



Conceptual

Key AI Models and Neural Networks

Welcome to Week 3! Today we'll explore the foundations of AI models and neural networks—the building blocks of modern artificial intelligence.



by S MM

Types of AI Learning

Supervised Learning

Models learn from labeled data. The algorithm receives input-output pairs and optimizes to predict correct outputs.



Unsupervised Learning

Models identify patterns in unlabeled data. They discover hidden structures without explicit guidance.

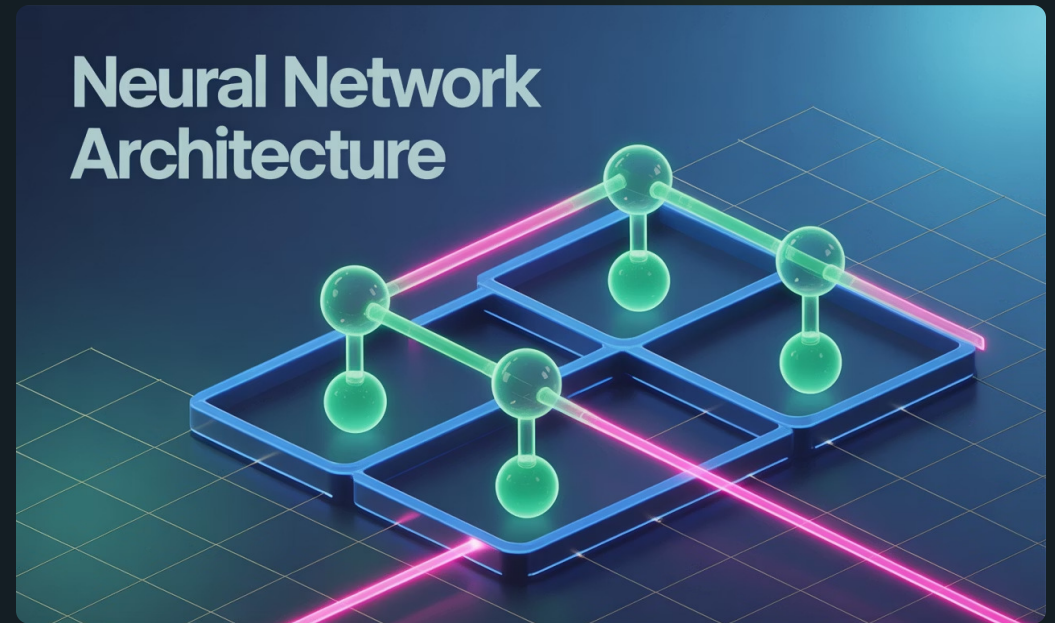
Reinforcement Learning

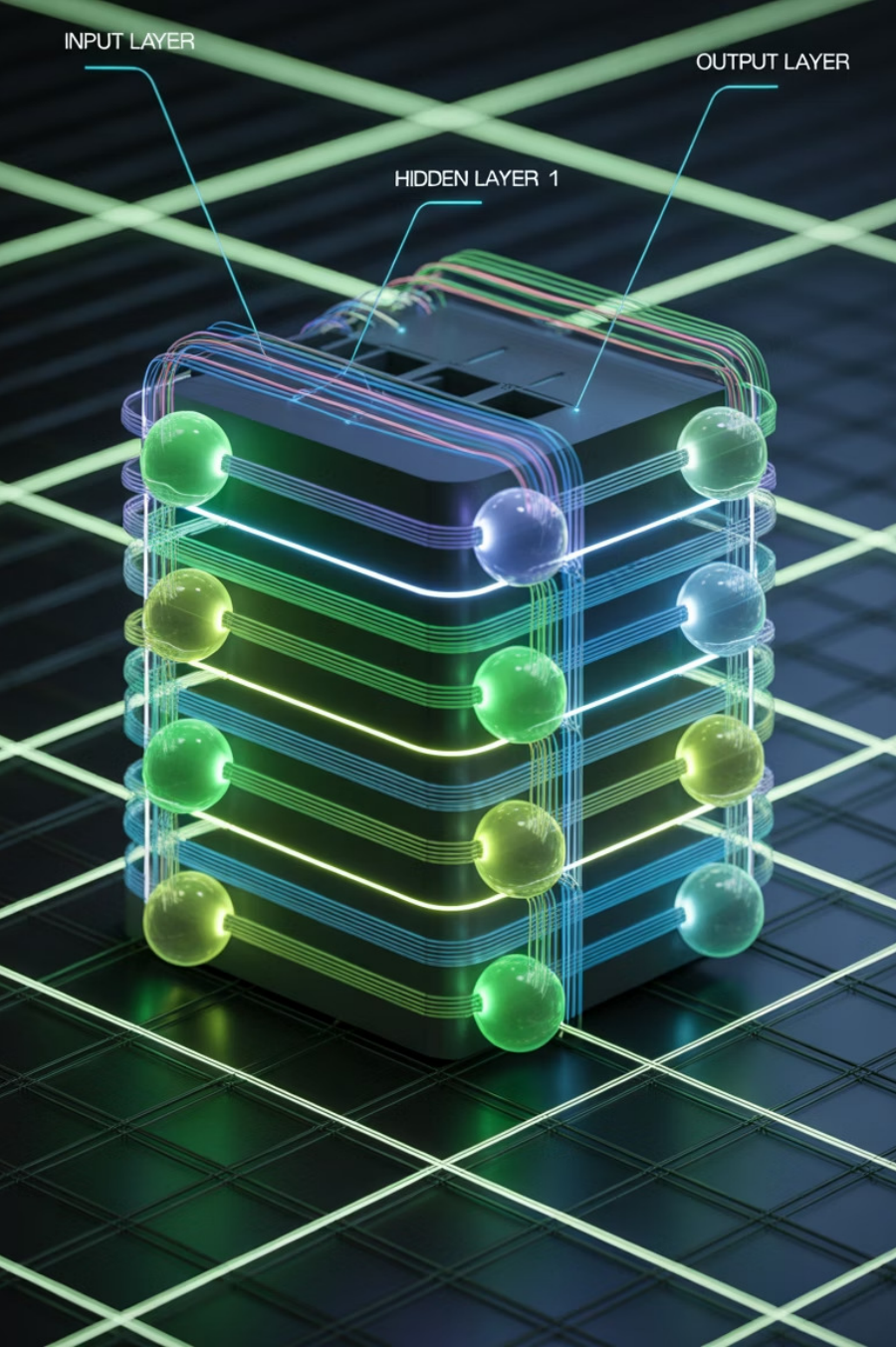
Models learn through trial and error. They receive rewards for desired behaviors in dynamic environments.

