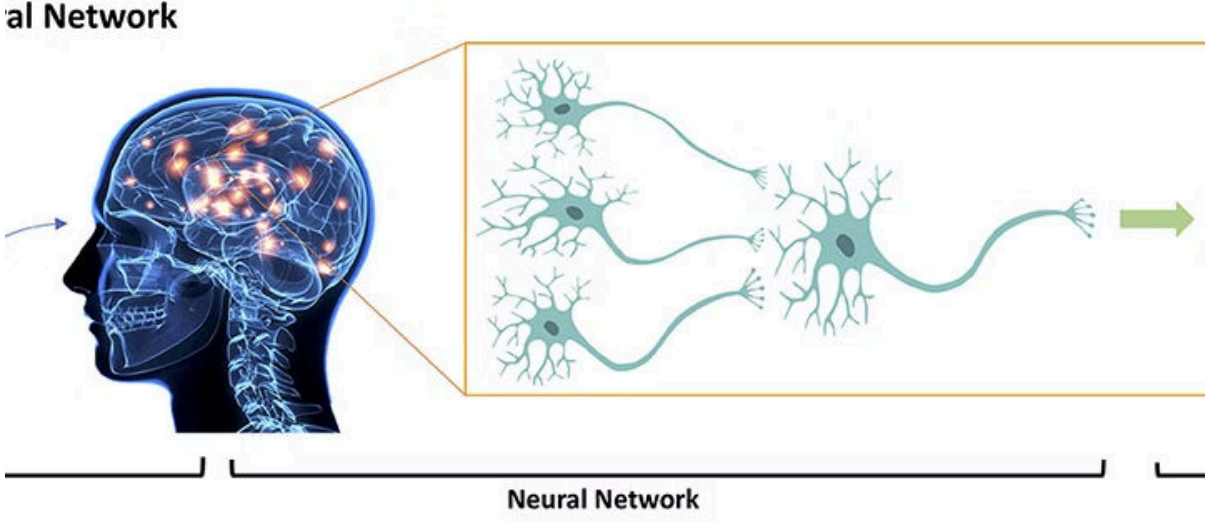
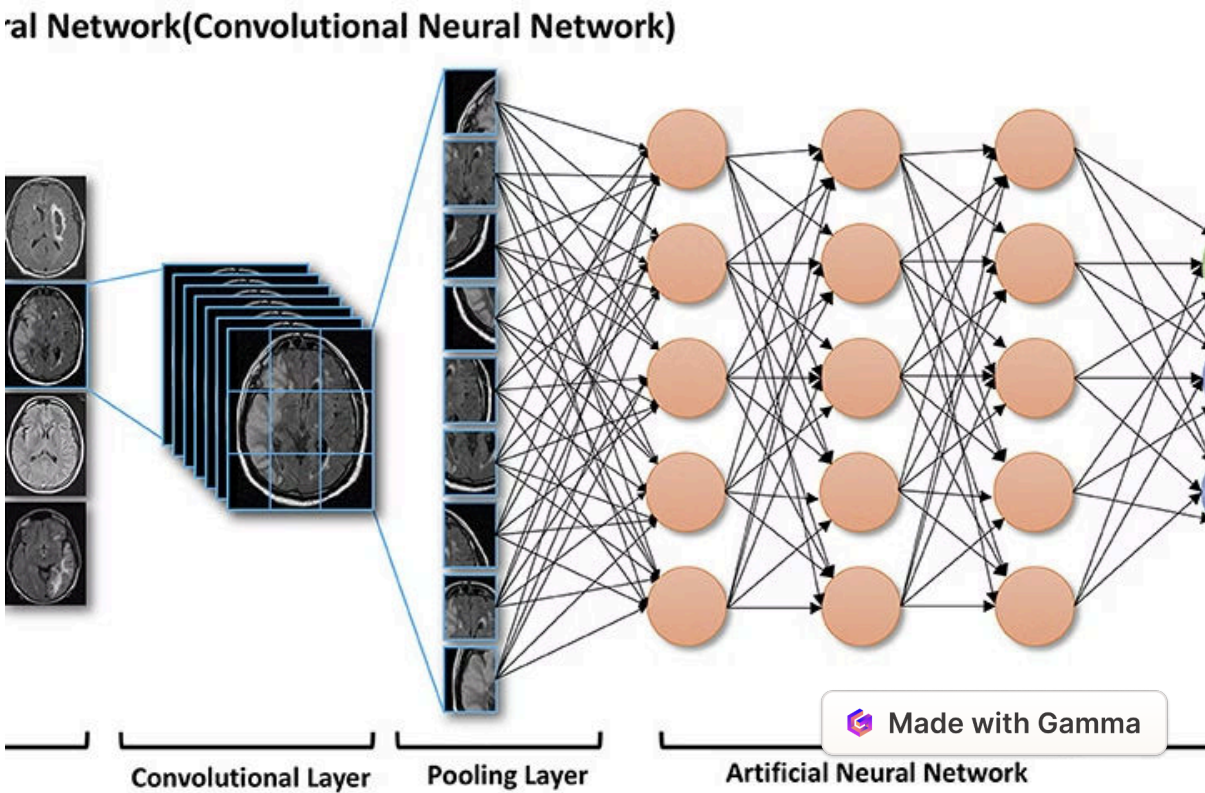
Introduction to Deep Learning

