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Deep Learning

Herramientas de IA

Docente: Cristian Guarnizo Lemus

Somos Innovación Tecnológica con *Sentido Humano*



Alcaldía de Medellín



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Contenido

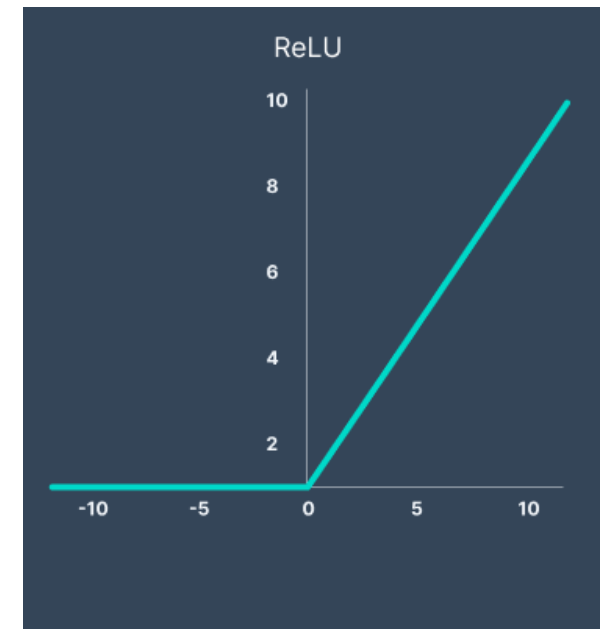
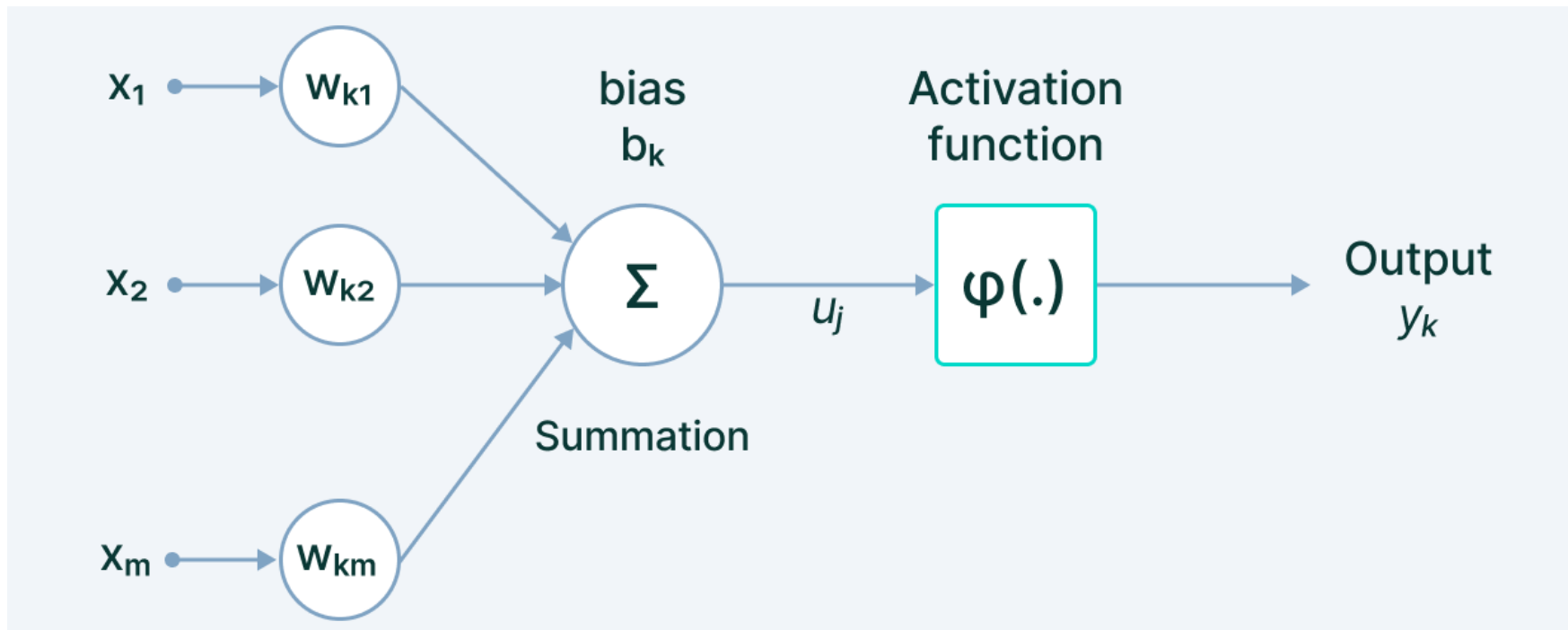
1. **Neural Networks**
2. Convolutional Neural Networks
3. Generative Adversarial Networks
4. Transformers
5. Transfer Learning
6. Fine Tuning



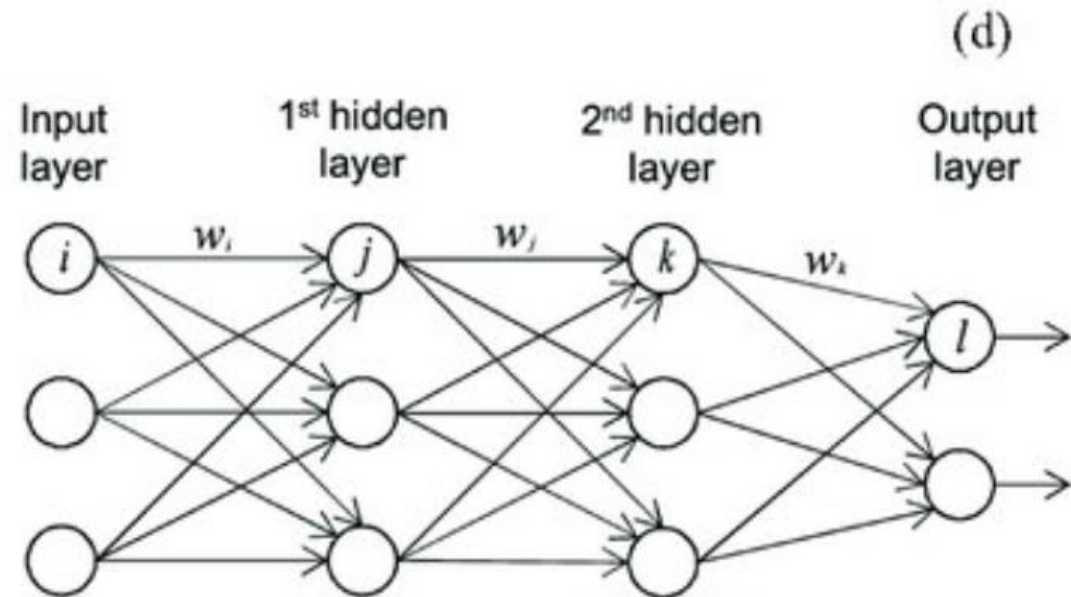
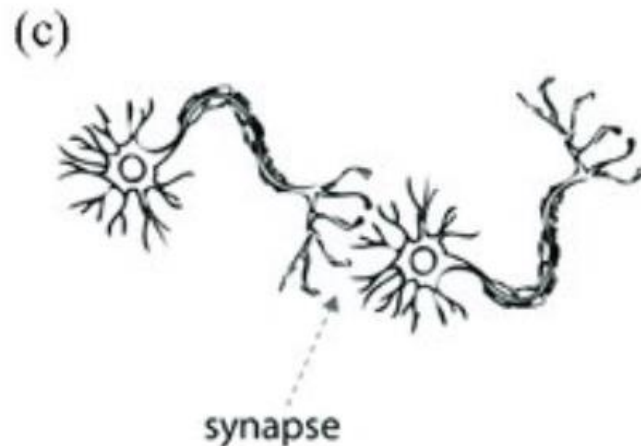
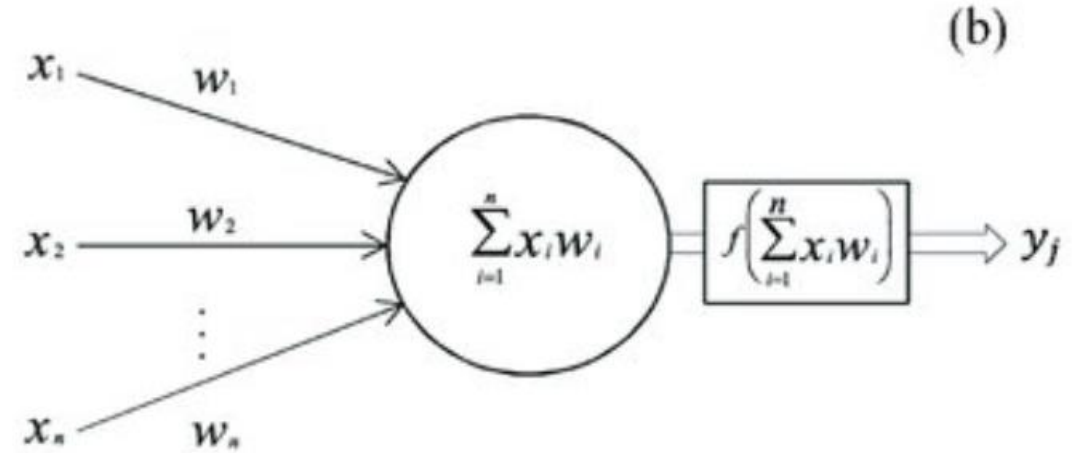
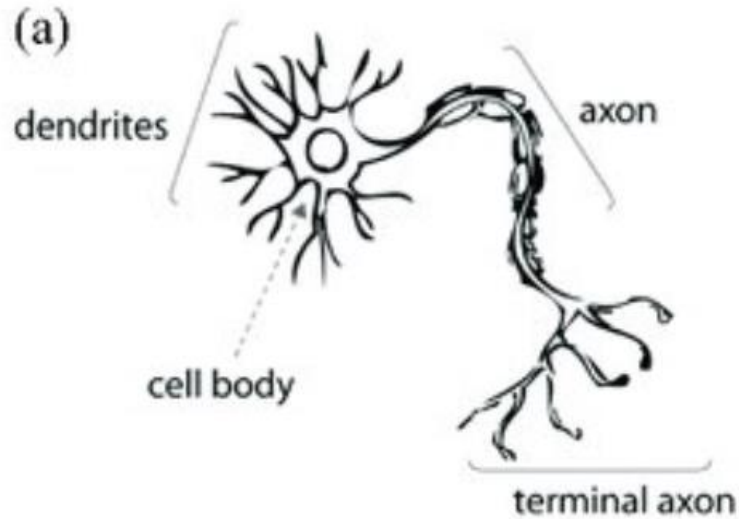
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Neural Networks

