A03
NEURAL NETWORK ZOO

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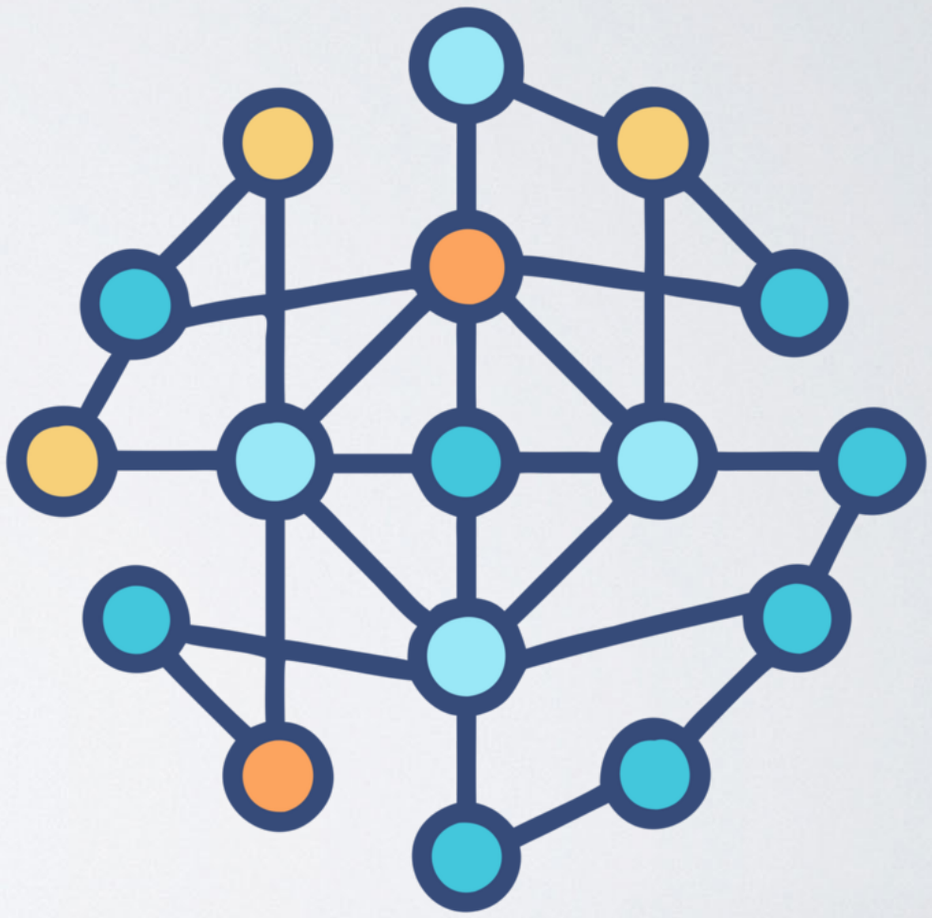
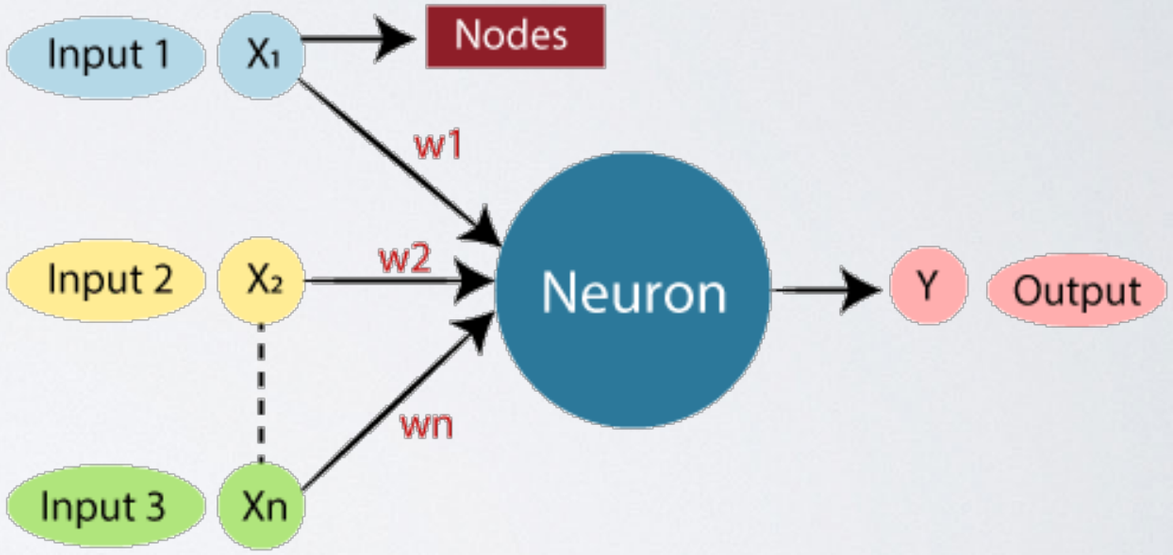
INTRODUCTION TO NEURAL NETWORKS