Deep learning is a subset of machine learning that uses neural networks with multiple layers to extract higher-level features from data. It's at the forefront of artificial intelligence, enabling machines to automatically learn and make decisions from data.





Made with Gamma

What is Deep Learning?

1 **Complex Data Analysis**

Deep learning is capable of analyzing and processing complex, unstructured data such as images, audio, and natural language.

2 **Feature Extraction**

It focuses on automatically identifying and extracting hierarchical representations of data, leading to more accurate results.

3 **Pattern Recognition**

It is used to recognize patterns and make decisions based on those patterns, typically mimicking the human brain's capabilities.

Made with Gamma

Neural Networks and Their Architecture

Structure

Neural networks consist of layers of interconnected nodes that process and transform data, eventually producing an output.

Activation Functions

Each node applies a mathematical function to the input signal, transforming it into the desired output.

Training Algorithms

Different optimization algorithms are used to adjust the connections' strengths based on the input data.

Made with Gamma

neural networks vs deep neural networks

neural networks have three layers : input layer, hidden layer, output layer

Deep neural networks : is a type of neural network with multiple hiden layers between the input and the output layers. The term “deep” refers to the number of hidden layers

The key difference between a Neural Network and a Deep Neural Network is the depth of the network.

Made with Gamma

Training Deep Learning Models

1

Data Collection

Acquire and preprocess the data used to train the model.

2

Model Building

Develop the architecture and parameters of the deep learning model for the specific task.

3

Evaluation

Assess the model's performance on validation data and fine-tune it for better accuracy.