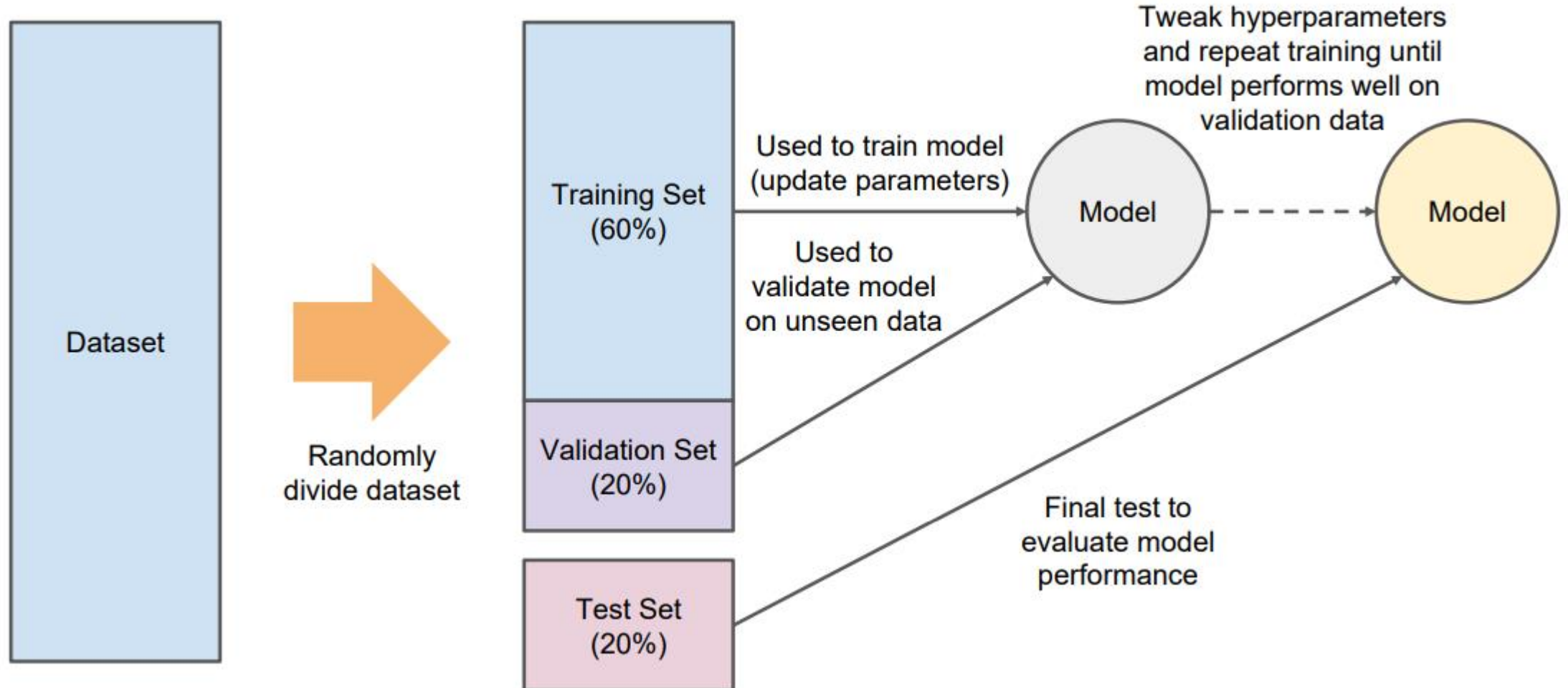
Neural Networks - Basic Unit



Neural Networks – Multiple layers



Neural Network - Setup

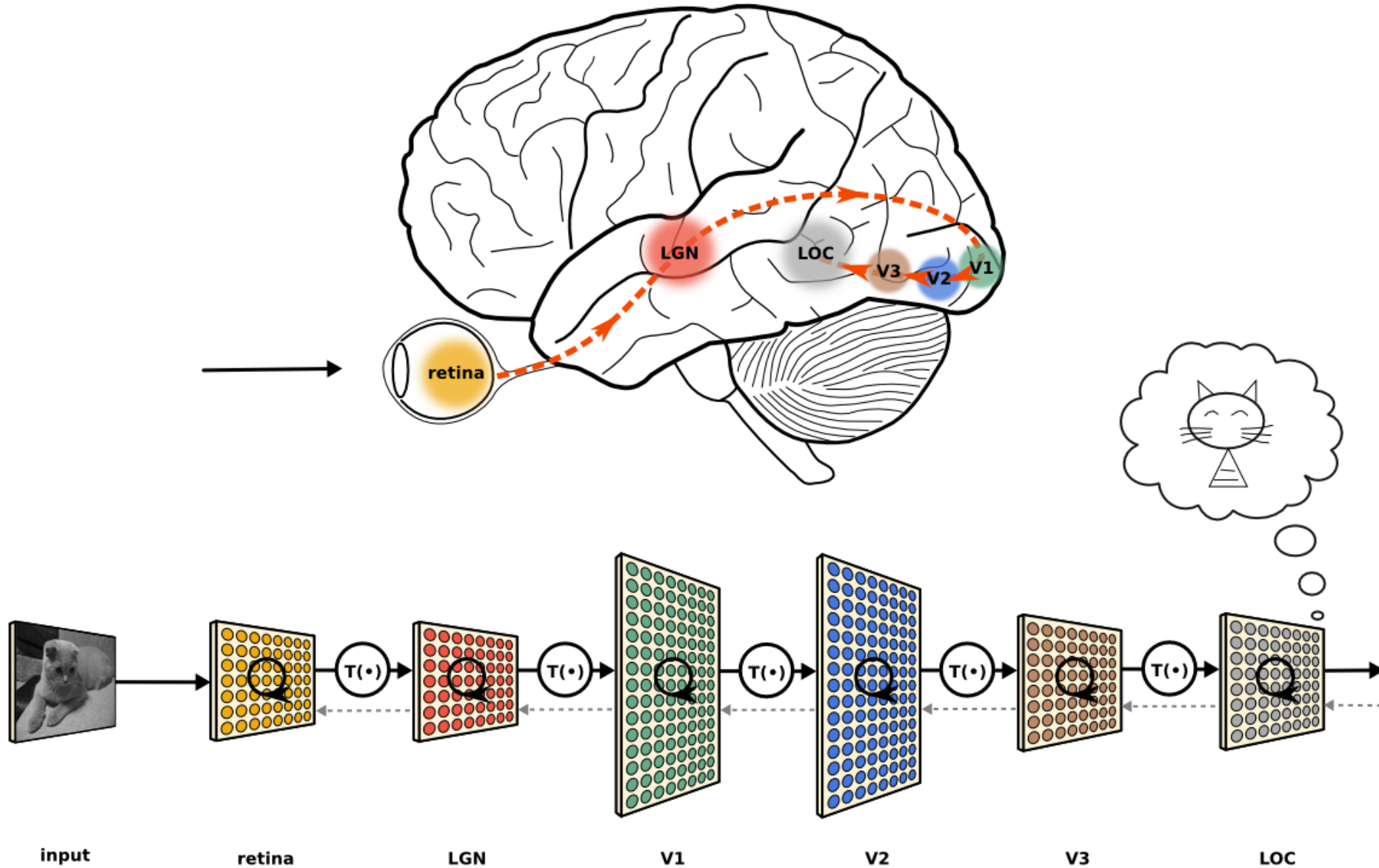




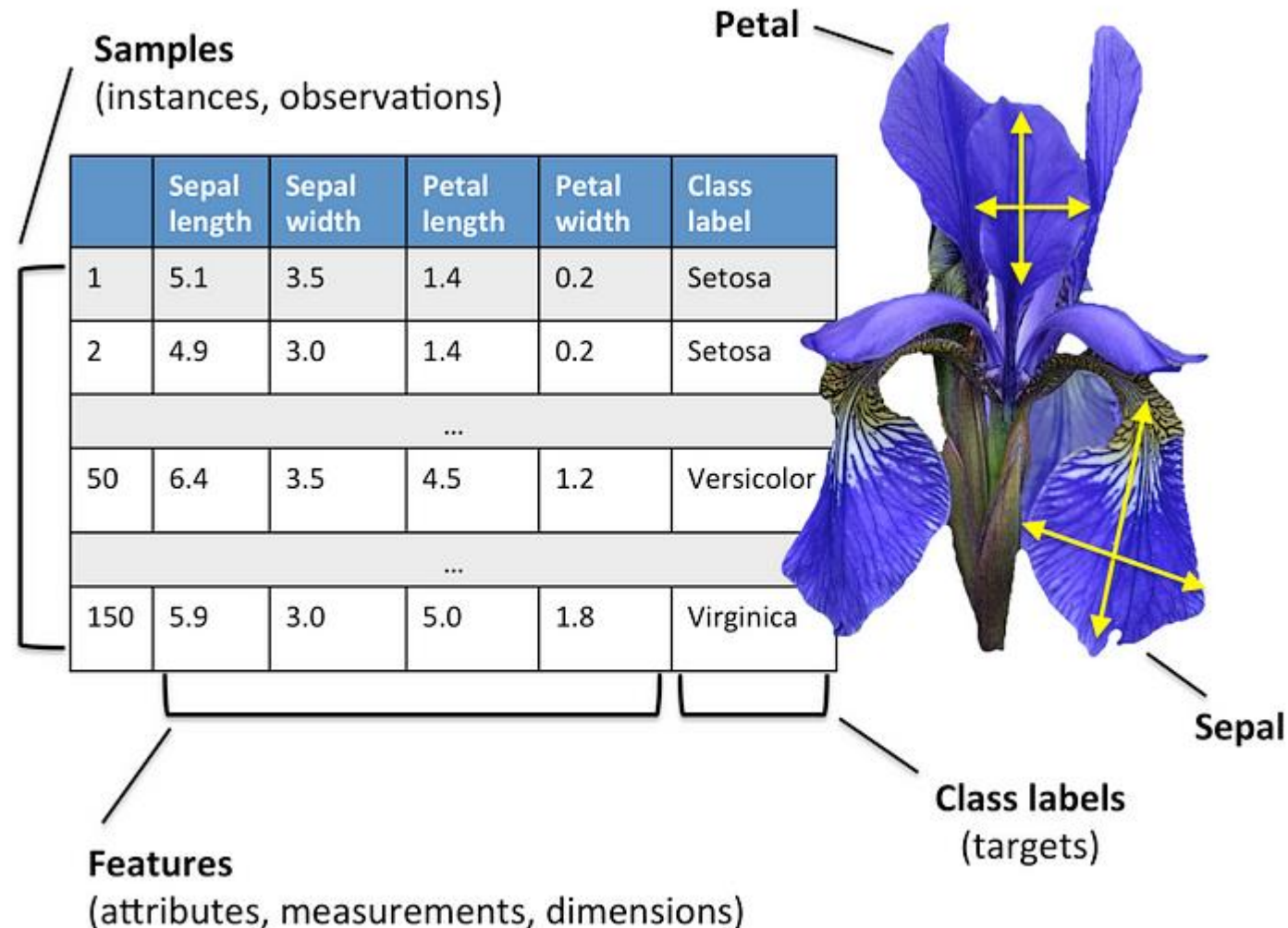
Contenido

1. Neural Networks
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Vision Artificial

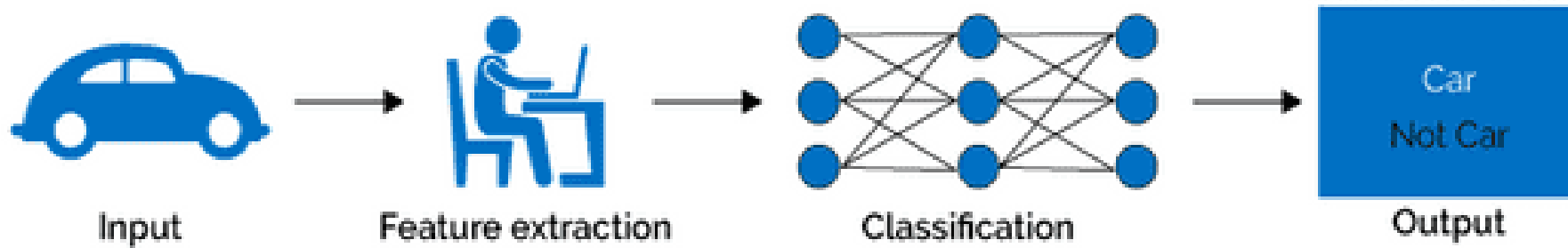


Recordemos - Clasificación

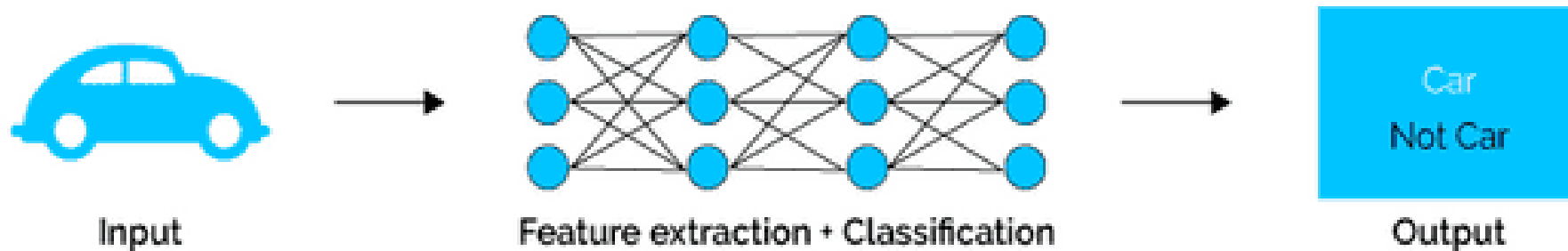


Extracción de características

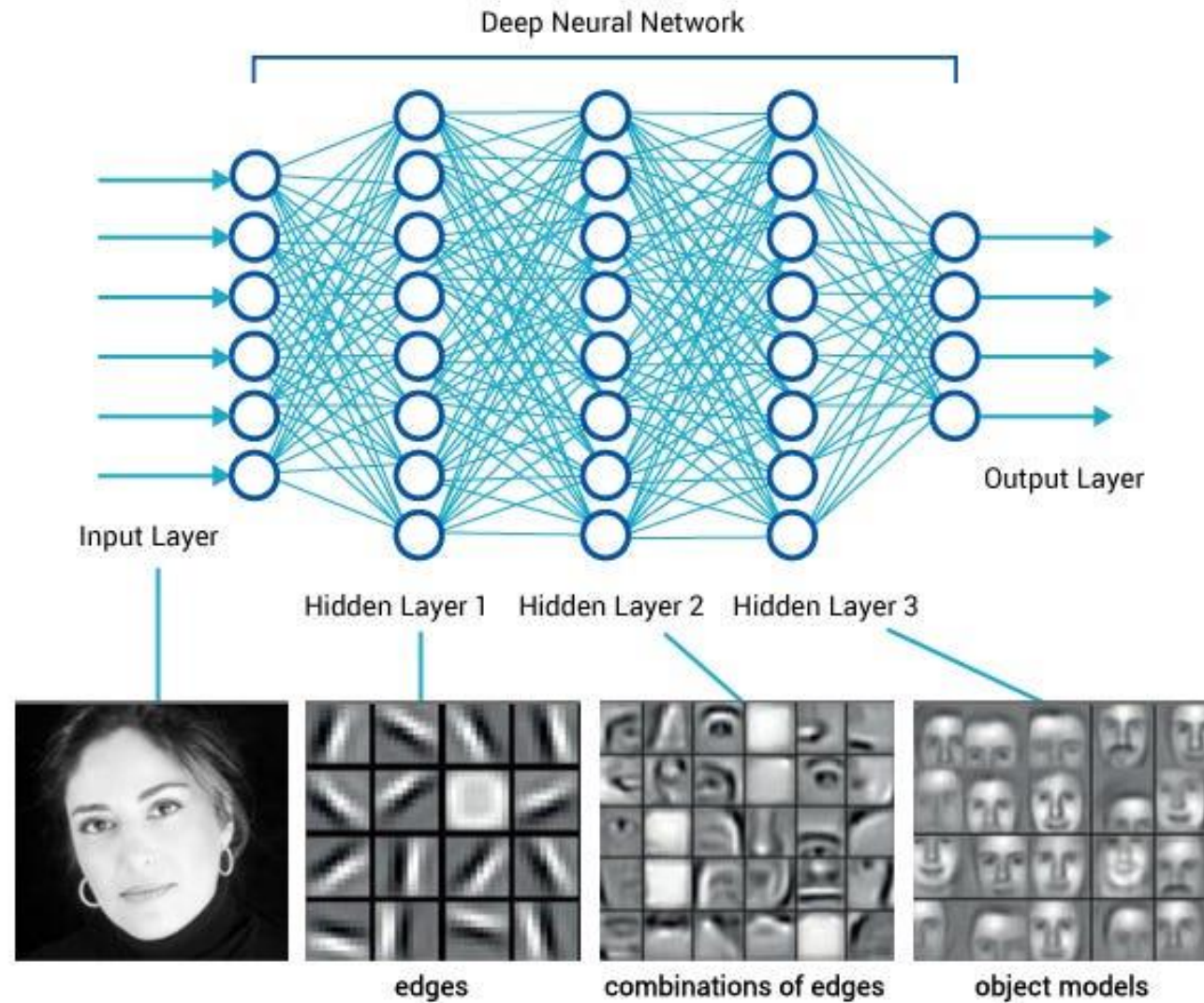
Machine Learning



