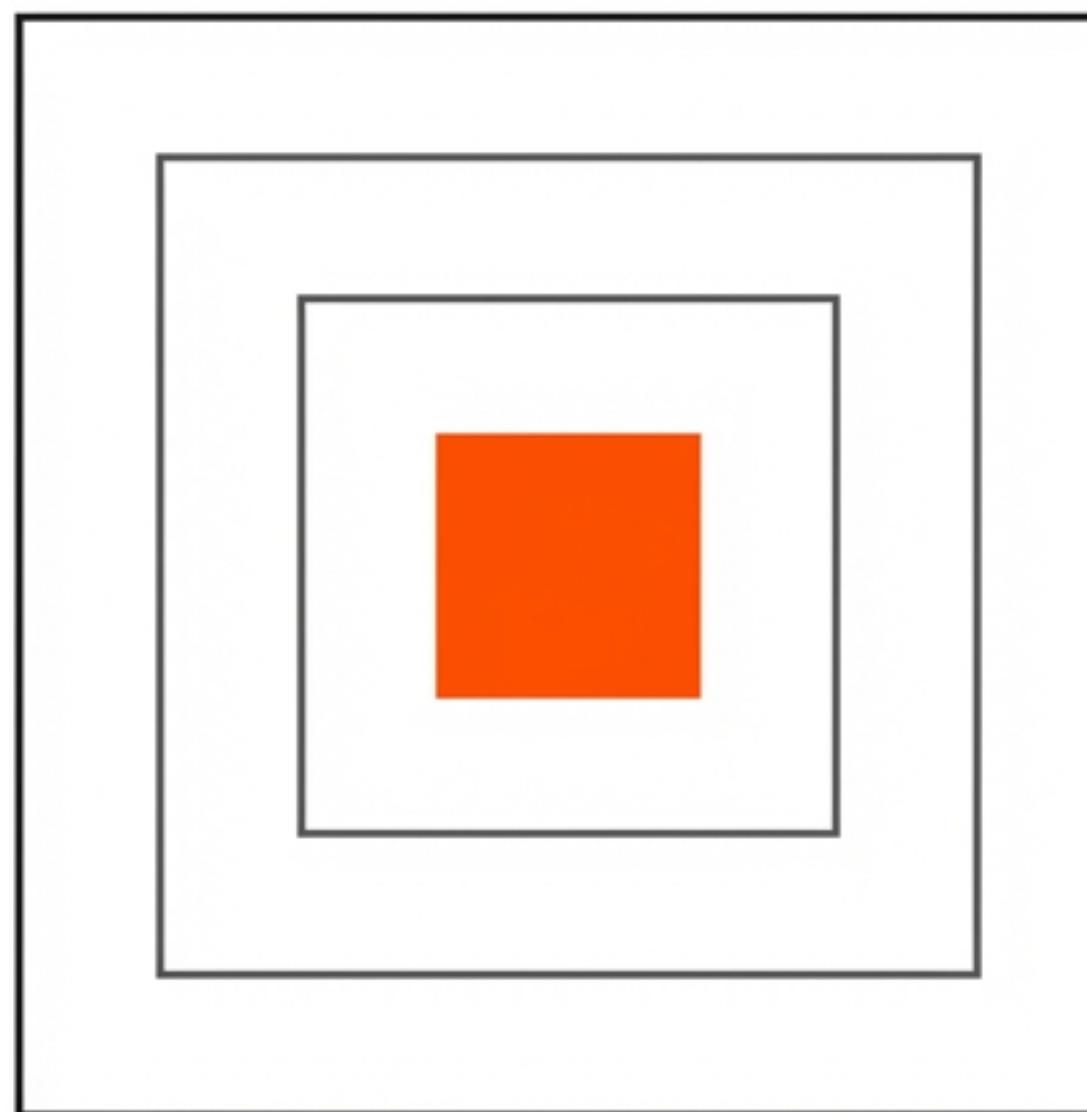


# The Hierarchy of Intelligence

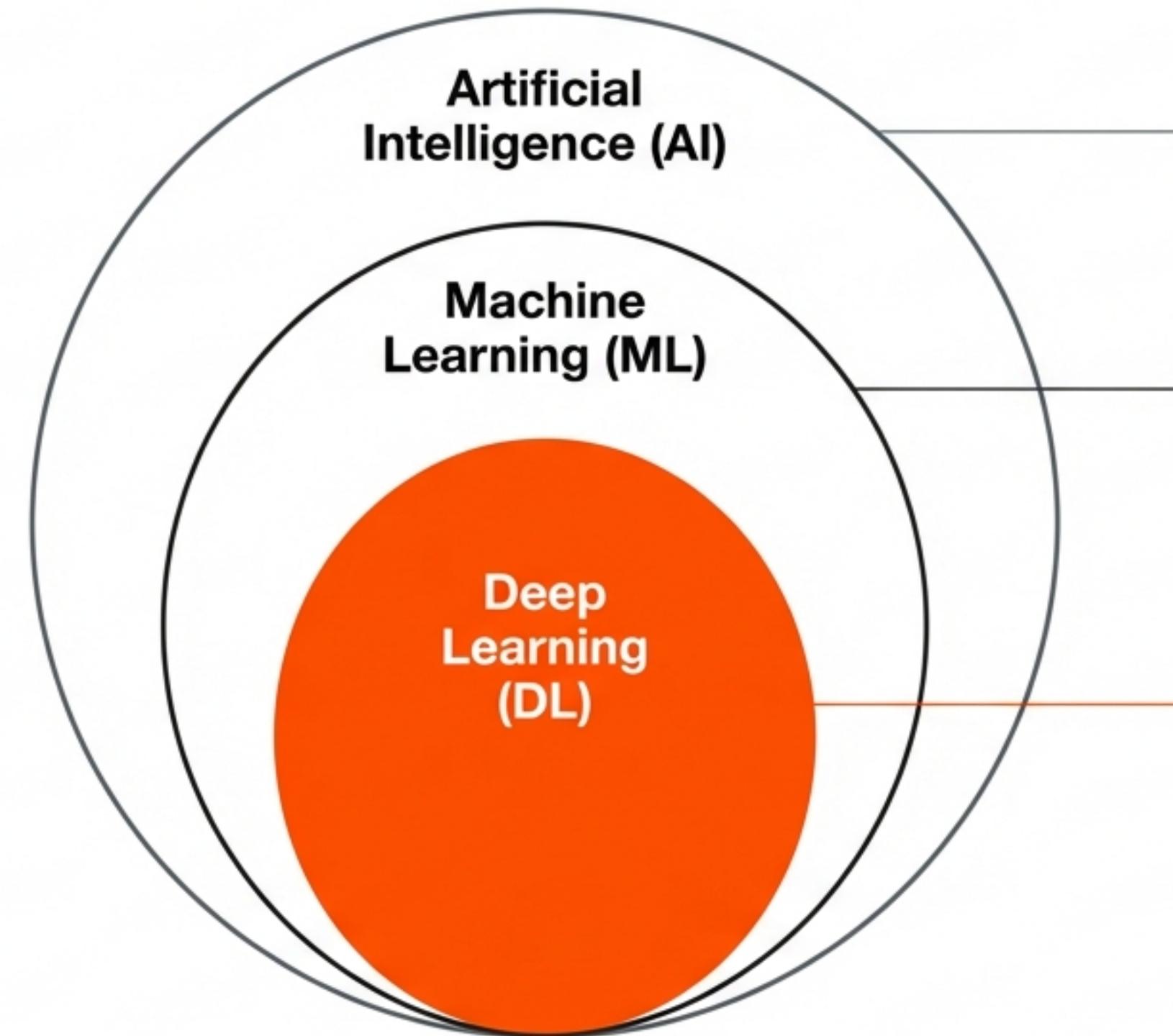
Demystifying the relationship  
between Artificial Intelligence,  
Machine Learning, and Deep  
Learning.