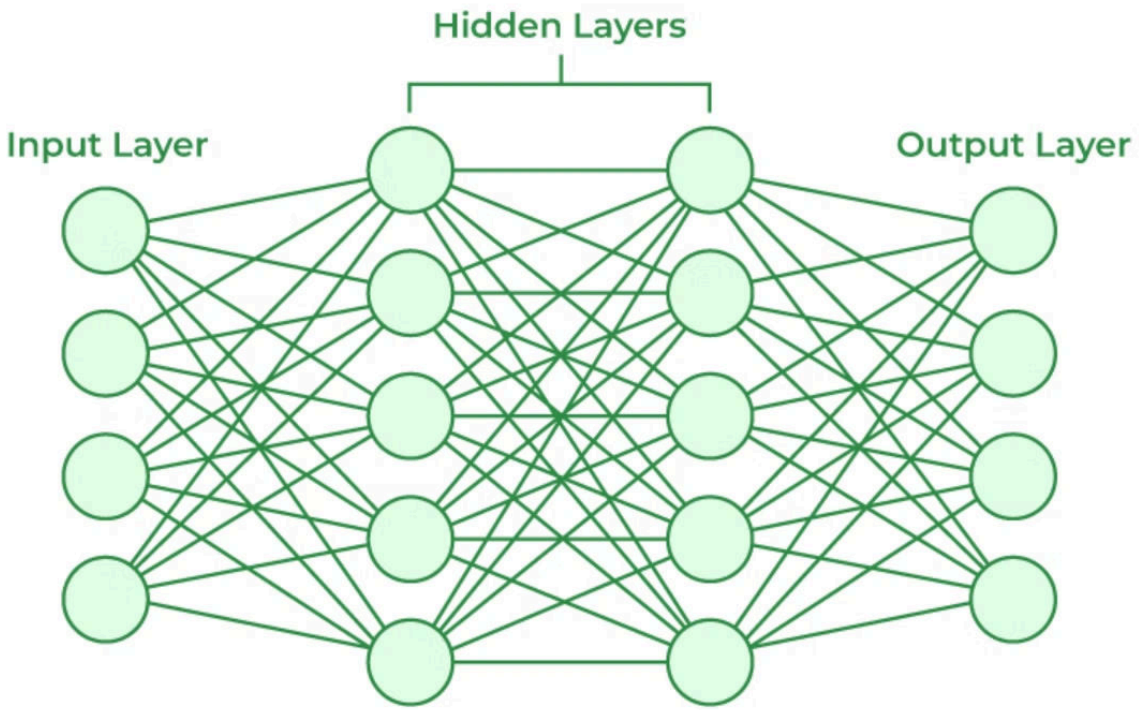
Made with Gamma

Deep learning architectures

1. Artificial neural networks
2. Recurrent neural networks
3. Long Short term memory (LSTM)
4. Convolutional neural networks (CNN)
5. Transformer
6. Generative adversial Networks (GAN)