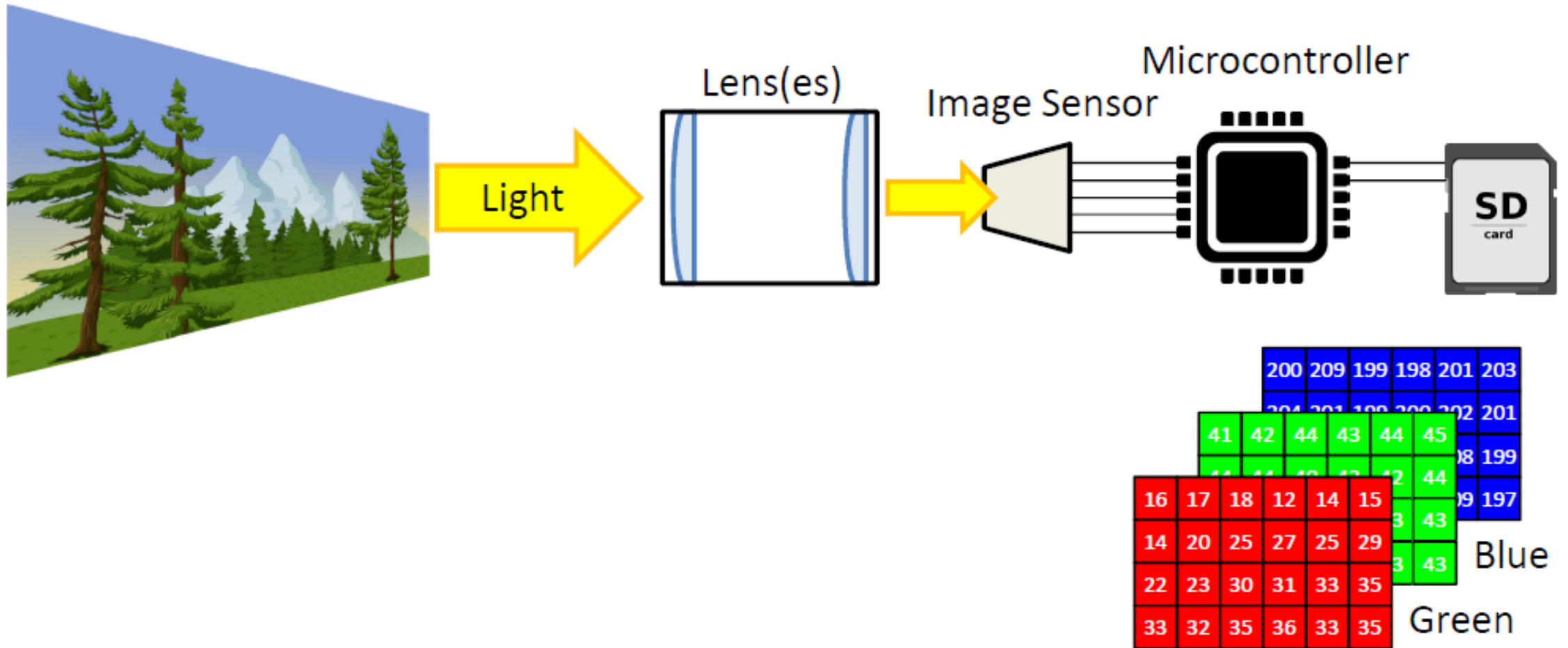
Deep Learning



Refinamiento por capas



Como se forman las imagenes

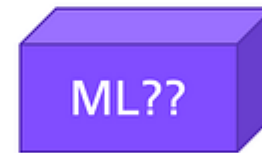


Recordemos - Machine Learning

What if the input is an image?

Classification

Is it a **tiger**, a **cat**, or a **fox**?



Class	Probability
Dog	0.03
Cat	0.96
Bird	0.01

=



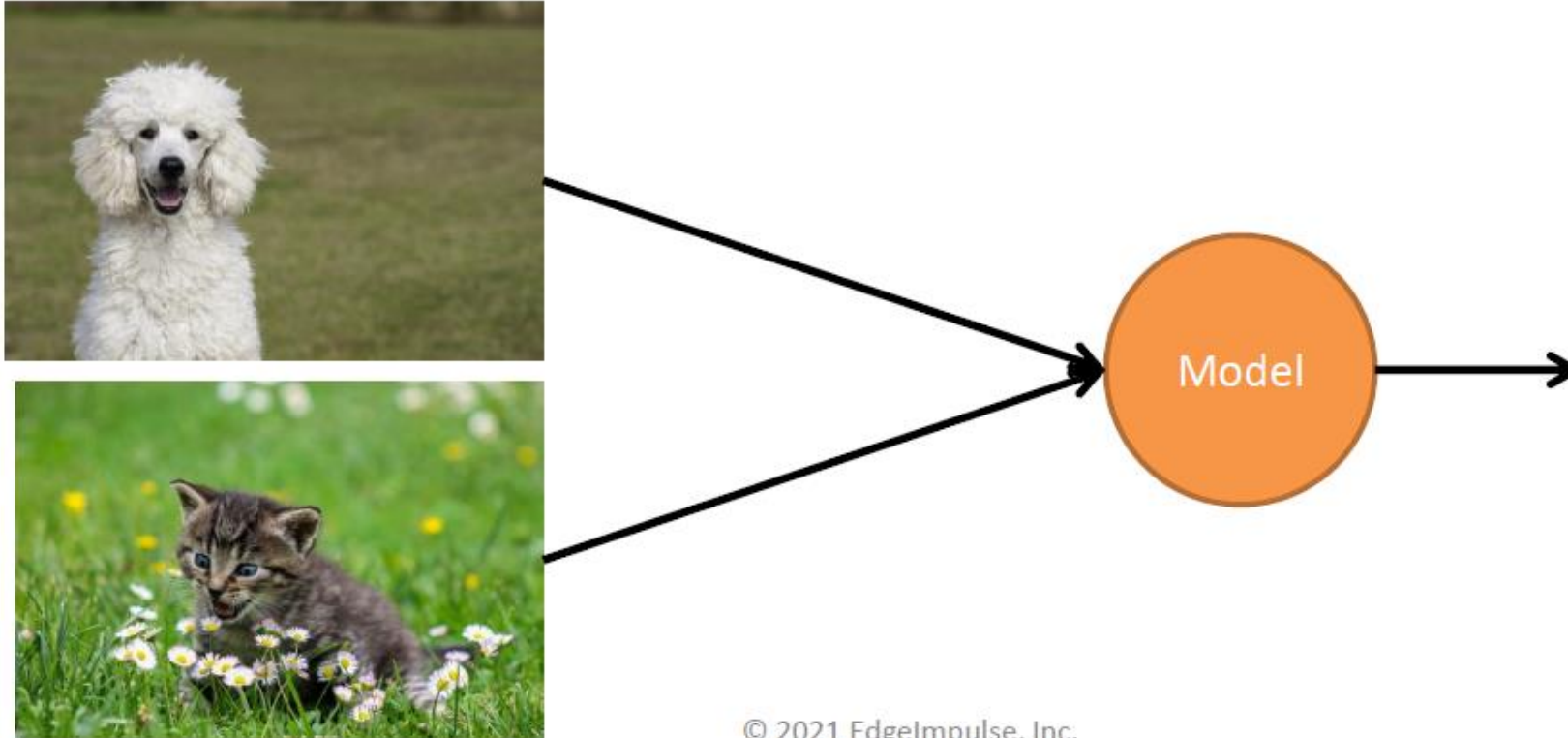
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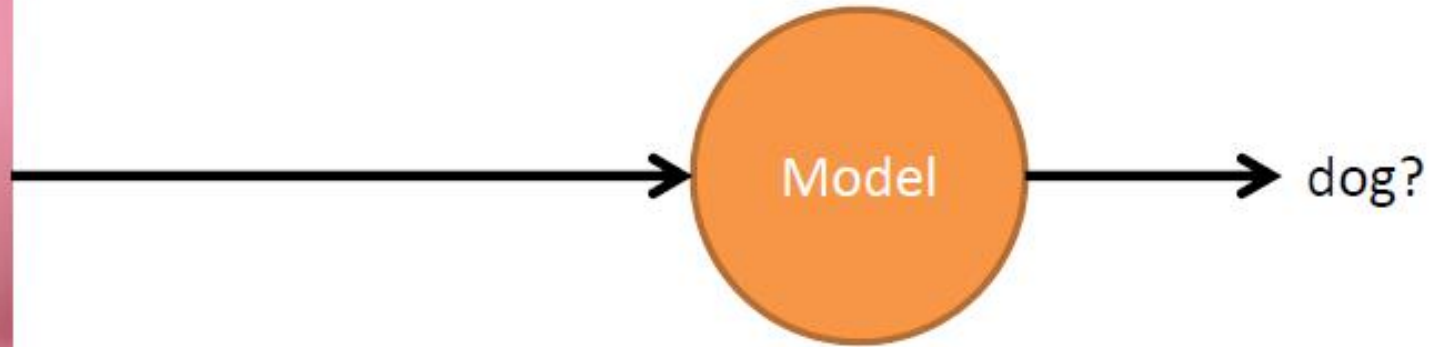
$224 \times 224 \times 3 = 150,528$ pixels (!!)