A strategic overview of  
technical boundaries.

# The Concentric Reality

The most common misconception is that these are competing technologies. They are subsets of one another. All Deep Learning is Machine Learning, but not all Machine Learning is Deep Learning.



The broad concept of intelligent machines (est. 1950s)

A subset that learns from data without explicit programming

A specialised subset using multi-layered neural networks

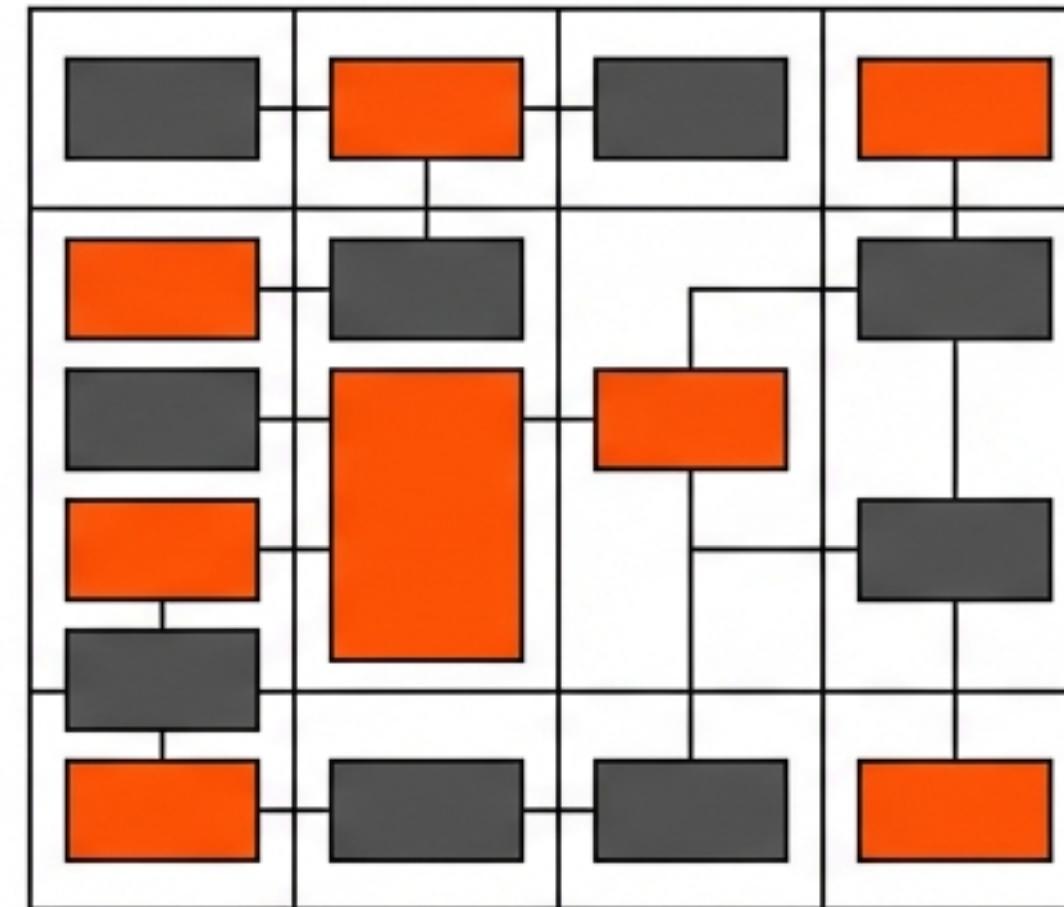
# The Pursuit of General Intelligence

## Biological Intelligence (General AI)



Humans possess General Intelligence—a complex mix of logic, emotion, creativity, and adaptability. We have long attempted to replicate this broad capability.