Neural Networks: The Basics

Neural networks are computing systems inspired by the human brain. They consist of interconnected nodes organized in layers.

These systems excel at recognizing patterns and solving complex problems through iterative learning.





Anatomy of a Neural Network

Input Layer

AB

Receives raw data and passes it to hidden layers. Each node represents a feature in your dataset.

Hidden Layers



Perform computations using weights and activation functions. Deeper networks can learn more complex patterns.

Output Layer



Produces the final prediction or classification. The structure depends on your specific task.

How Neural Networks Learn

Forward Propagation

Data moves forward through the network. Each node applies weights and activation functions.

Error Calculation

The network compares predictions with actual values. It calculates how far off the results are.

Backpropagation

The network adjusts weights backward through layers. Small changes improve future predictions.

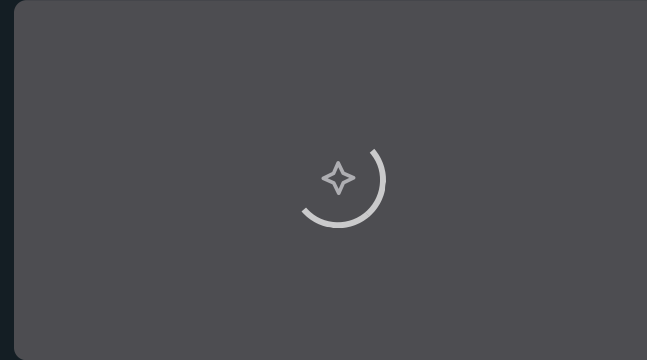


Activation Functions

Activation functions determine whether neurons fire. They introduce non-linearity, allowing networks to learn complex patterns.

1 ReLU (Rectified Linear Unit)

Most popular. Returns input for positive values, zero for negative values.



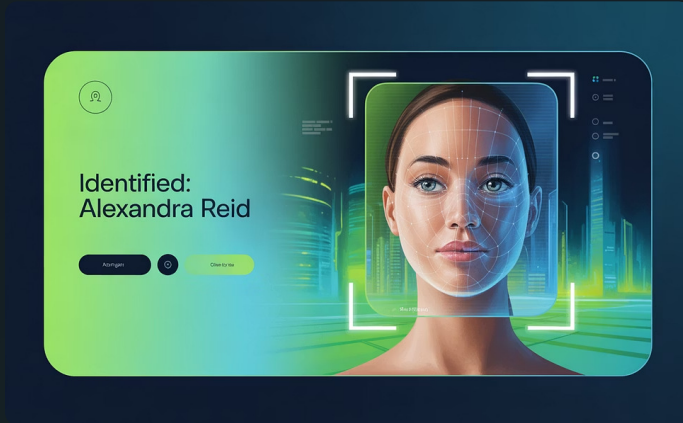
2 Sigmoid

Maps values between 0 and 1. Useful for probability outputs.

3 Tanh

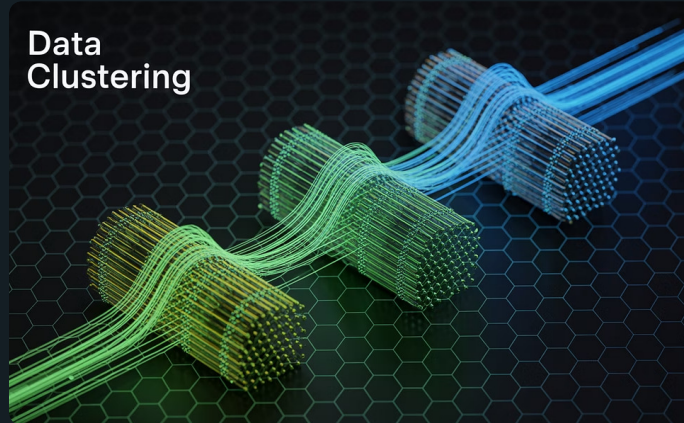
Maps values between -1 and 1. Often better than sigmoid for hidden layers.

Applications by Model Type



Supervised Learning

- Image classification
- Spam detection
- Medical diagnosis



Unsupervised Learning

- Customer segmentation
- Anomaly detection
- Feature extraction



Reinforcement Learning

- Game playing AIs
- Autonomous vehicles
- Robotics control

Key Takeaways

1 Three Main Learning Types

Supervised, unsupervised, and reinforcement learning solve different problem classes.

2 Neural Network Structure

Networks consist of input, hidden, and output layers with interconnected nodes.

3 Learning Process

Networks improve through forward propagation, error calculation, and backpropagation.



Next week: We'll explore deep learning architectures and their specific applications!