Clasificación de imágenes

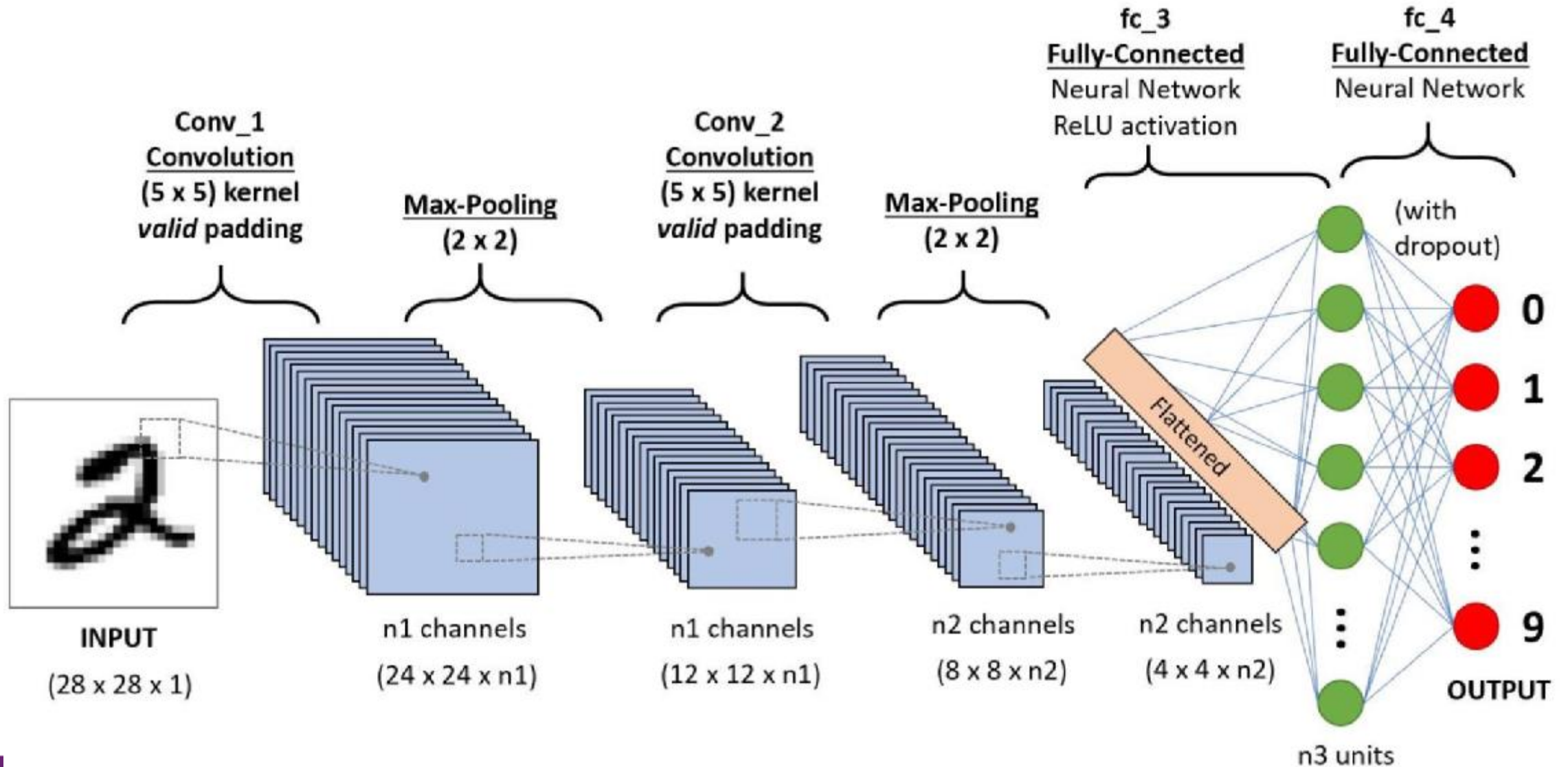


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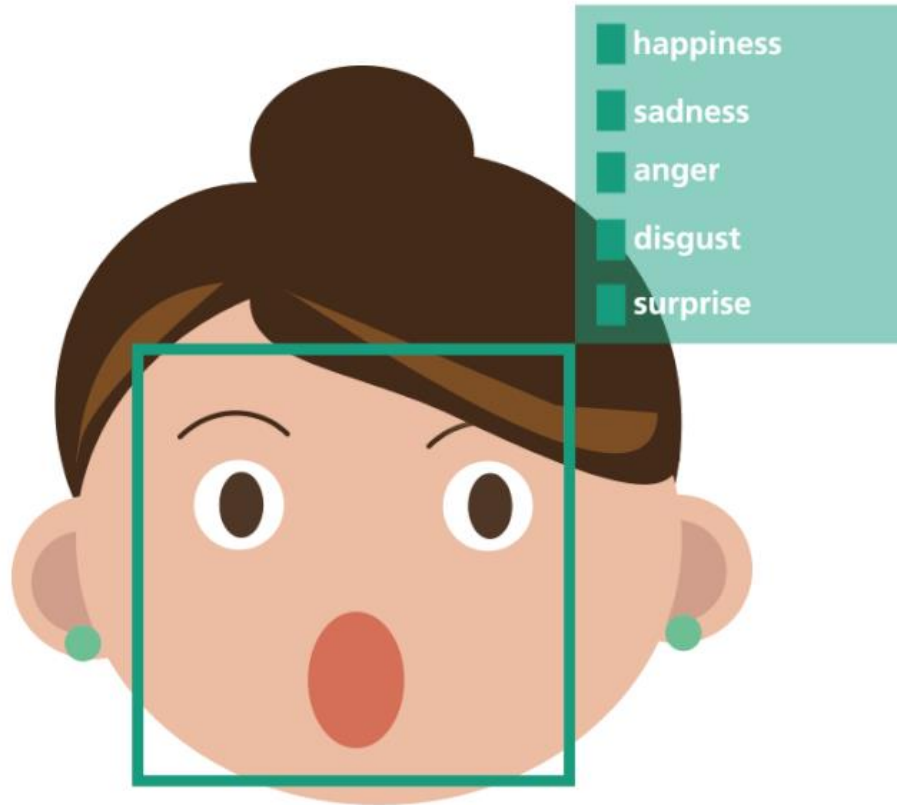
Detección de objetos



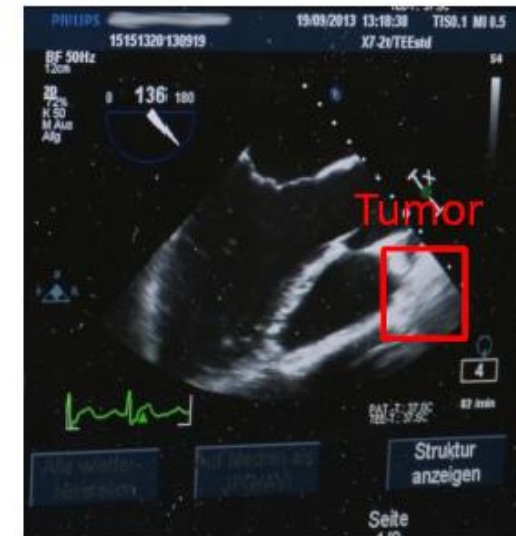
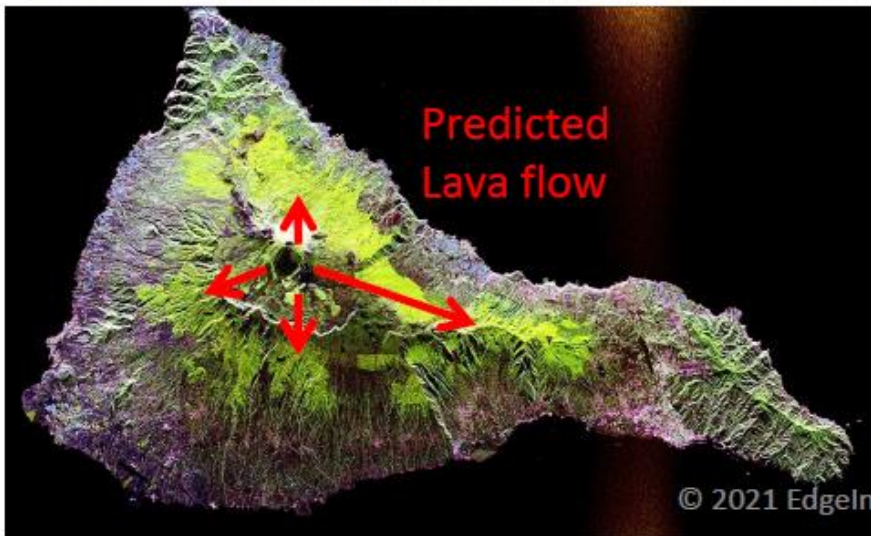
Convolutional Neural Network



Aplicaciones



Aplicaciones

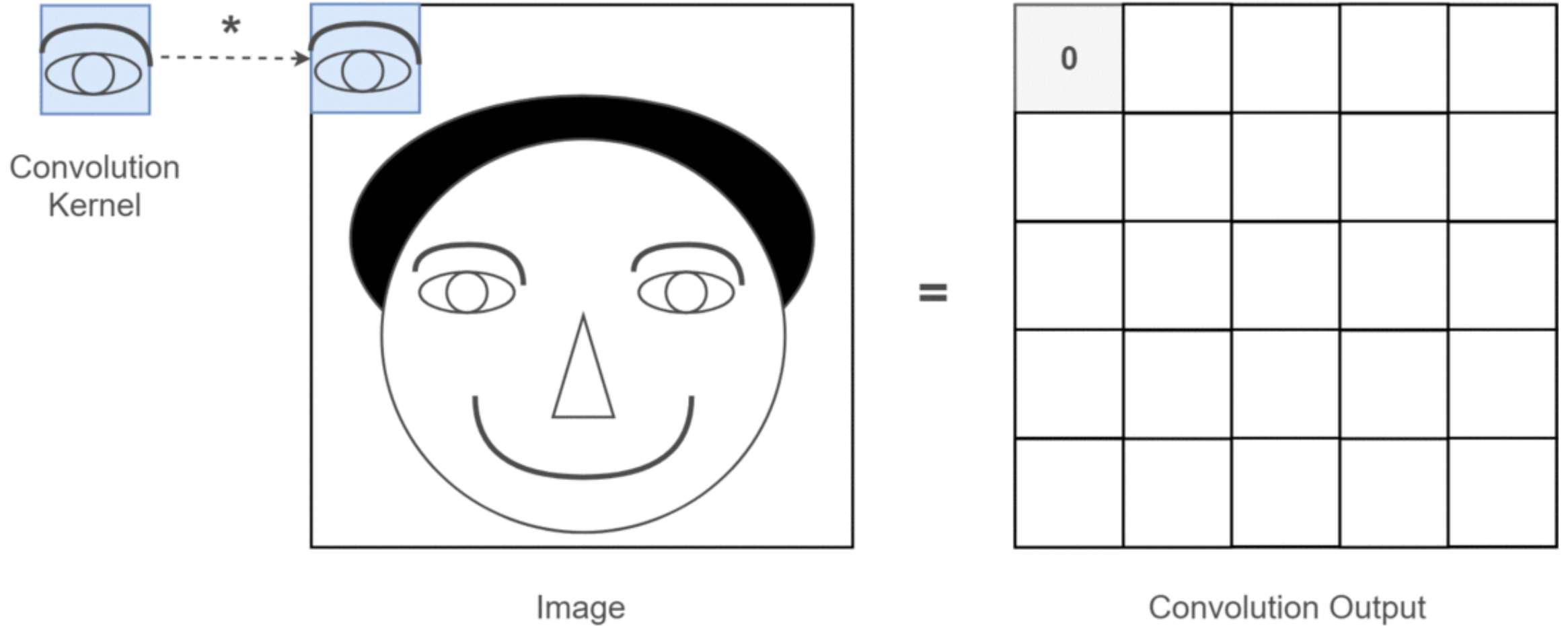


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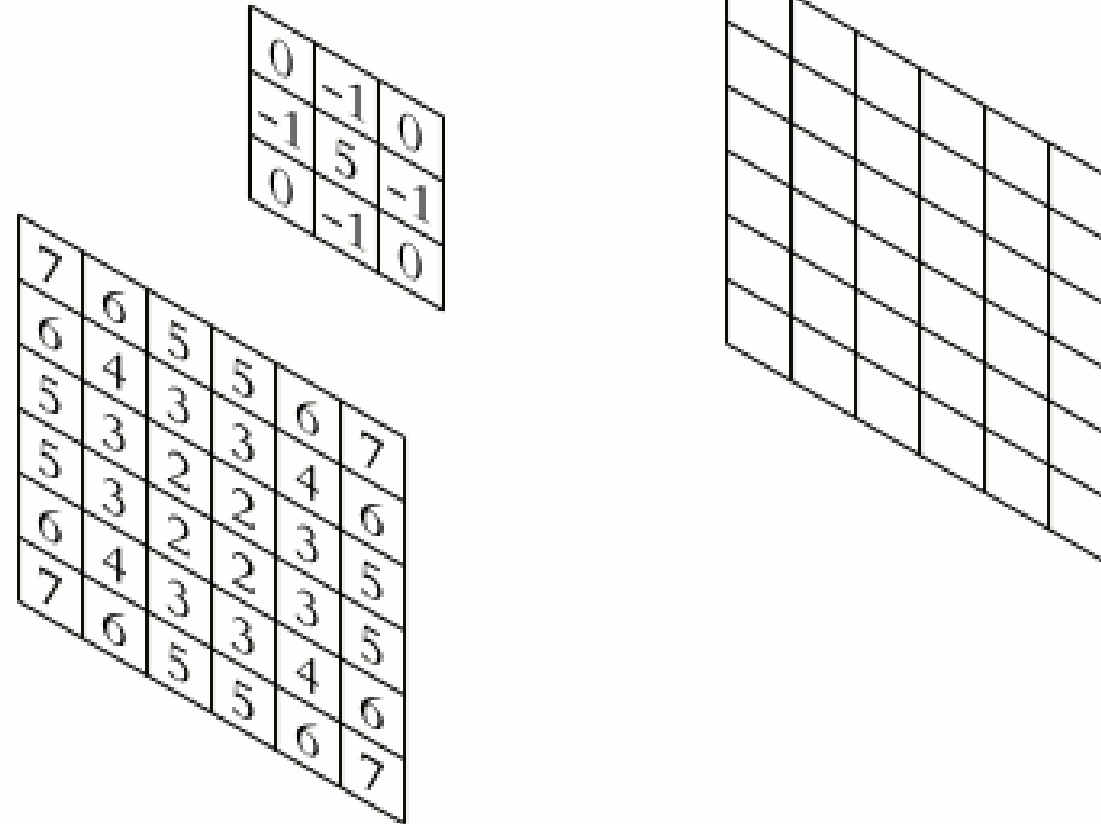
sentido Humano