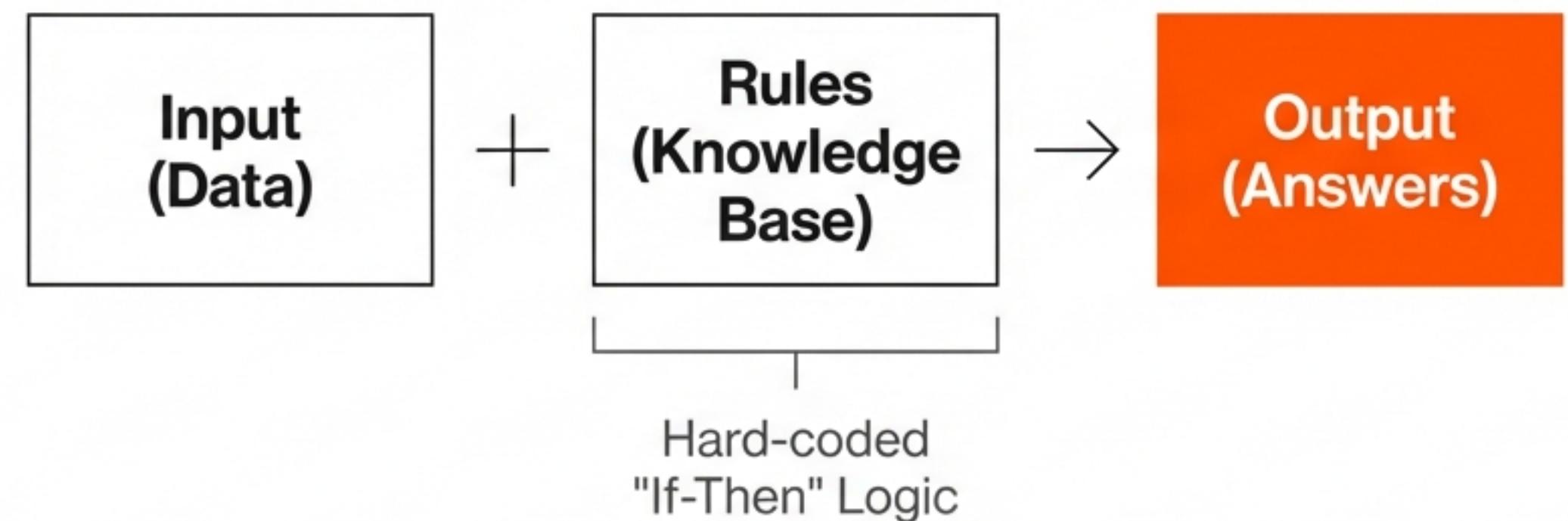
## Artificial Intelligence (Weak/Specific AI)



We are currently at the stage of Weak AI. Today's systems optimise specific tasks—recognition, prediction, calculation—rather than replicating consciousness.

