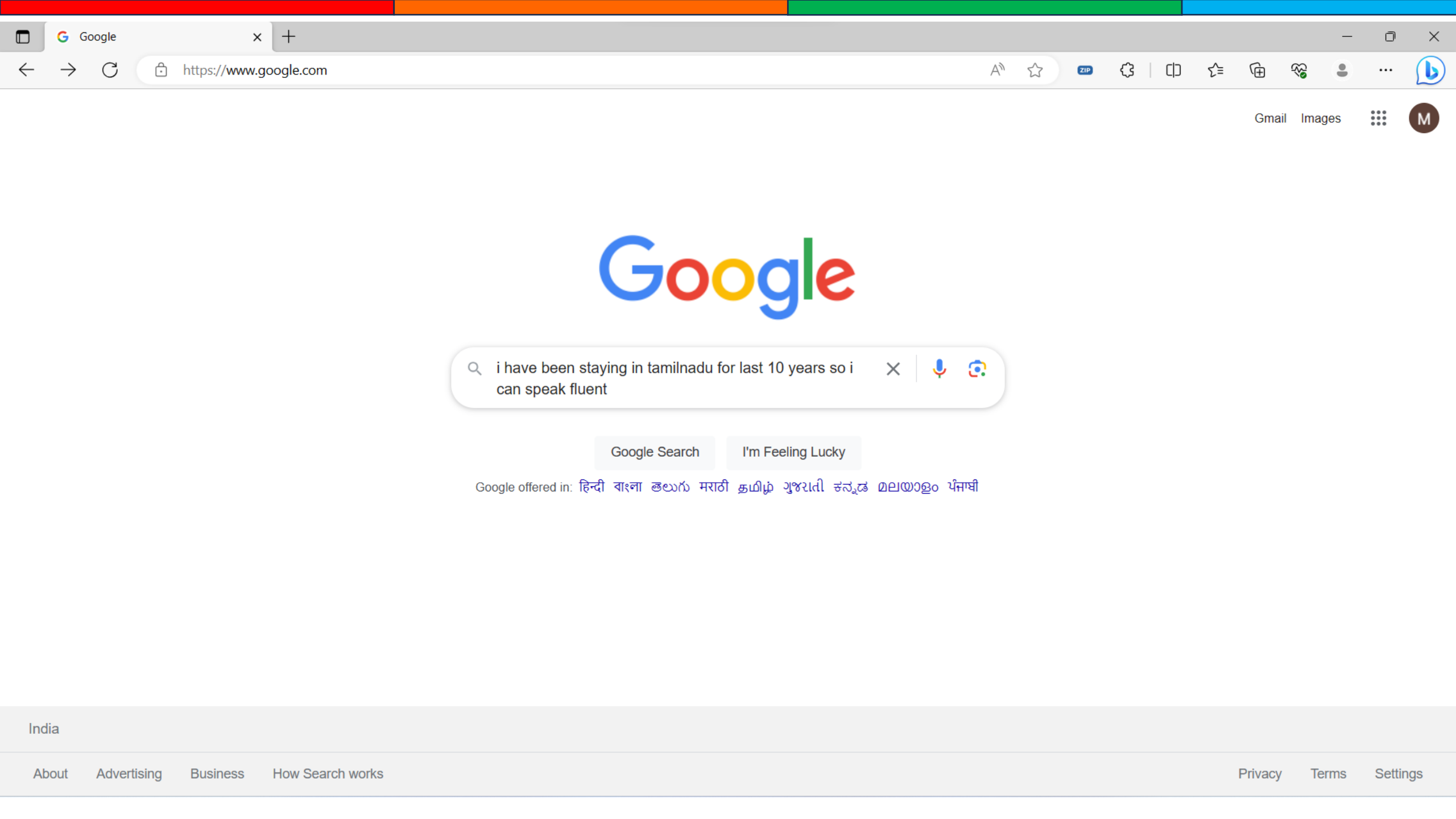
Google
https://www.google.com
Gmail
Images
M
Google
i have been staying in tamilnadu for last 10 years so i can speak fluent
Google Search
I'm Feeling Lucky
Google offered in: हिन्दी বাংলা తెలుగు मराठी தமிழ் ગુજરાતી ಕನ್ನಡ മലയാളം ਪੰਜਾਬੀ
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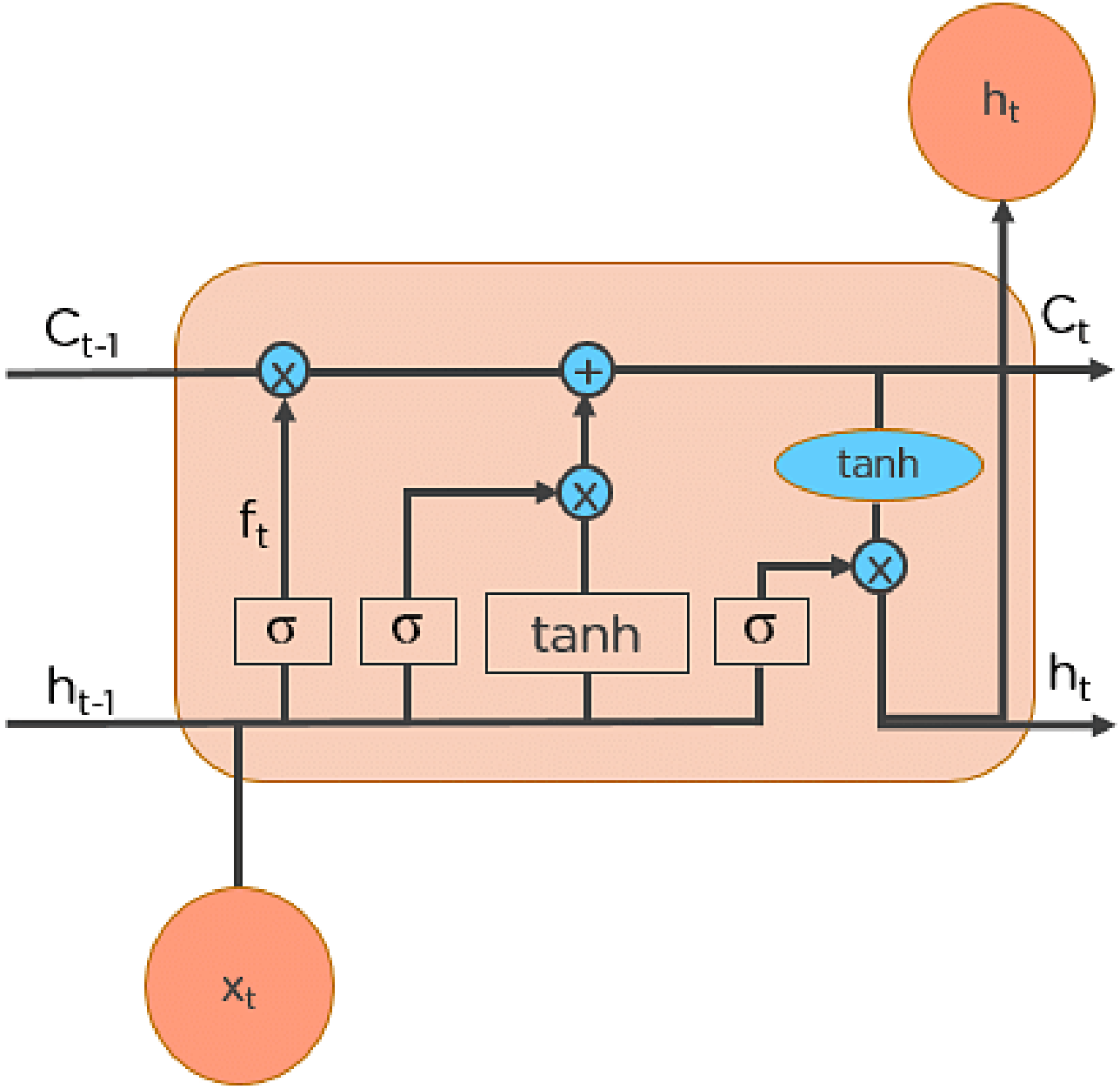
LSTM's



	CNN (Convolutional Neural Network)	RNN (Recurrent Neural Network)	LSTM (Long Short-Term Memory)
Suitable for	Grid-like structured data (e.g., images)	Sequential data (e.g., text, speech)	Sequential data with long-term dependencies
Key feature	Convolutional layers for local feature extraction	Recurrent connections for sequential information	Memory cells for capturing long-term dependencies
Architecture	Consists of convolutional layers and pooling	Consists of recurrent layers	A specialized type of RNN with LSTM memory cells
Information flow	Forward and occasionally backward	Unidirectional or bidirectional	Unidirectional or bidirectional
Memory	Limited memory, typically local context	Hidden state carries past information	Memory cells store past information and gate it

Weaknesses	Limited sequential modeling, global context	Difficulty capturing long-term dependencies	Computational complexity, overfitting with small data
Common applications	Image classification, object detection	Sentiment analysis, language modeling, speech recognition	Natural language processing, machine translation

THANK YOU

Queries???