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TensorFlow and Keras

- Introduction
- Main features/components
- CNN v/s MLP
- Hands-on Coding (CIFAR-10)

Presented by:

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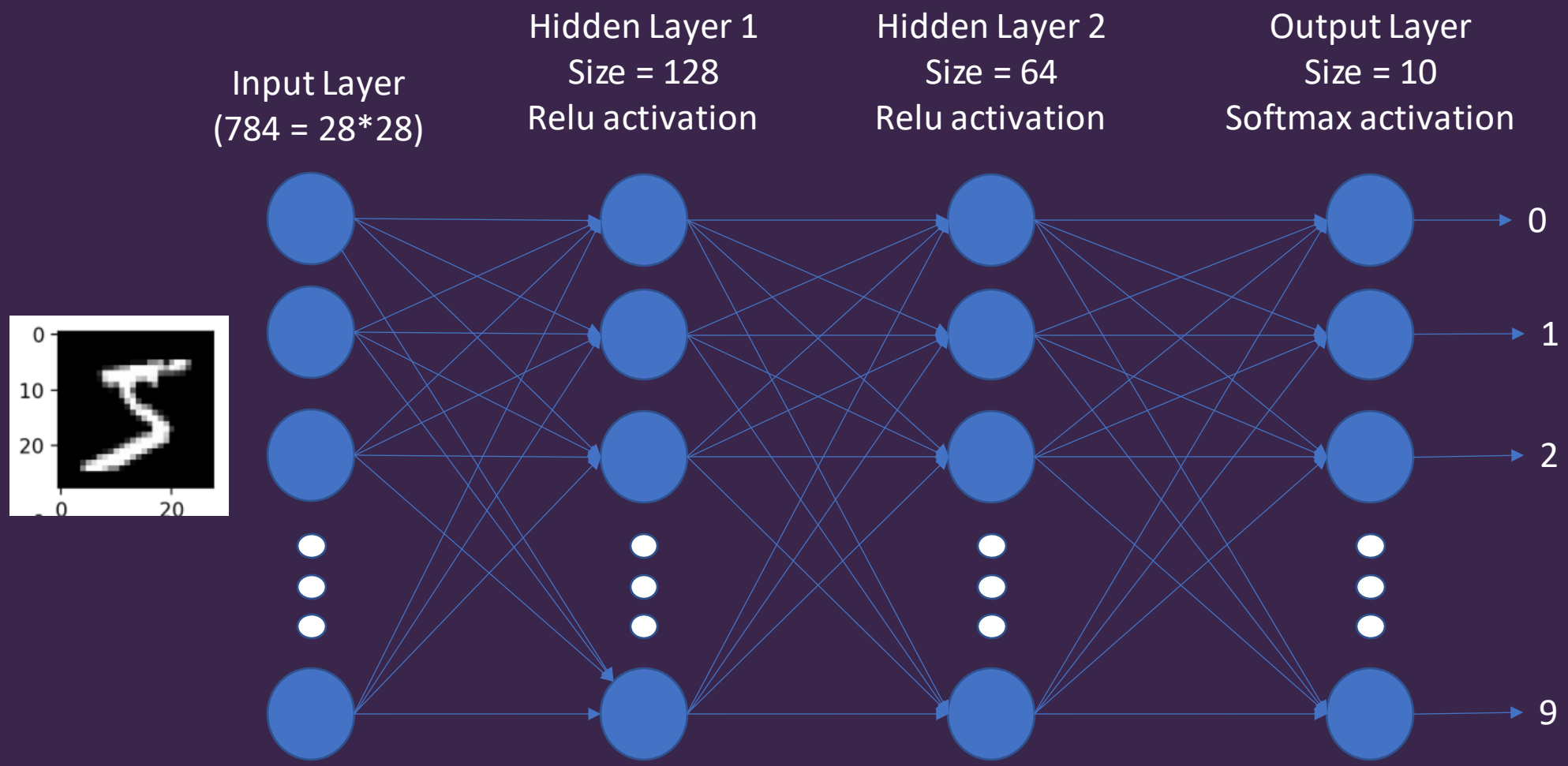
What is Deep Learning?