Neural networks are the building blocks of current artificial intelligence, inspired by the structure and function of the human brain. Artificial neural networks, like our brain, analyze information through billions of interconnected neurons. They spot patterns, learn from data, and make decisions.



THE BASIC STRUCTURE OF A NEURON

An artificial neuron, or node, reproduces the behavior of a biological neuron: It accepts inputs (numerical data or characteristics), processes them with weights and biases, Applying an activation function (such as ReLU or sigmoid) introduces nonlinearity and sends a signal to the next layer. These neurons are connected into layers: The input layer accepts raw data. One or more hidden layers extract features and apply complicated modifications. The output layer generates the final prediction or categorization. Deep learning occurs when numerous hidden layers are utilized, resulting in deep neural networks capable of performing extremely complicated tasks such as language translation, art generation, and facial recognition.



Examples of animal representations include

CNN (Convolutional Neural Network) - Cheetah, which is a fast visual processor with strong picture recognition capabilities.

RNN (Recurrent Neural Network) – Raccoon
Clever and recursive, it can handle sequences and time-based data.

LSTM (Long Short-Term Memory) - Lemur
Agile with a large memory utilized for extended sequence prediction.

Transformer - Owl is a skilled observer who excels at linguistic challenges.

GAN (Generative Adversarial Network) – Dragon
Powerful and inventive; creates new, realistic data from nothing.

Autoencoder - Parrot
Learns to compress and recreate input through imitation.

Ants use self-organization to map their environment, similar to how colonies do.


CNN
RNN
LSTM
Transformer
GAN
Gofin
Autoncoder
Self-Organizing Map


GAN

INTERACTIVE ACTIVITY

I decided to make the Dragon the symbolic animal for the Generative Adversarial Network (GAN).

Dragons are recognized for their mythological powers, capacity to create illusions, and dual nature (both destructive and creative).

This exactly matches the inner structure and behavior of GANs.

CREATOR OF ILLUSIONS

Species:
Generative Adversarial Network

Habitat:
Fantasy Studios of Data

Diet:
Random noise

Power:
Can generate human-like images, voices, and stories

Natural-Enemy
The Real-World Discriminator

A GAN is composed of two competing neural networks:

The Generator (the creative dragon) processes random noise and produces synthetic data.

The Discriminator (the judicial dragon) determines if the data is genuine or fraudulent.

They are constantly battling:

The generator learns to produce more realistic data.

The discriminator improves its ability to identify the difference between real and phony.

Eventually, the generator becomes so advanced that it tricks the discriminator, producing synthetic data that appears to be very real.

- Common GAN applications include deepfakes, which are synthetic movies or voices.
- Art Generation: AI-powered artworks and style transfer.
- Data Augmentation: Creating synthetic medical images to improve restricted datasets.
- Super-resolution is the process of upscaling fuzzy photographs.
- Game design involves procedural world generation.

REFLECTION

This project gave not just a solid understanding of GANs, but also a deeper awareness of how various neural networks tackle different types of issues.

Key Takeaway: GANs generate data, while CNNs and RNNs focus on classification or prediction.

GANs are based on adversarial learning, which adds a layer of competition-driven progress over direct error correction. Training GANs is similar to taming a dragon—difficult, unpredictable, but extremely rewarding. Each network in the zoo has unique strengths and specialties. CNNs work quickly and precisely with images. LSTMs remember long-term dependence. Transformers are masters of attention. GANs can synthesize data and model the real world.

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