Convolution 2D



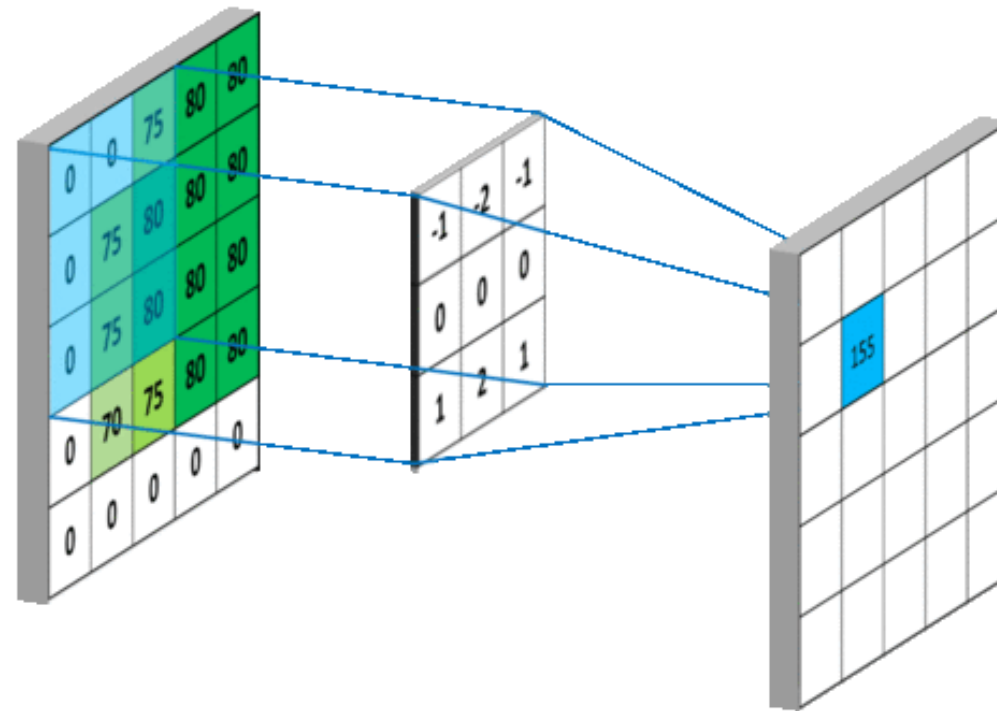
Kernel product

output



input

Convolutional layer - example



Ejercicio

Image

59	58	67	82
66	75	100	124
69	89	121	150

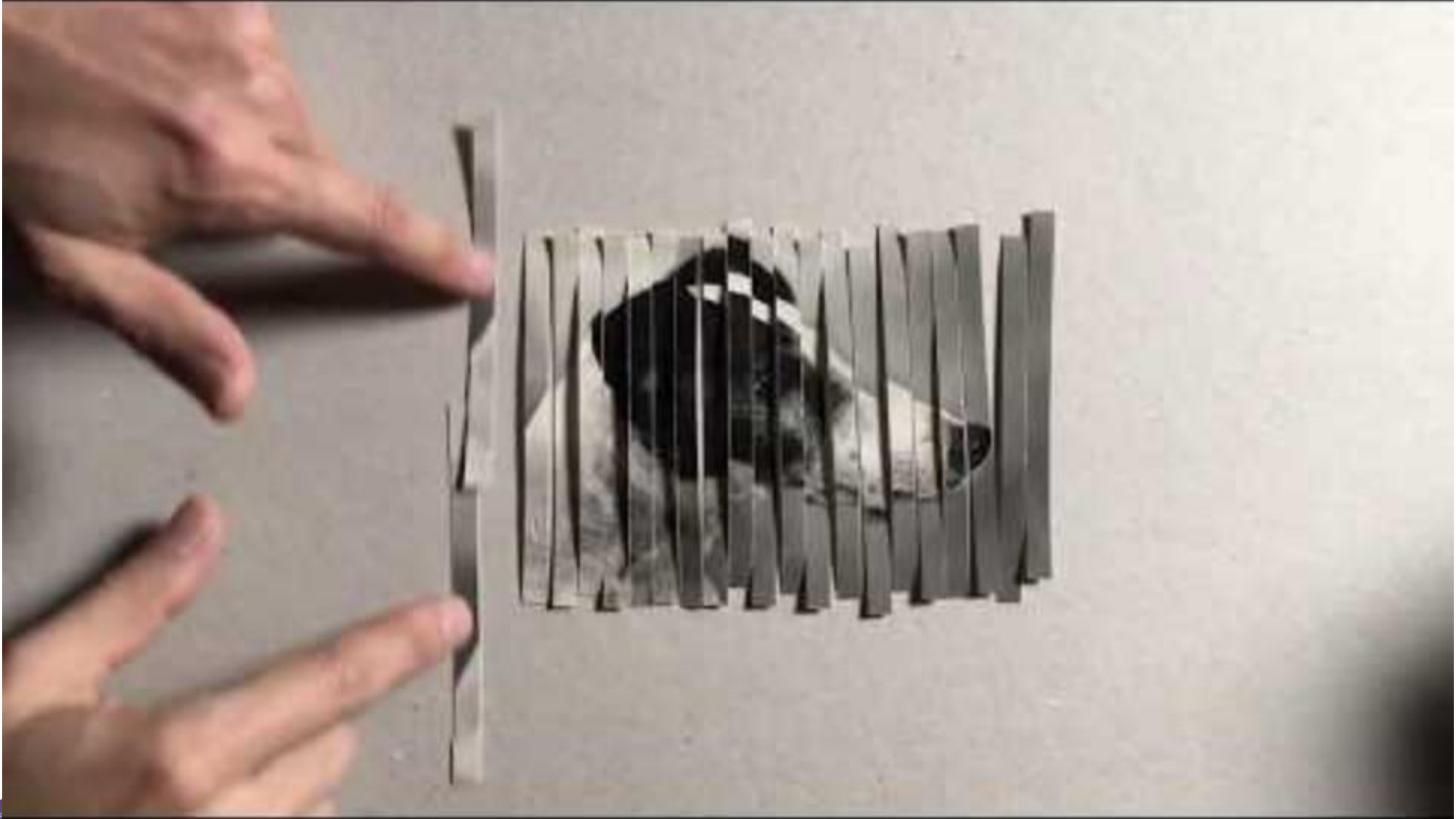
Kernel

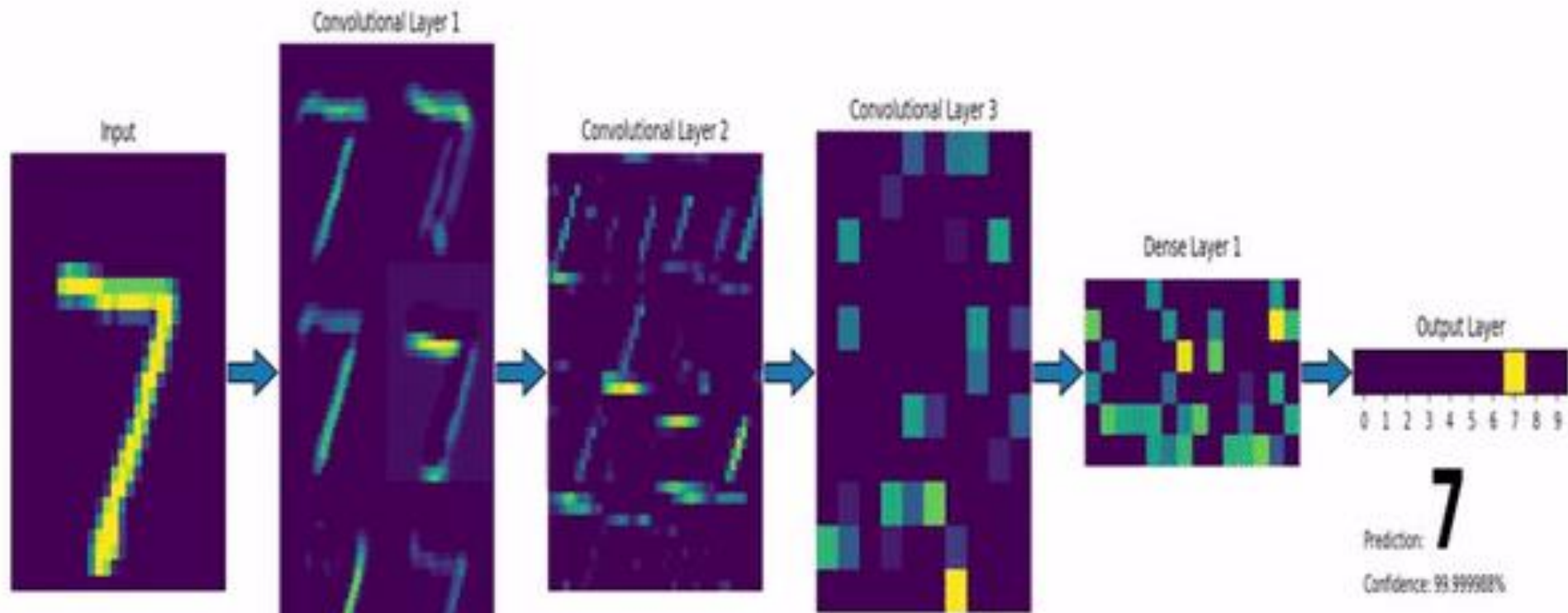
-1	-1
-1	3

Kernel: 2x2
Stride: 1
Padding: valid

Output

	x	





Pooling

Max Pooling

29	15	28	184
0	100	70	38
12	12	7	2
12	12	45	6

2 x 2
pool size

100	184
12	45

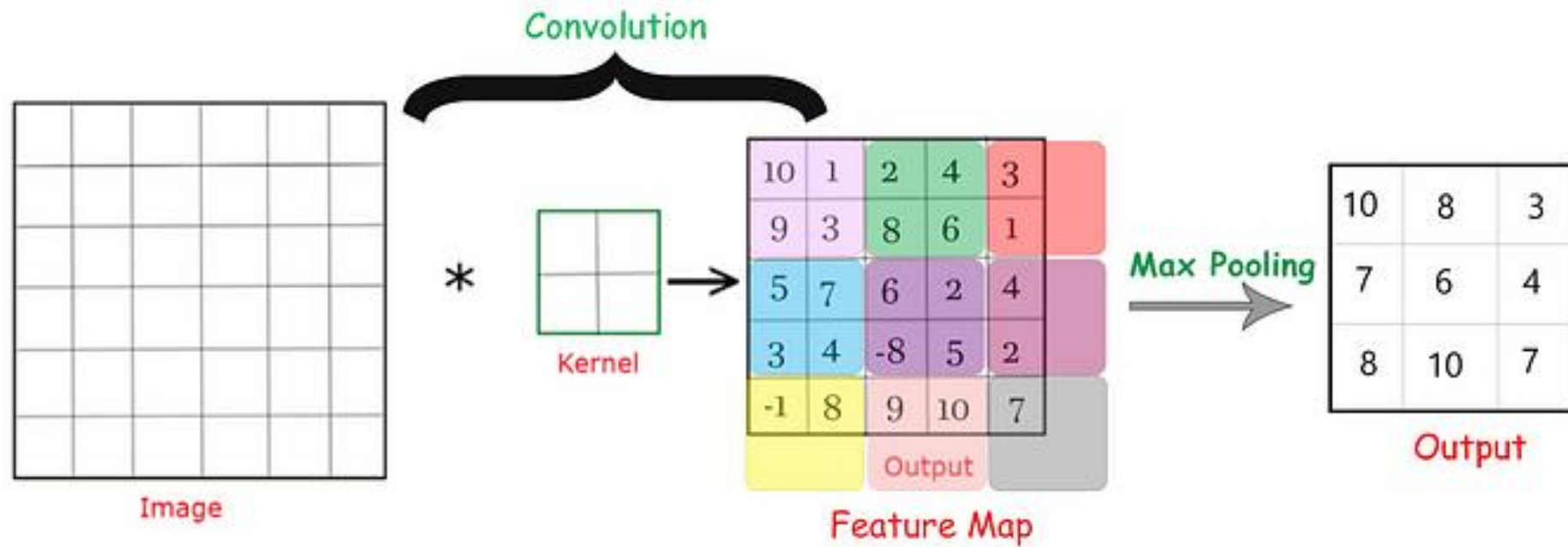
Average Pooling

31	15	28	184
0	100	70	38
12	12	7	2
12	12	45	6

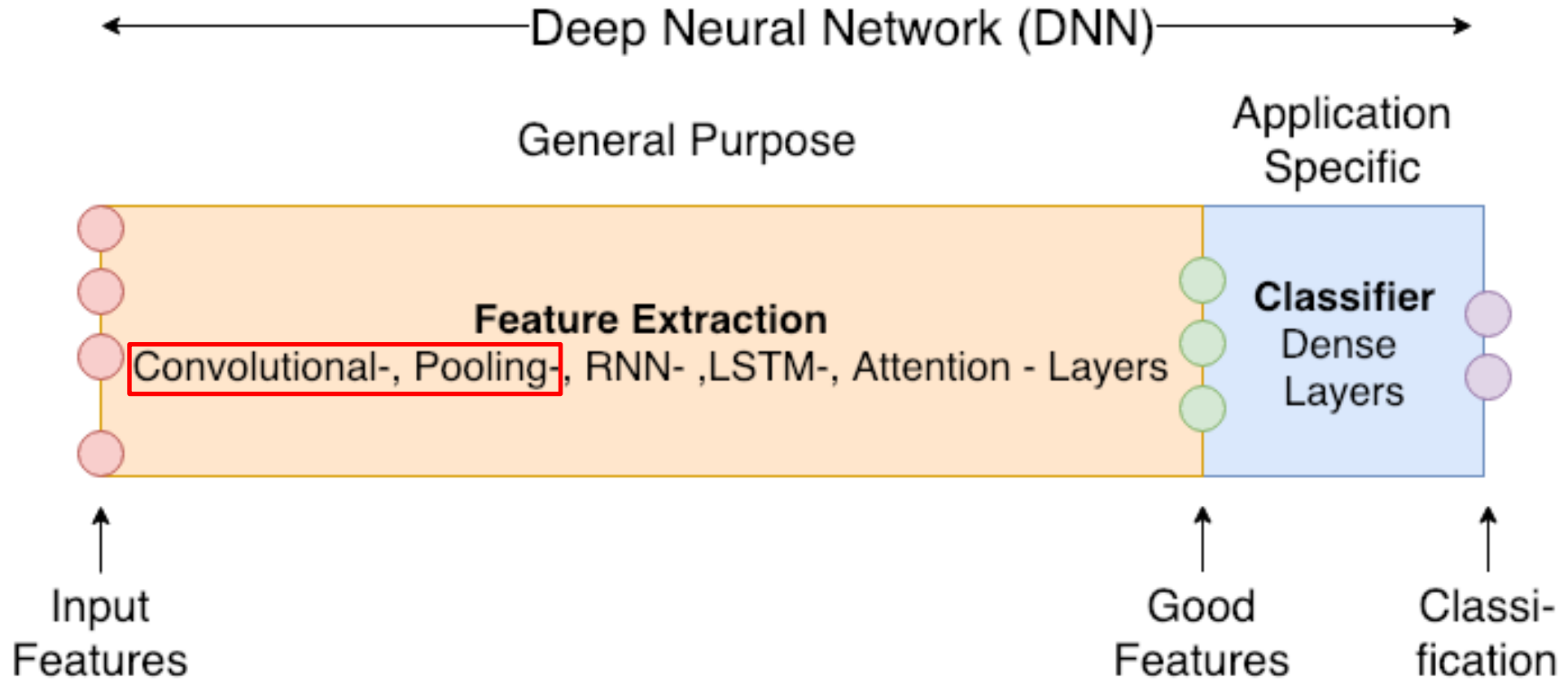
2 x 2
pool size

36	80
12	15

Max Pooling – Example