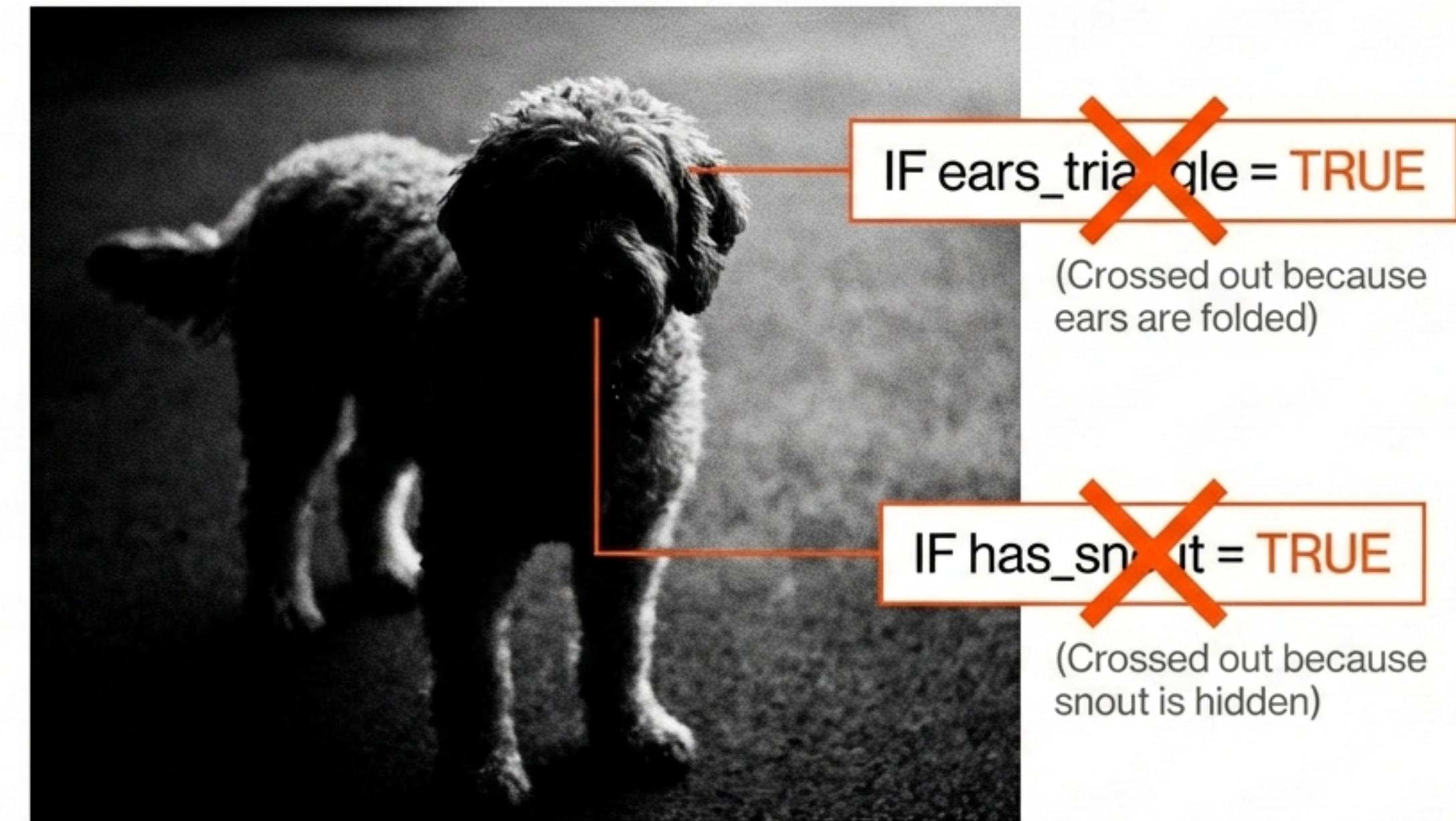
# The Era of Symbolic AI (1950s–1980s)

Early AI relied on Expert Systems. Programmers interviewed human experts (e.g., chess players) and translated their knowledge into explicit code. This worked for logical, closed-loop problems like chess.



# The Failure of Explicit Rules

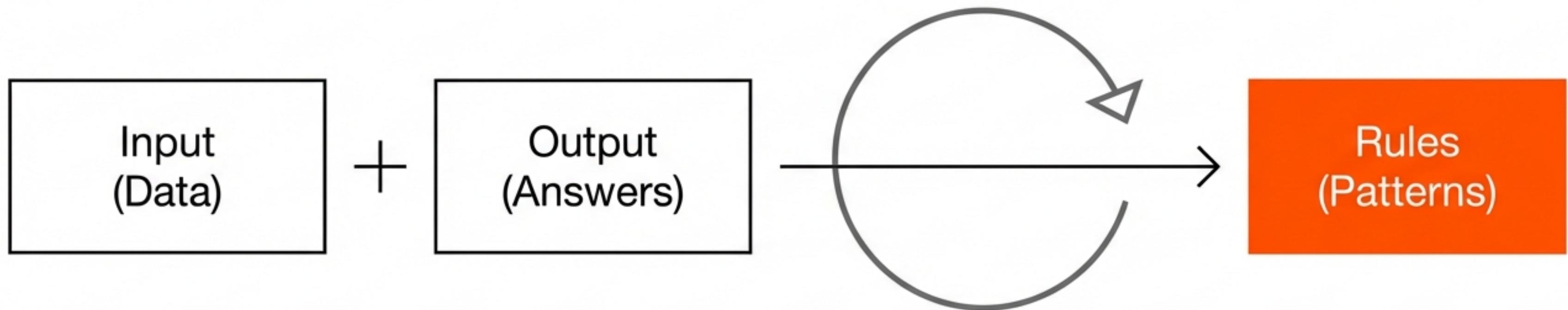
Symbolic AI crashes when faced with “fuzzy” logic.  
You cannot manually write enough rules to cover every possible angle or lighting condition of a real-world object.