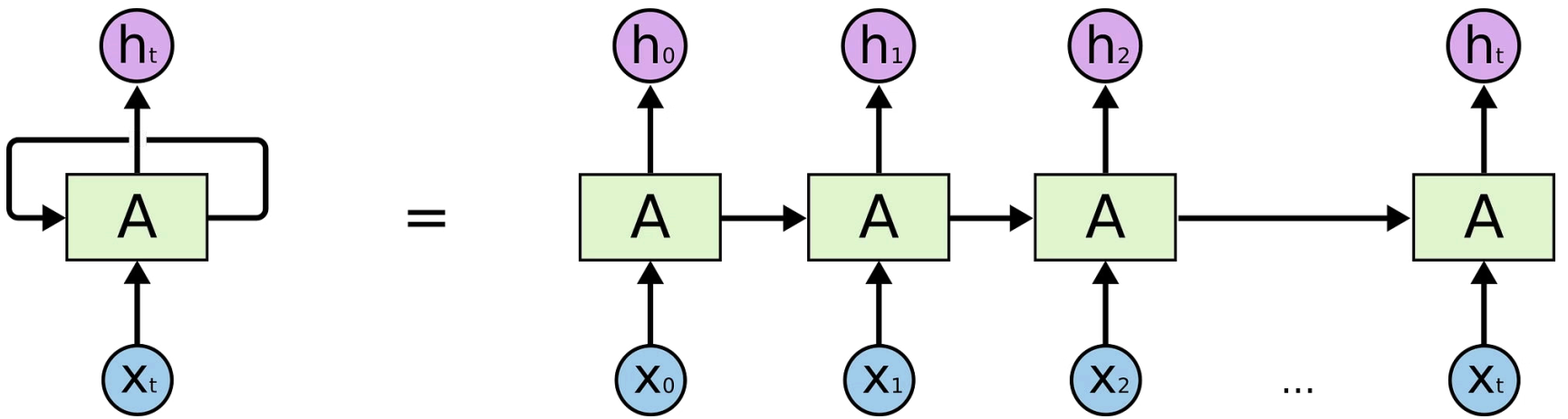
Made with Gamma

Artificial neural networks



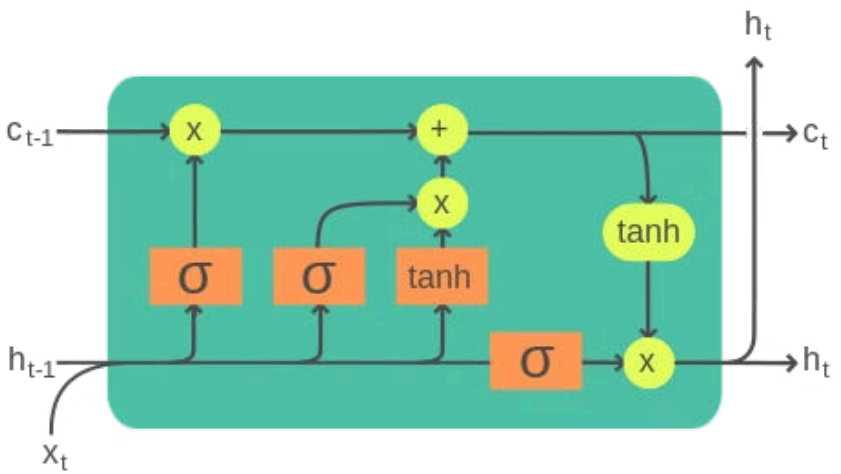
Made with Gamma

Recurrent neural networks