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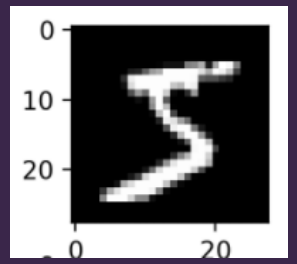
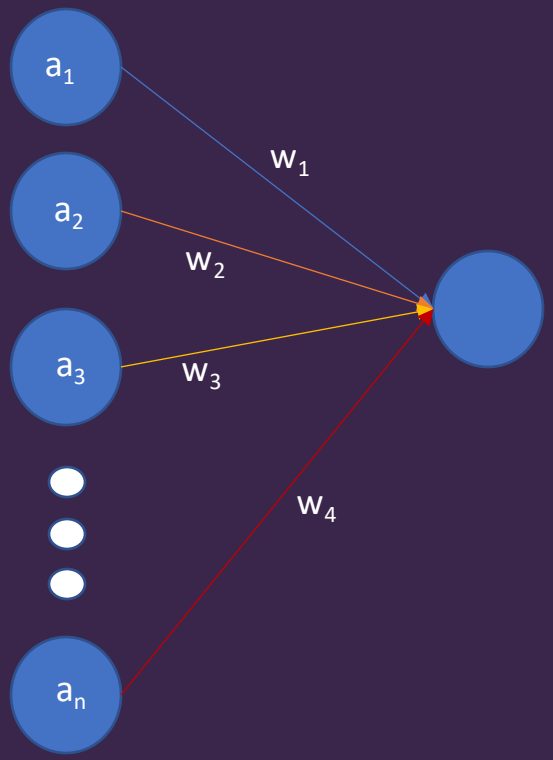
A look at a single neuron





Value at given node = relu($w_1a_1 + w_2a_2 + w_3a_3 + ... + w_na_n + bias$)

OR

$$\sigma\left(\begin{bmatrix} w_{0,0} & w_{0,1} & \cdots & w_{0,n} \\ w_{1,0} & w_{1,1} & \cdots & w_{1,n} \\ \vdots & \vdots & \ddots & \vdots \\ w_{k,0} & w_{k,1} & \cdots & w_{k,n} \end{bmatrix} \begin{bmatrix} a_0^{(0)} \\ a_1^{(0)} \\ \vdots \\ a_n^{(0)} \end{bmatrix} + \begin{bmatrix} b_0 \\ b_1 \\ \vdots \\ b_n \end{bmatrix}\right)$$

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Common Activation Functions

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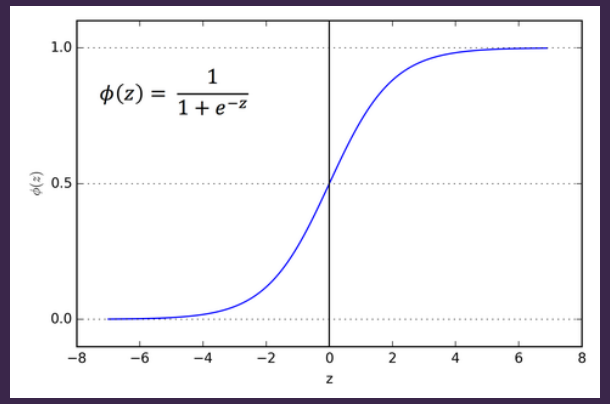
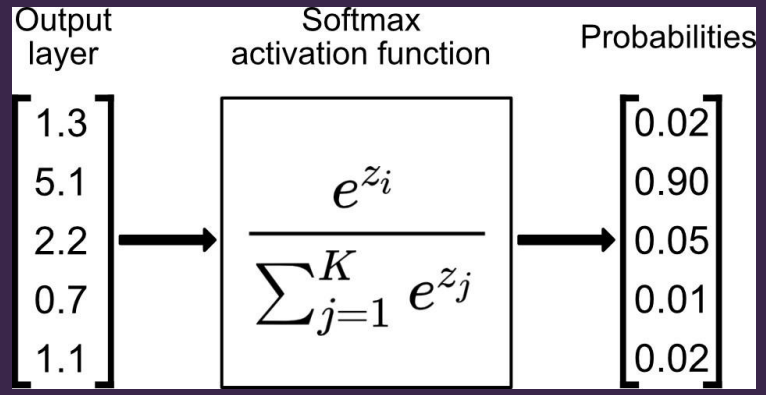
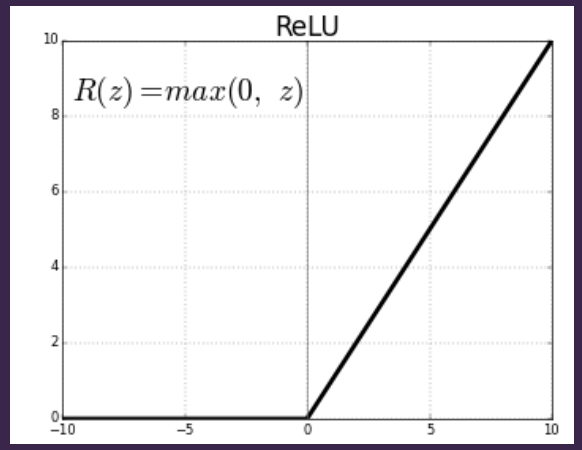
Sigmoid