The complexity of the real world breaks the Expert System.

# Flipping the Equation: Machine Learning

Instead of programming the rules, we feed the system data and the answers. The system statistically determines the patterns (the rules) itself.



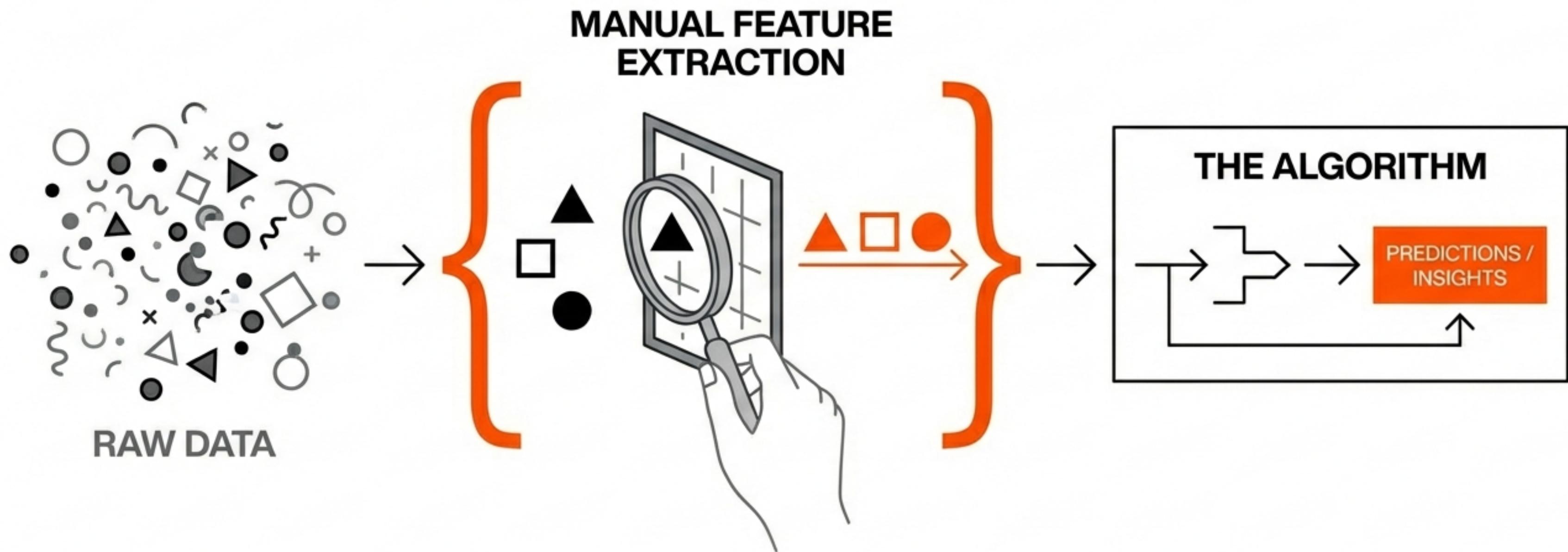
# The Mechanism of Learning

Learning is not magic; it is iterative statistical adjustment. The system attempts to classify data, receives feedback on its error rate, and adjusts its internal math until the error is minimized.