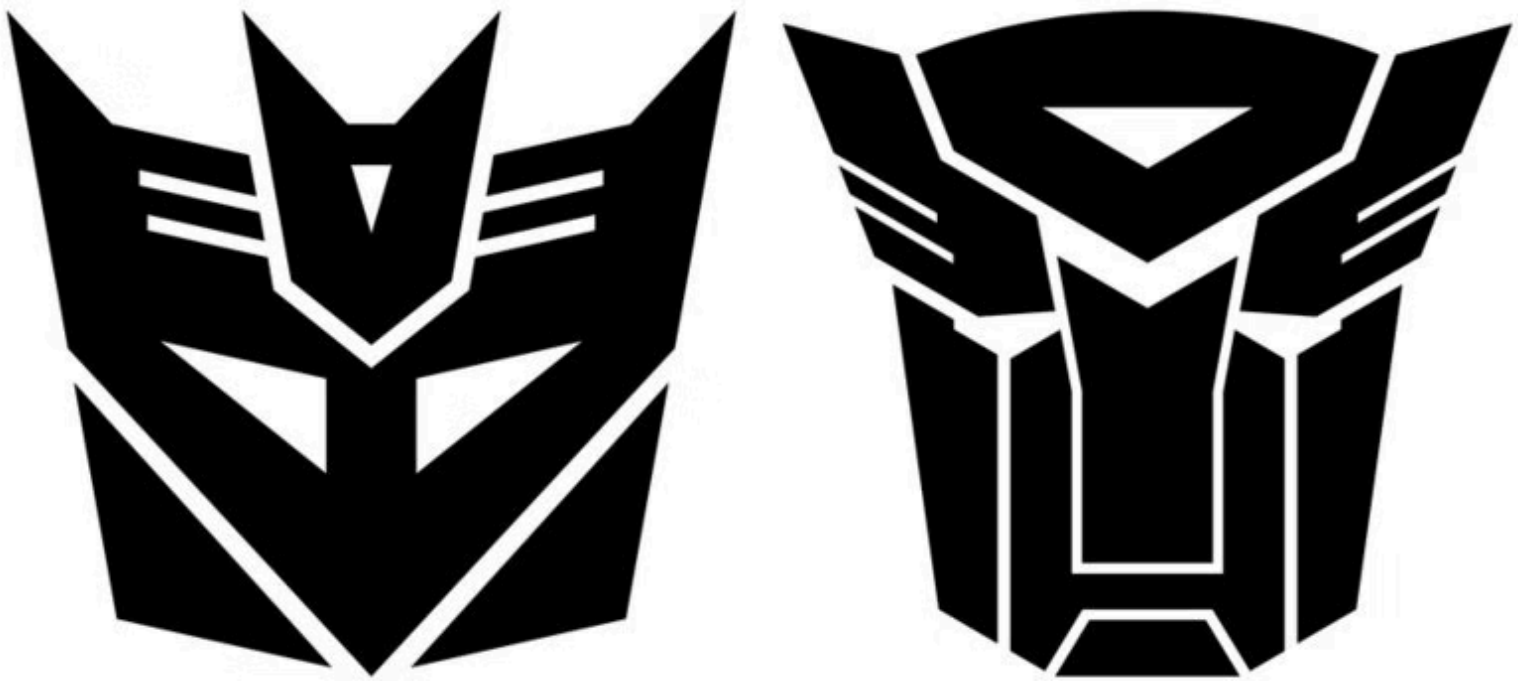
Made with Gamma

Long Short Term Memory

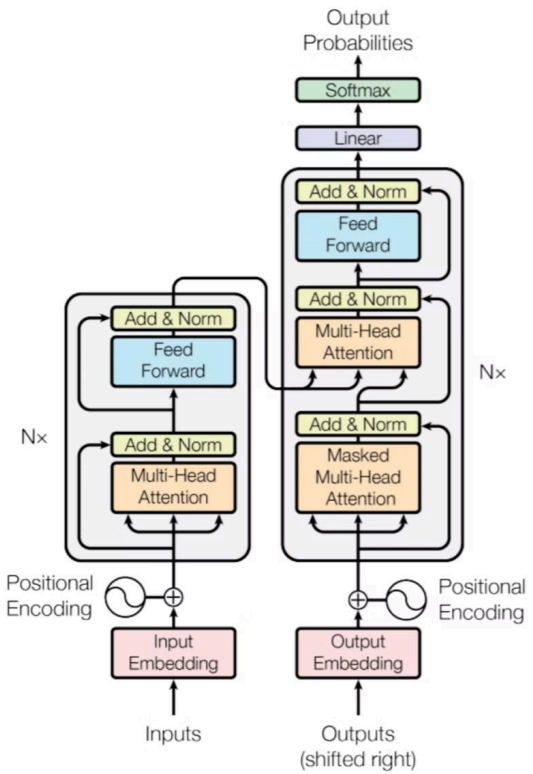


Made with Gamma

Transformer