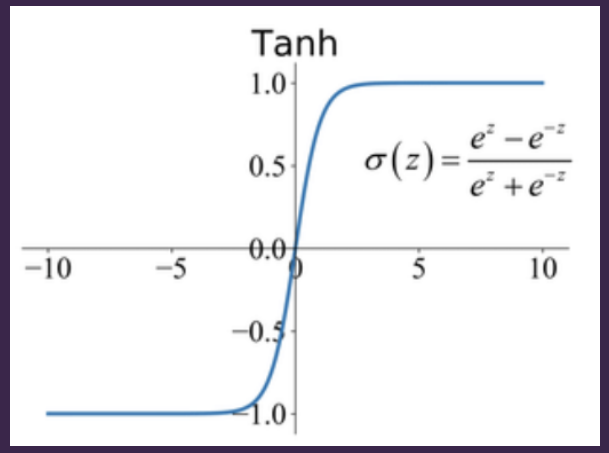
Softmax



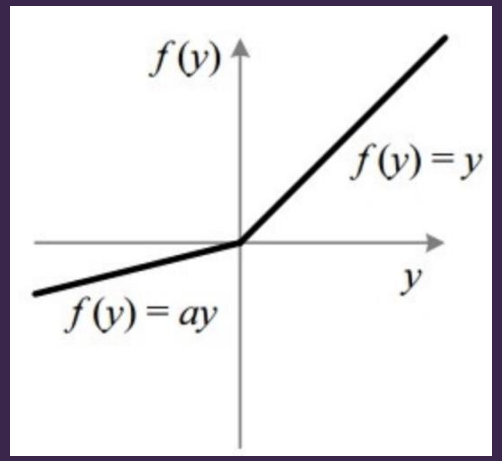
ReLU



tanh



Leaky ReLU



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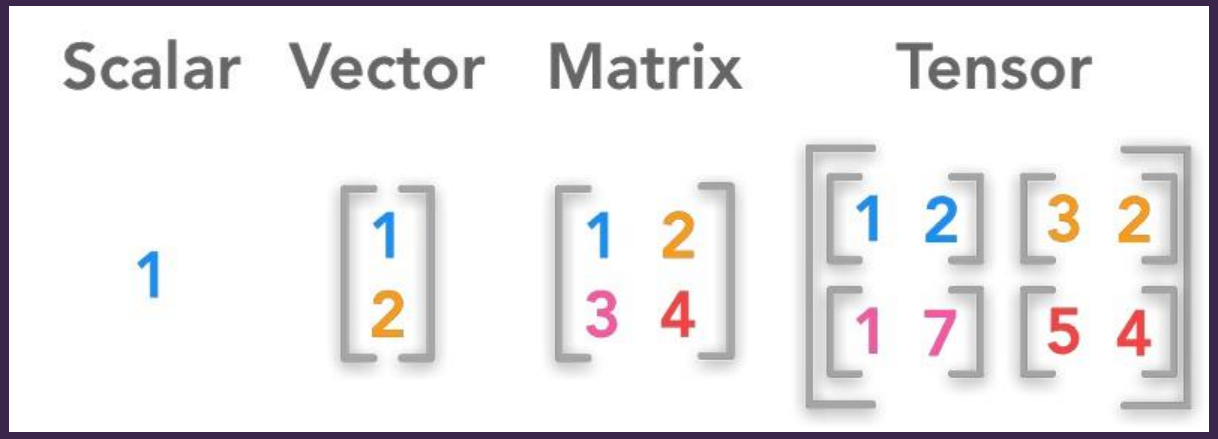
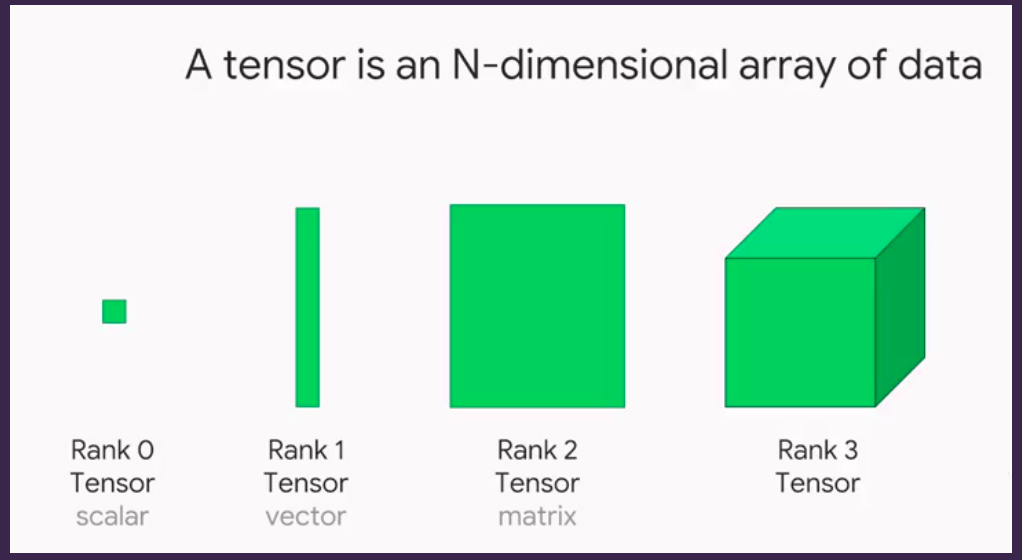
What are Tensors?