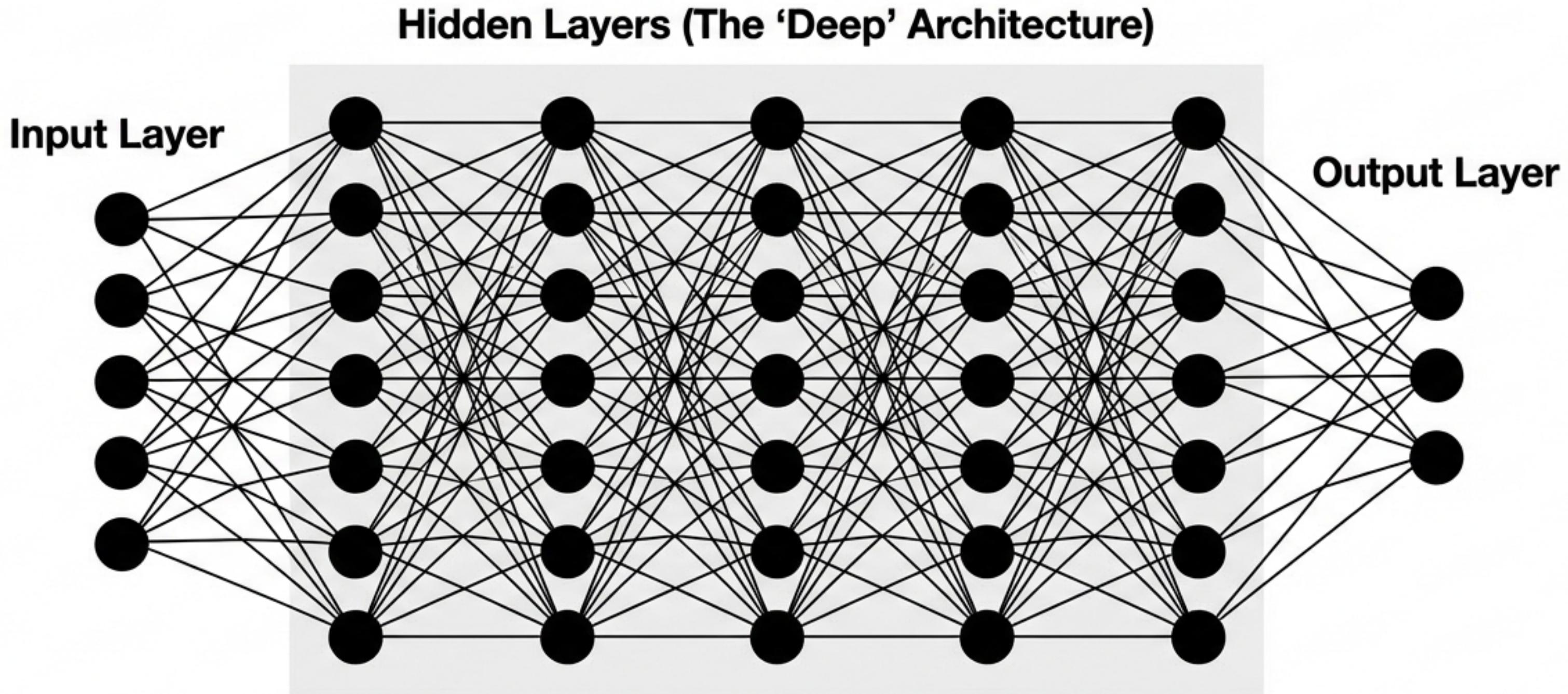
# The Machine Learning Bottleneck

Classic ML requires Feature Extraction. Humans must tell the computer *what* to look for. If you miss a feature, or if the data is too complex to describe manually (like raw pixels), the model struggles.