Deep Learning

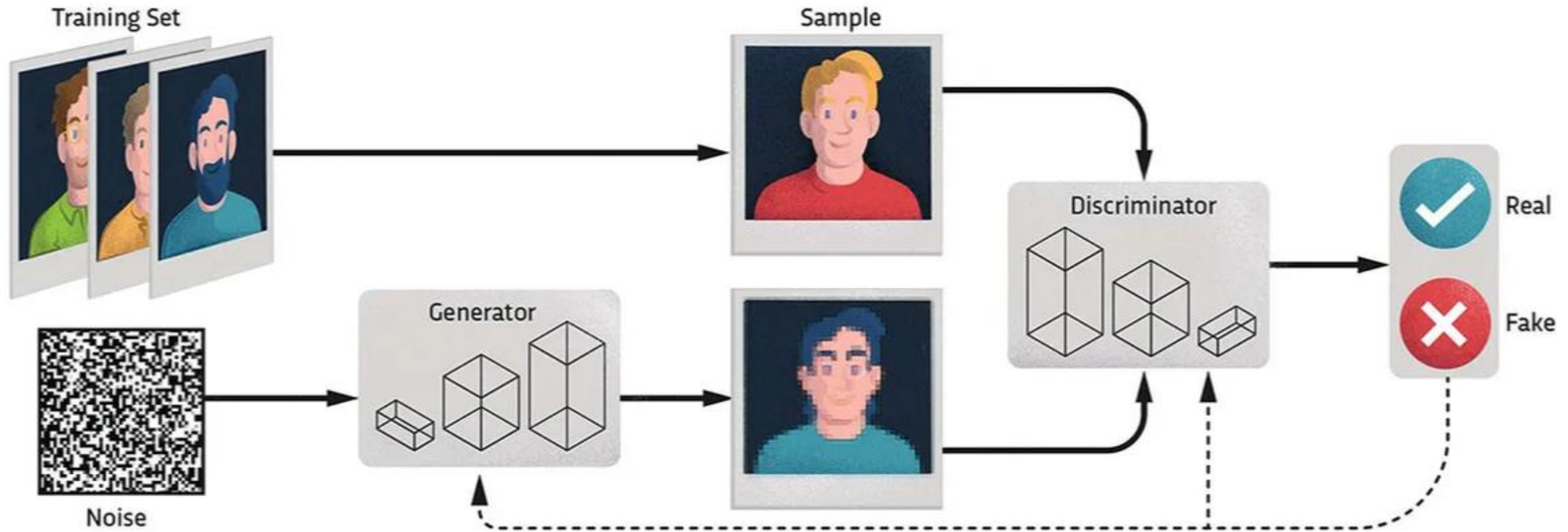




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GANs

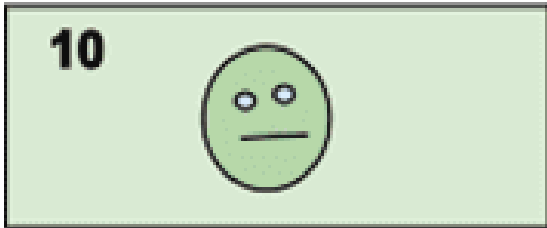


GANs

Generated Data

Discriminator

Real Data



FAKE

REAL



FAKE

REAL



REAL

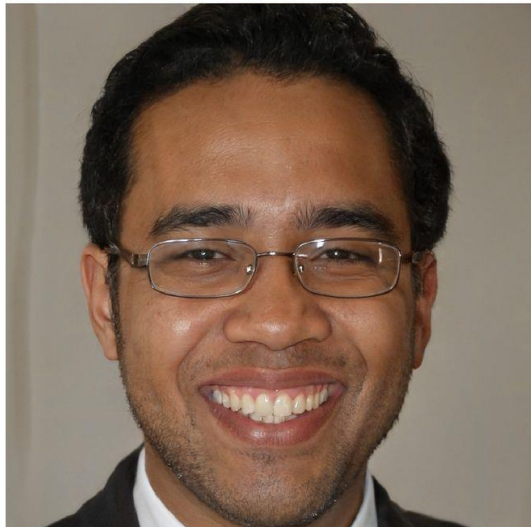
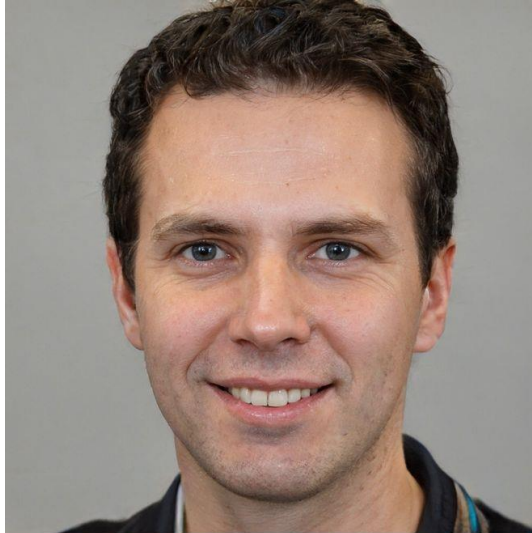
REAL





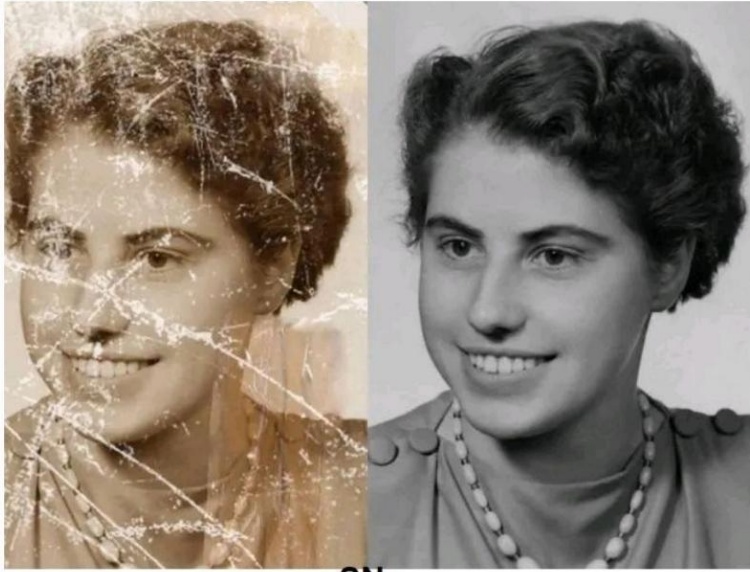
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GANs

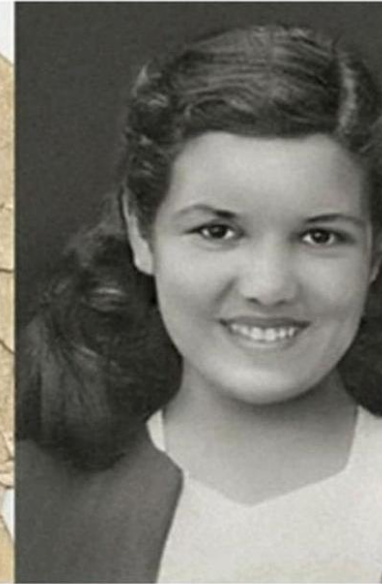


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GANs



SN

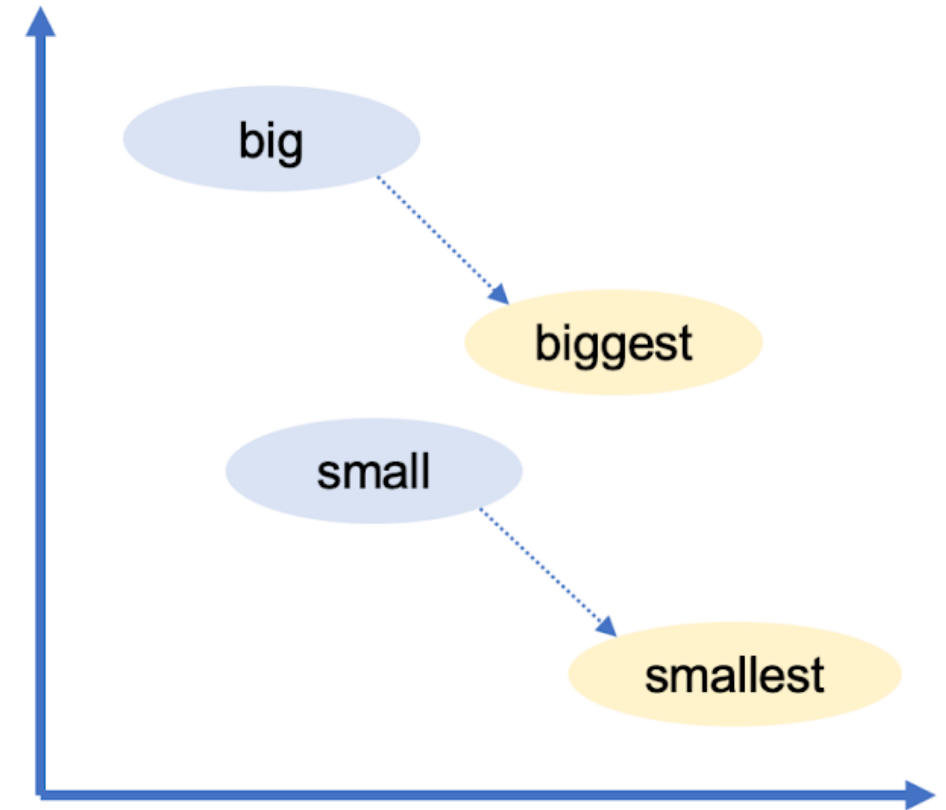
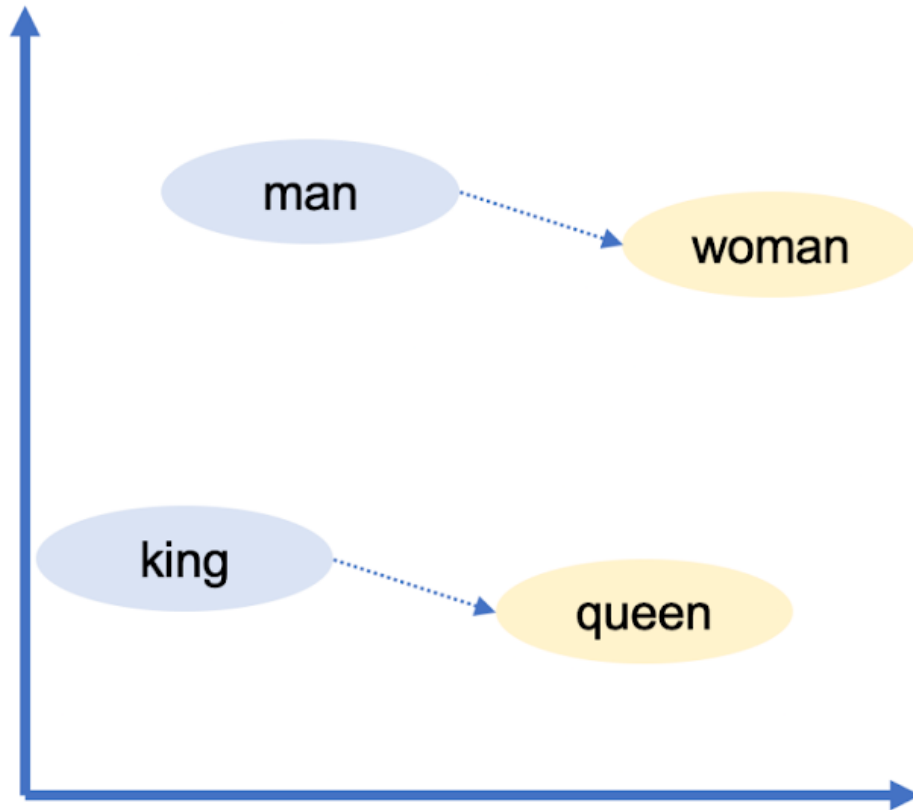