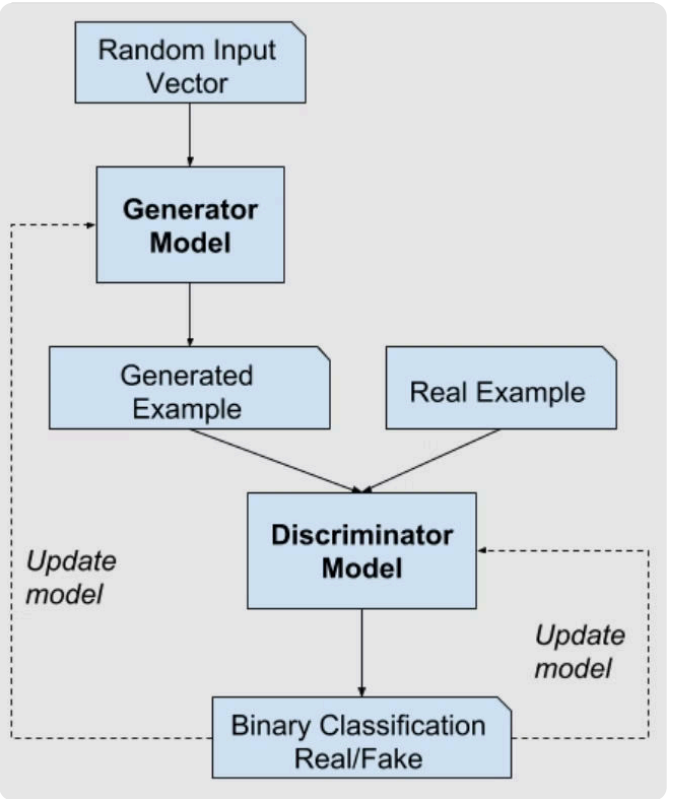


Made with Gamma



Made with Gamma

Generative adversarial network



Made with Gamma

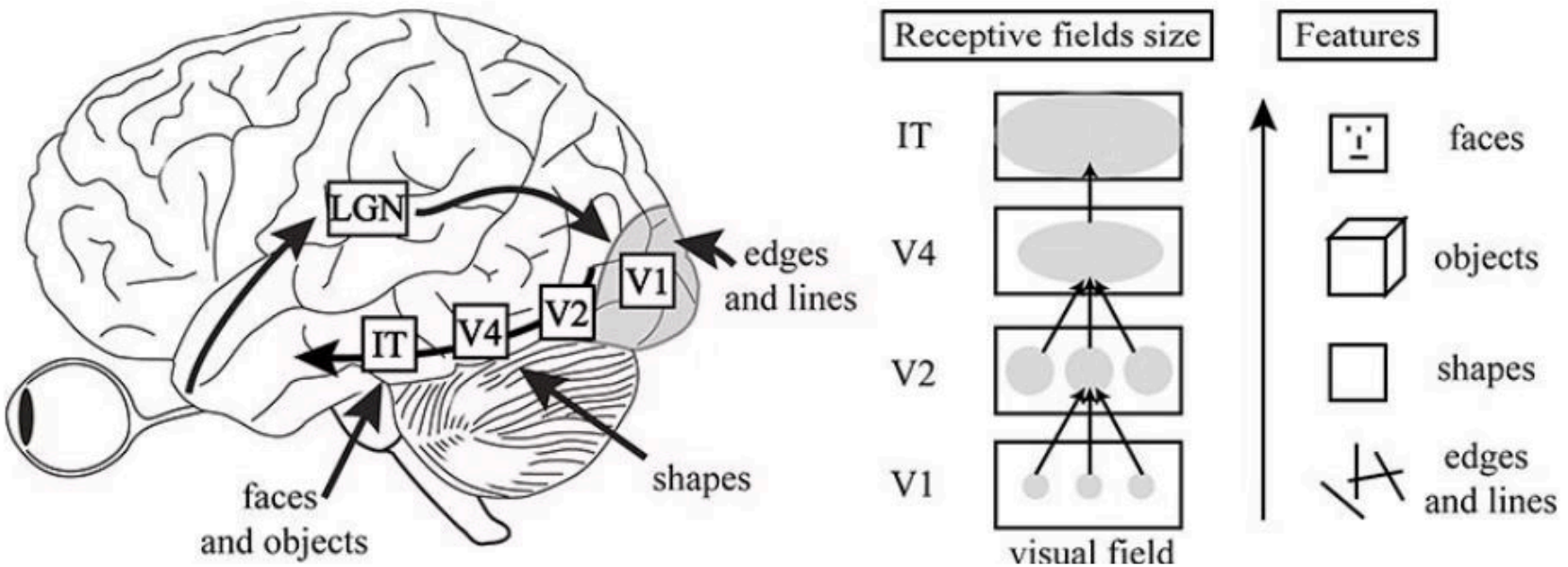
What is a CNN?