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What is TensorFlow?

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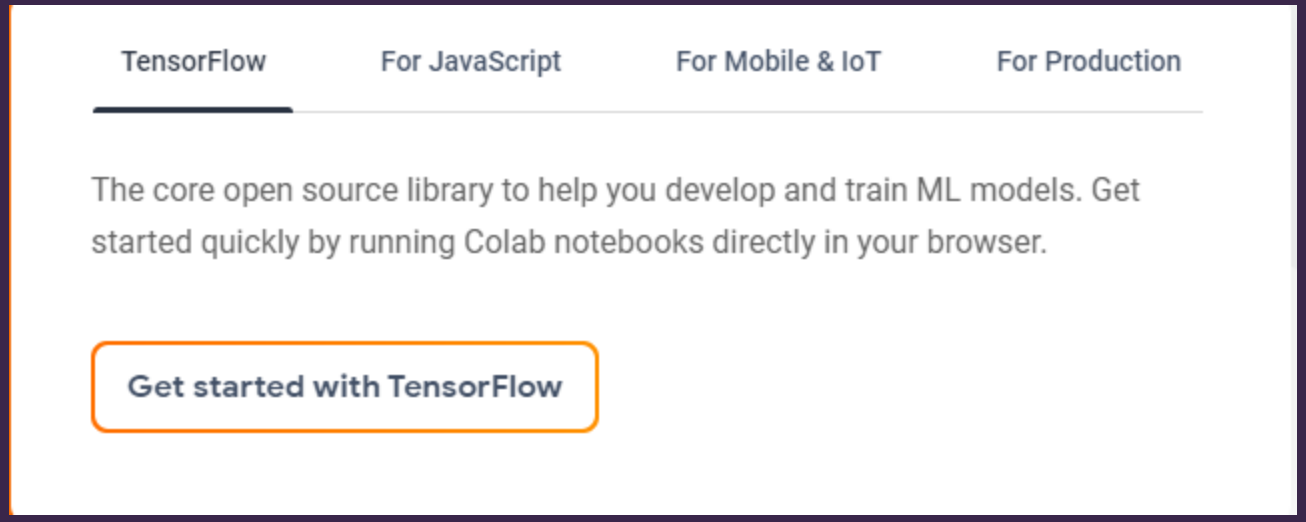
- Originally developed by Google
- Since 2015, it is an open-source project

- If we consider the previous network as a giant mathematical function, and the input vector (image pixel array) as a **tensor**, then the different mathematical operations that it **flows** through is defined in the **TensorFlow** model.