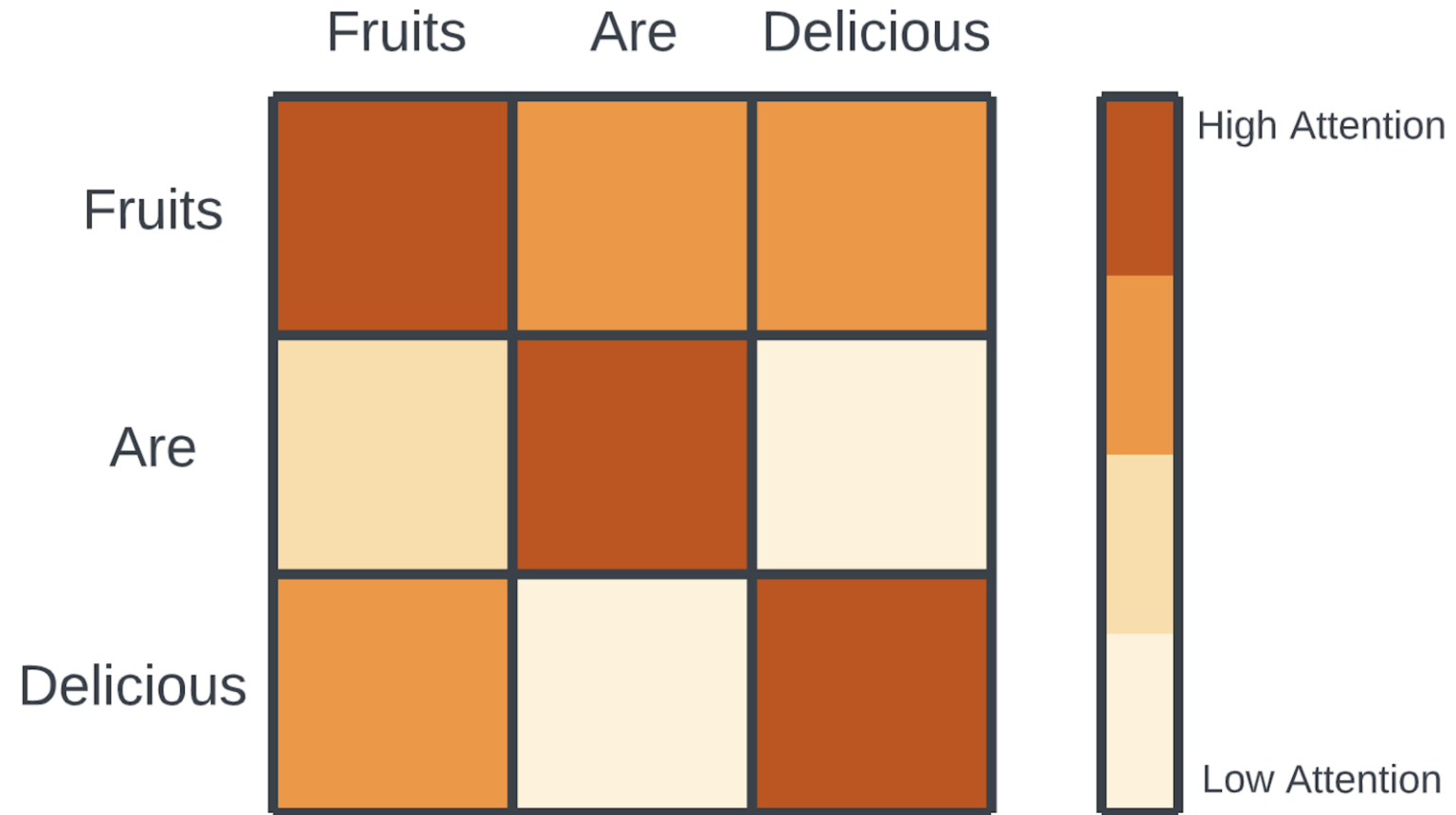
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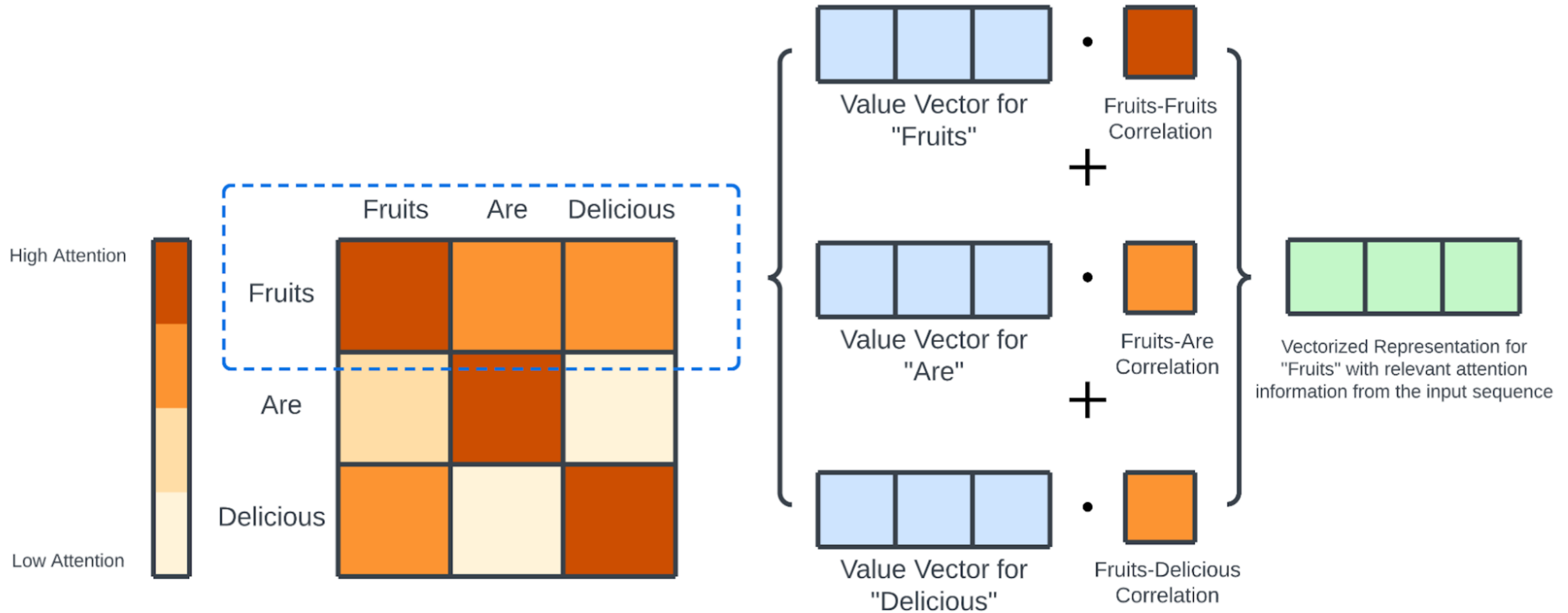
Word Embedding