The name «Convolutional Neural Network» indicates that the network employs a mathematical operation called Convolution. Convolution is a specialized kind of linear operation. Convolutional networks are simply neural networks that use convolution in place of general matrix multiplication in at least one of their layers.

Made with Gamma

Architecture of the visual cortex:

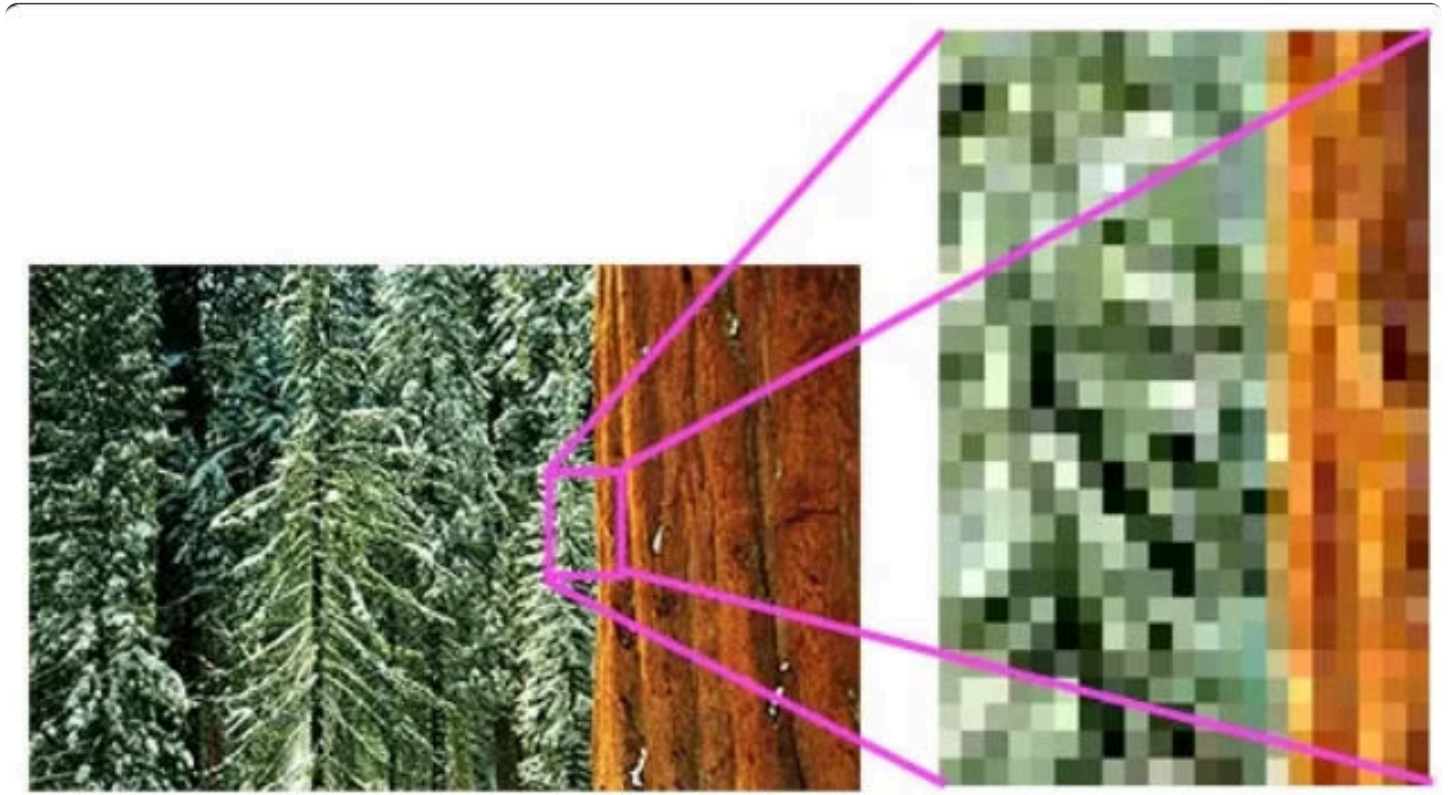
CNNs are basically inspired from the concept of the human brain, specifically the visual cortex.