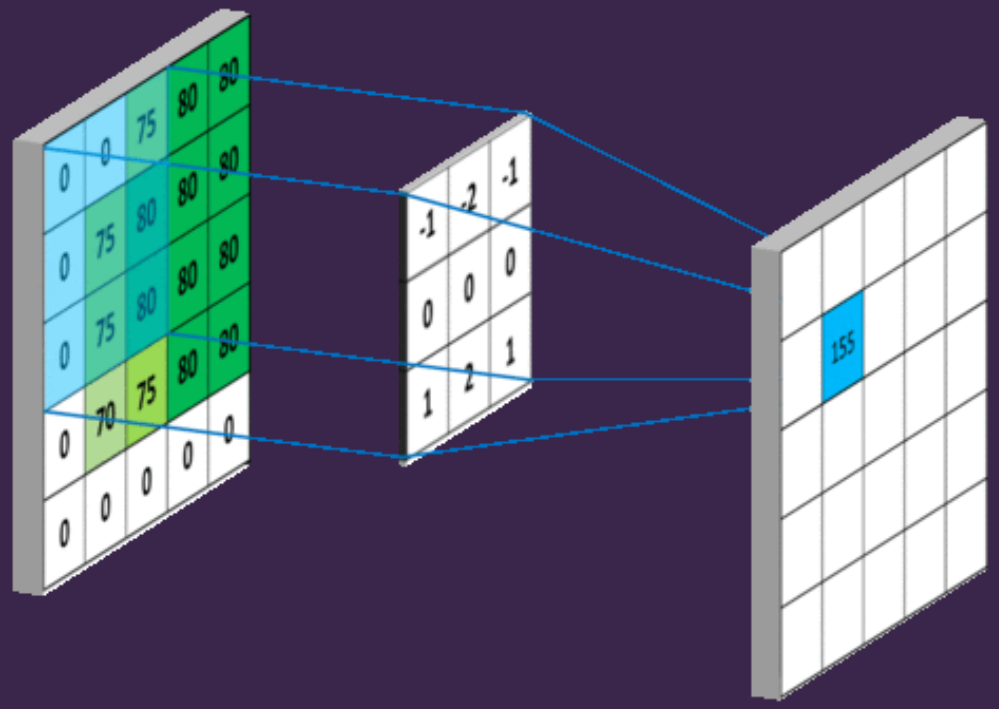
Why TensorFlow?

- **TensorFlow** has gained widespread adoption, and is extensively used within some of the largest corporations and research labs in the world.
- One major reason for its prominence is that TensorFlow is available to use in multiple languages and platforms, such as C++, Python, JS, and can even run on Mobile/IoT devices.
- Thus, it has been wholeheartedly accepted by the tech community at large.



CNN v/s MLP

- After the convolutional filters have passed over the image, a feature map is generated for each filter. These are then taken through an activation function, which decides whether a certain feature is present at a given location in the image. We can then do a lot of things, such as adding more filtering layers and creating more feature maps, which become more and more abstract as we create a deeper **CNN**.



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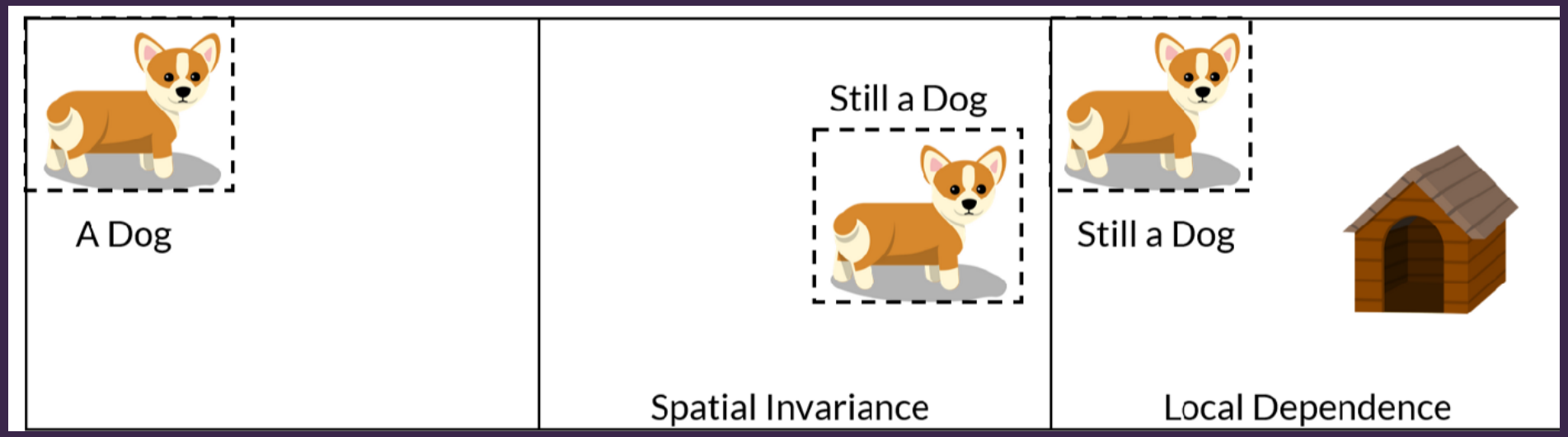
CNN v/s MLP

CNNs are Space-Invariant



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