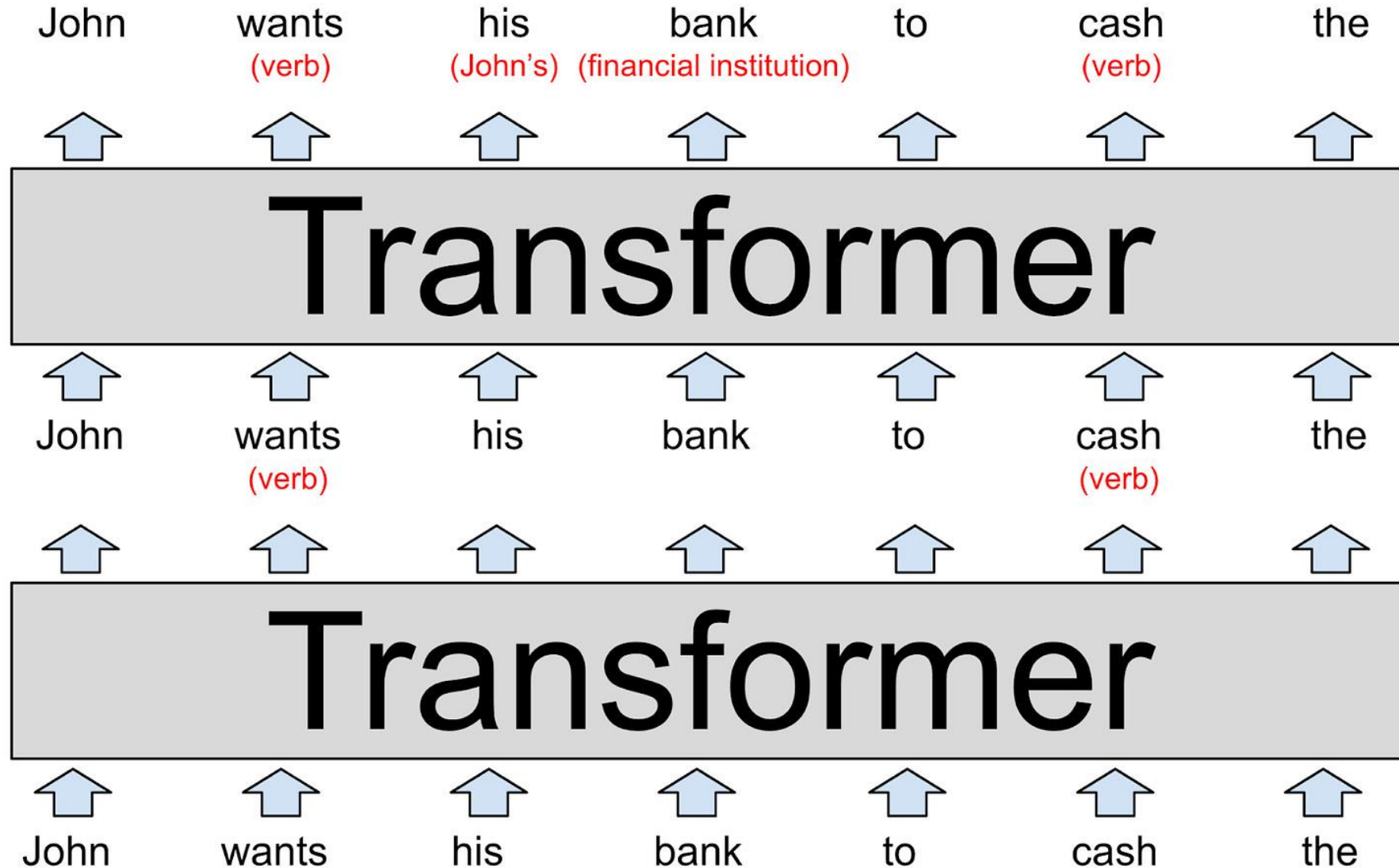
Attention



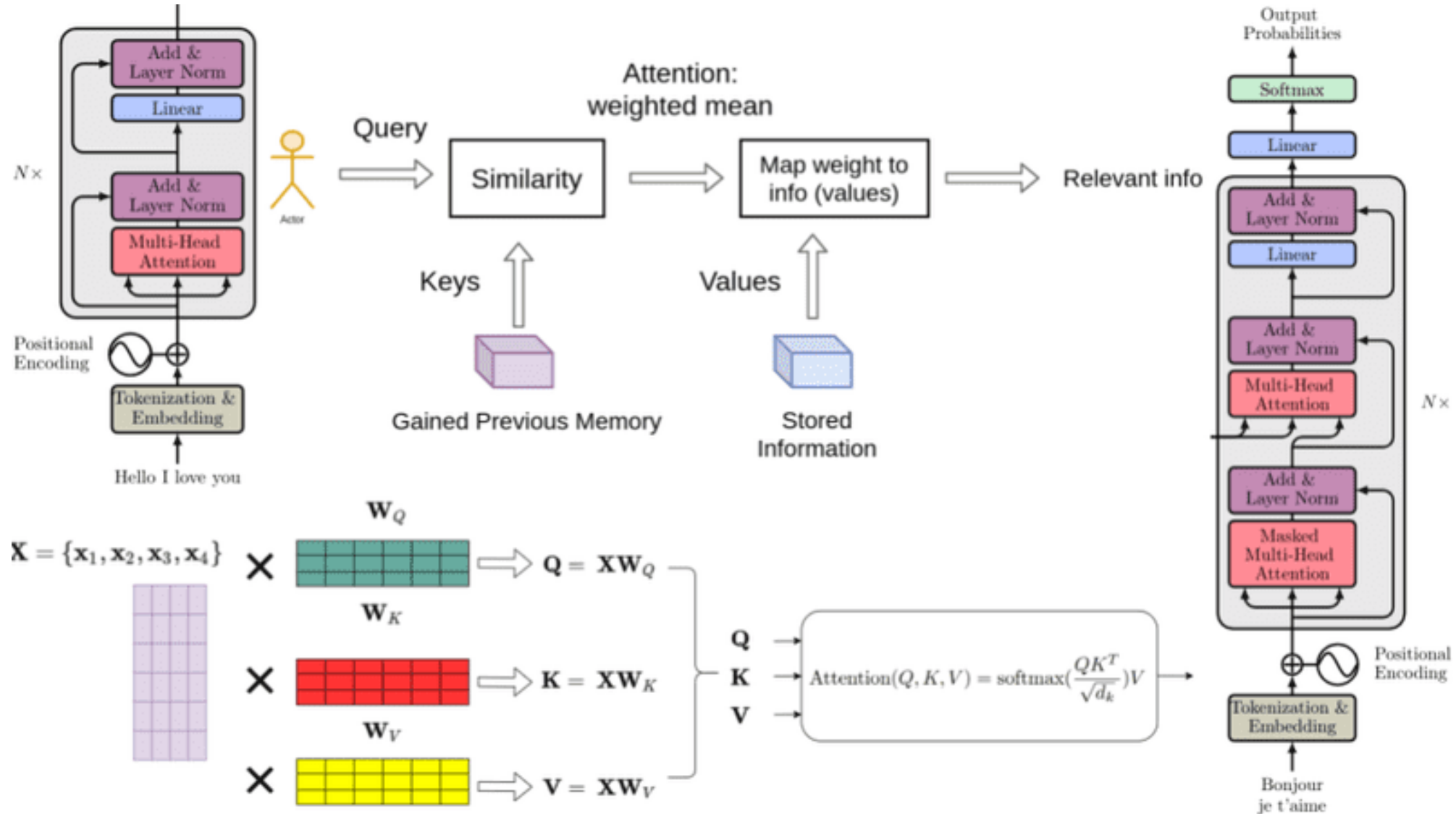
Attention

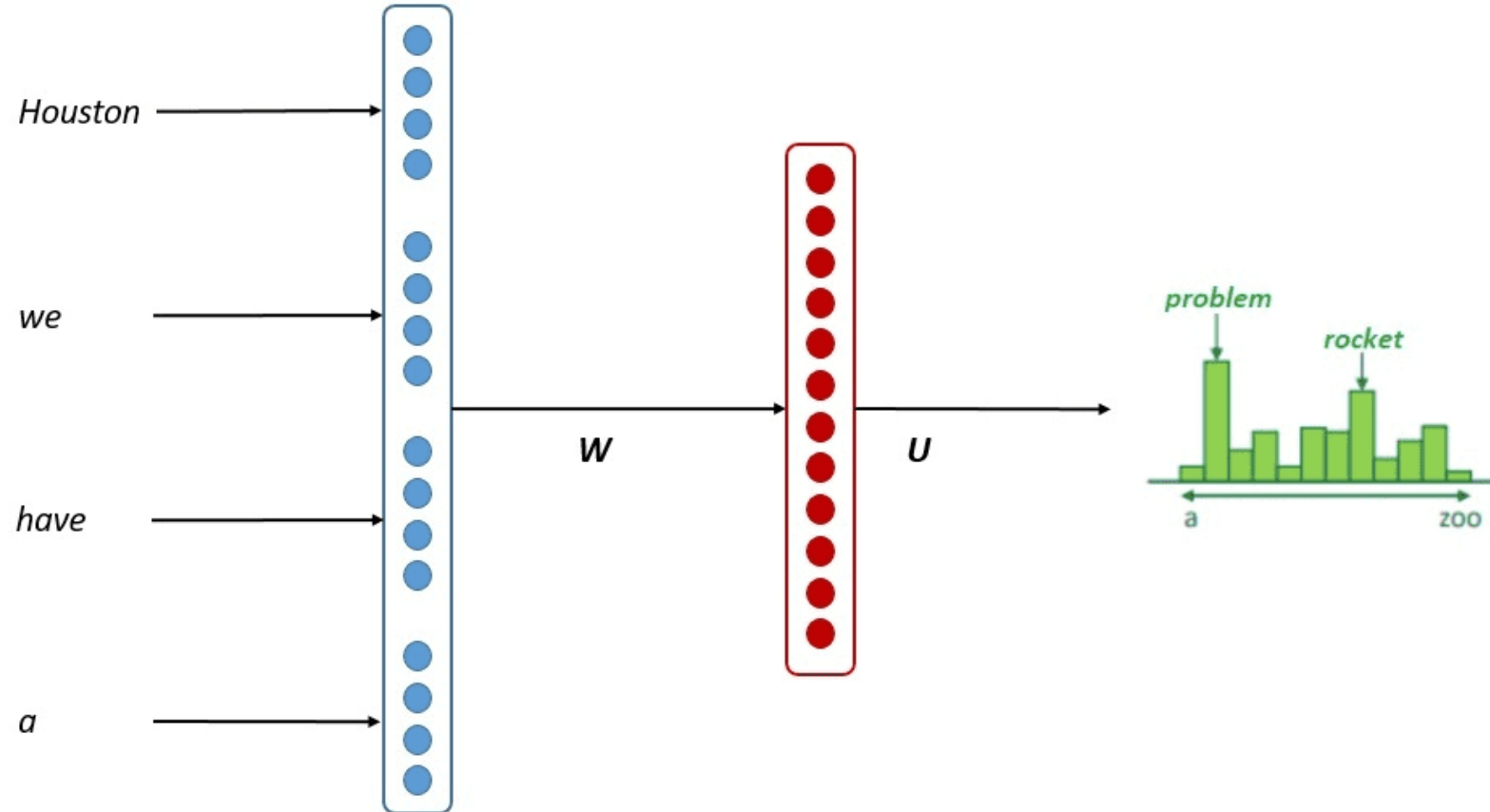


Transformers



Transformers





$$x^1, x^2, x^3, x^4$$

Input text sequence

$$e = [e^1; e^2; e^3; e^4]$$

Concatenated word embeddings

$$h = f(We + b_1)$$

Hidden layer of the neural network

$$\hat{y} = \text{softmax}(Uh + b_2)$$

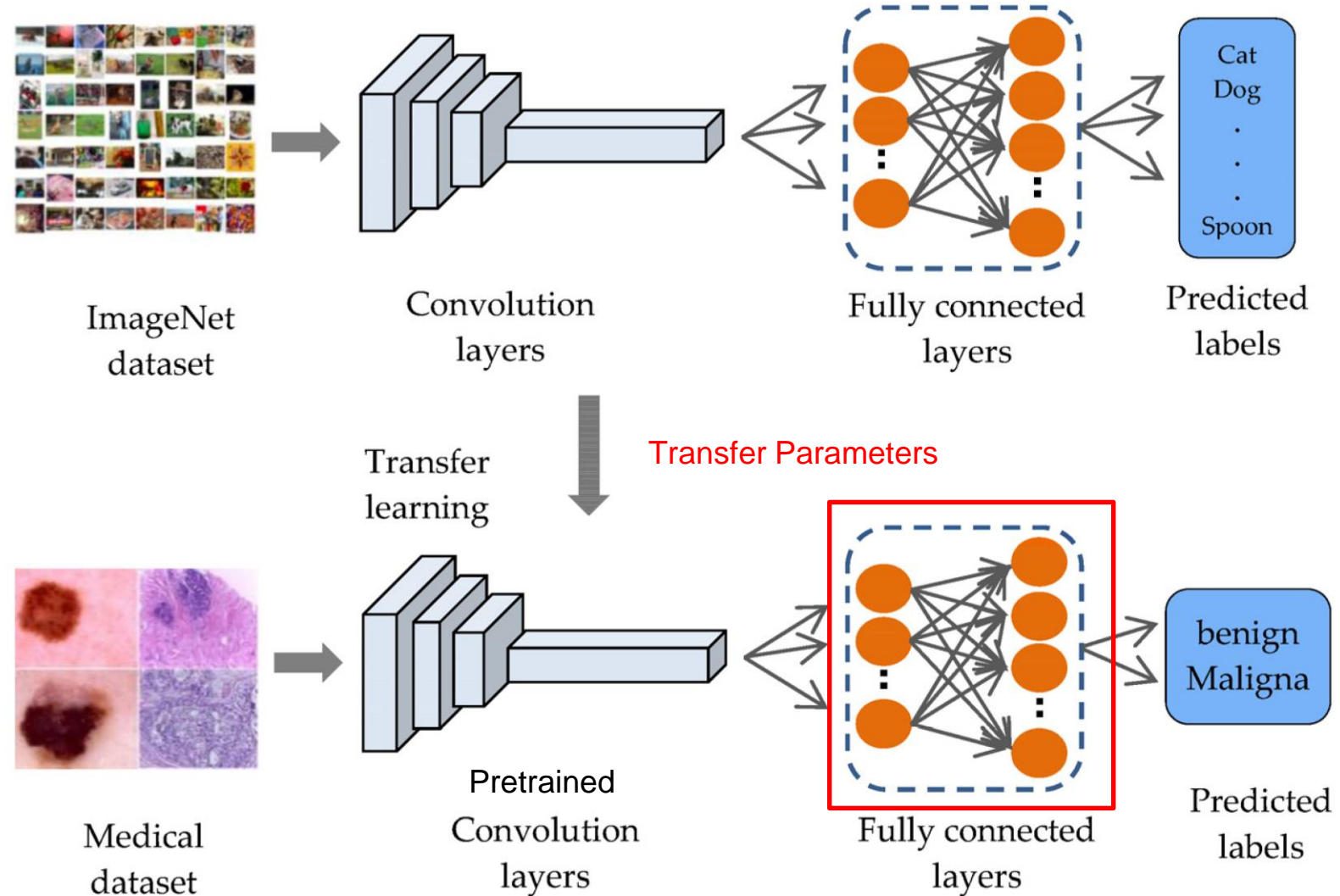
Output probability distribution



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Transfer Learning

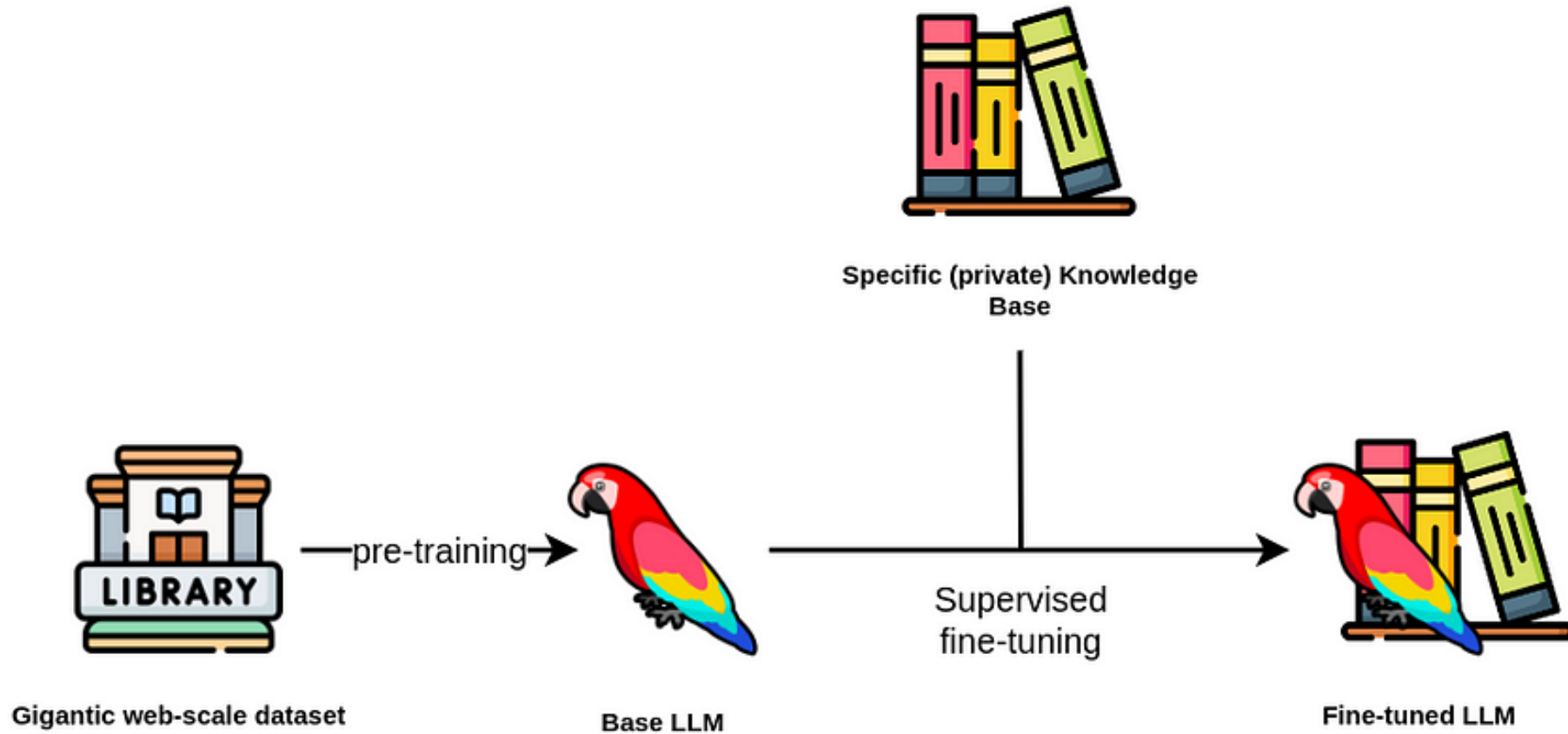




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Fine tuning



Preguntas?

1. Que es la caracterización de imágenes? Este paso es necesario en Deep Learning?
2. Cual es el proceso de aprendizaje de una GAN?
3. Que aplicaciones tienen las GANs?
4. Que es transfer learning?



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¡Gracias!

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