Made with Gamma

images

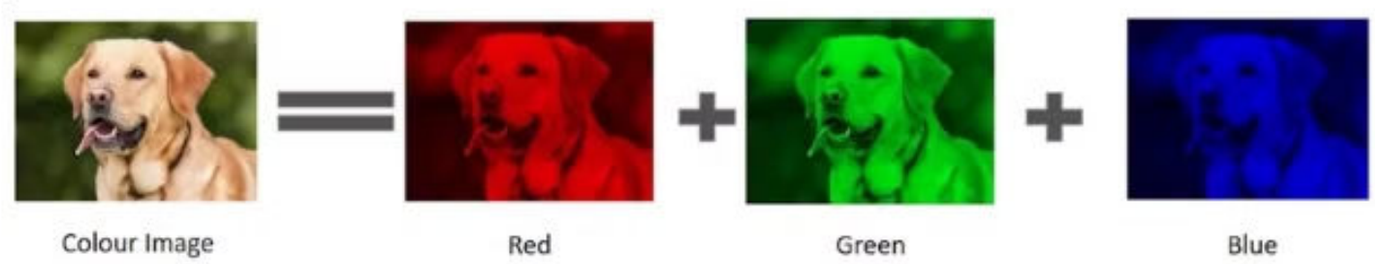
pixel

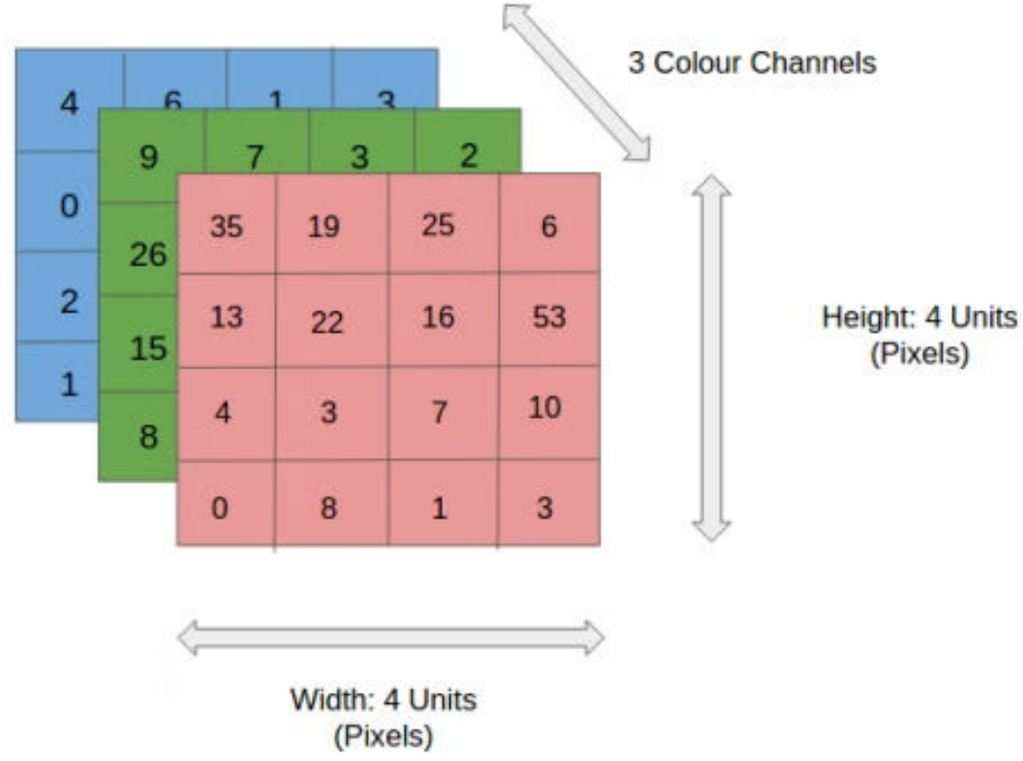


Made with Gamma

images

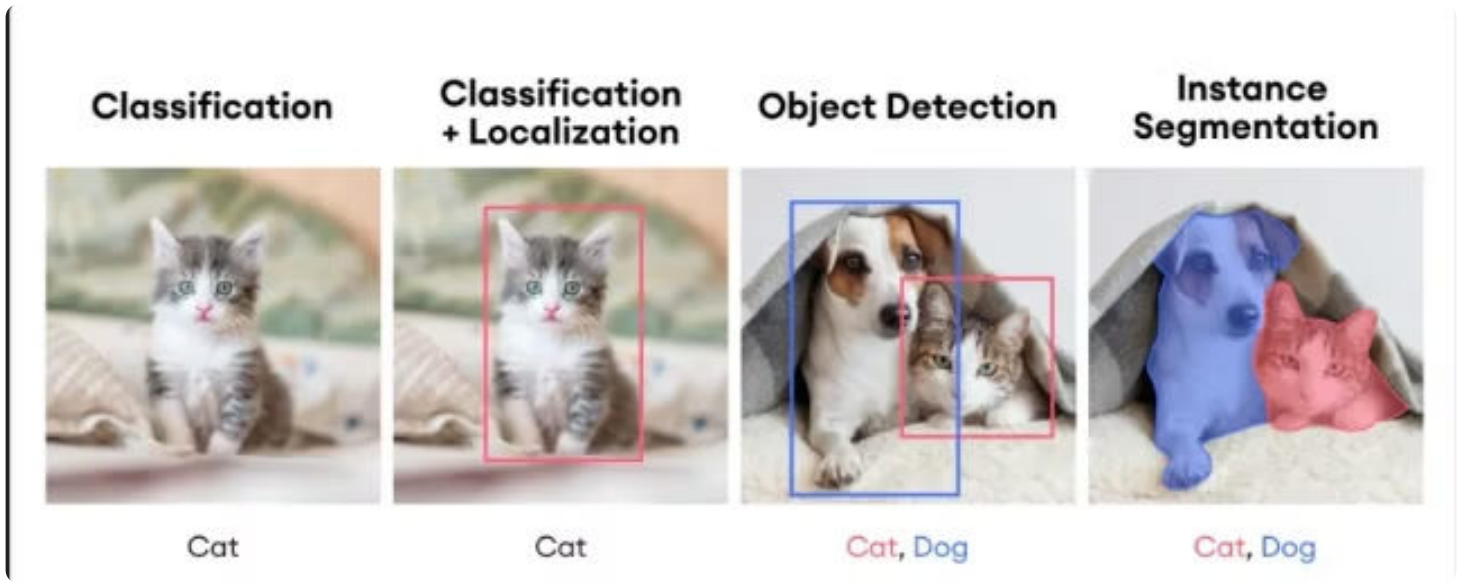
RGB





Made with Gamma

classification vs object detection vs segmentation



Made with Gamma

PyTorch Library

1 **Dynamic Computation Graphs**

PyTorch allows for the creation of computational graphs that change during runtime, providing flexibility.

2 **Scalability**

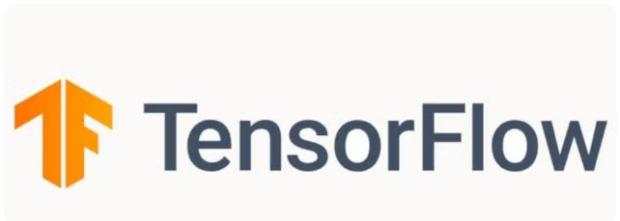
It supports easy scaling of deep learning models to large datasets and GPUs.

3 **Research and Production**

Used extensively in both academic research and production environments for various applications.

Made with Gamma

TensorFlow Library



Highly Scalable	Provides distributed computing and deployment across multiple platforms.
Rich Ecosystem	Comes with a wide variety of tools, libraries, and community support for deep learning tasks.
Model Compatibility	Supports easy integration with different hardware, allowing for efficient model deployment.

Made with Gamma

what are tensors

central data abstraction used for numeric computation. you can create array of tensors,integers, float .
can run on either CPU or GPU.

Made with Gamma