# Enter Deep Learning

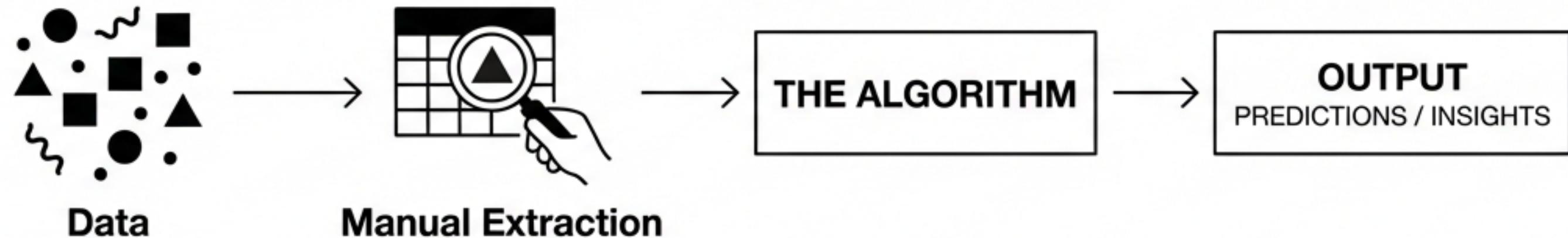
Deep Learning is a subset of ML inspired by biological neurons but operating on pure mathematics. The ‘Deep’ refers to the number of hidden layers between input and output.



# The Killer Feature: Automated Extraction

Deep Learning removes the need for human domain expertise in selecting features. It excels at unstructured data because it figures out what is important—edges, curves, patterns—on its own.

## Classic Machine Learning

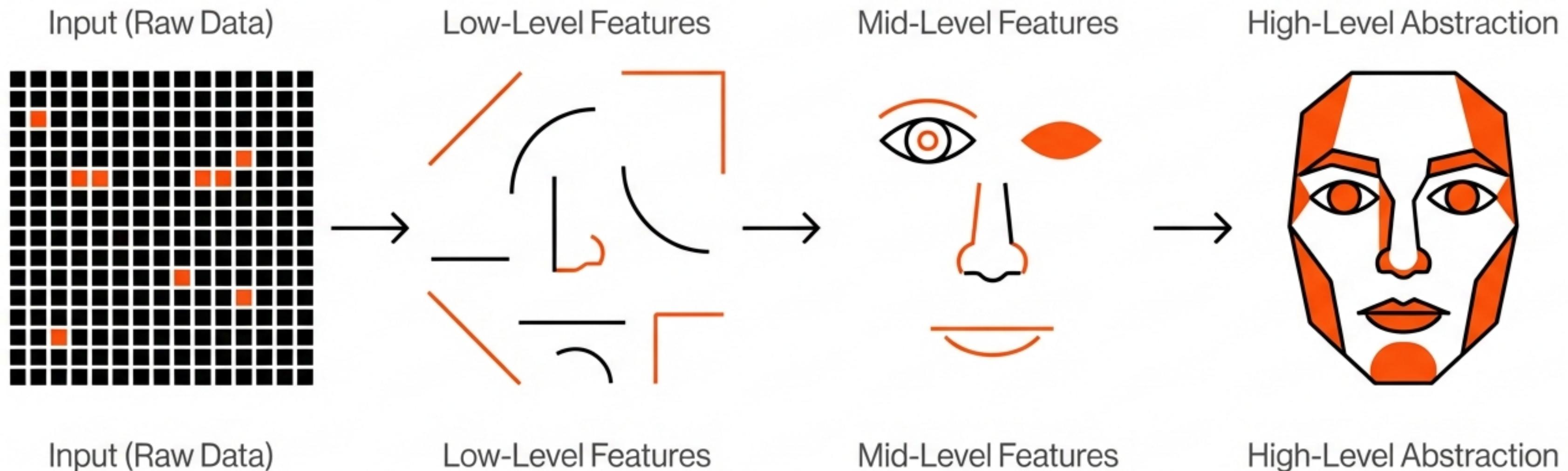


## Deep Learning



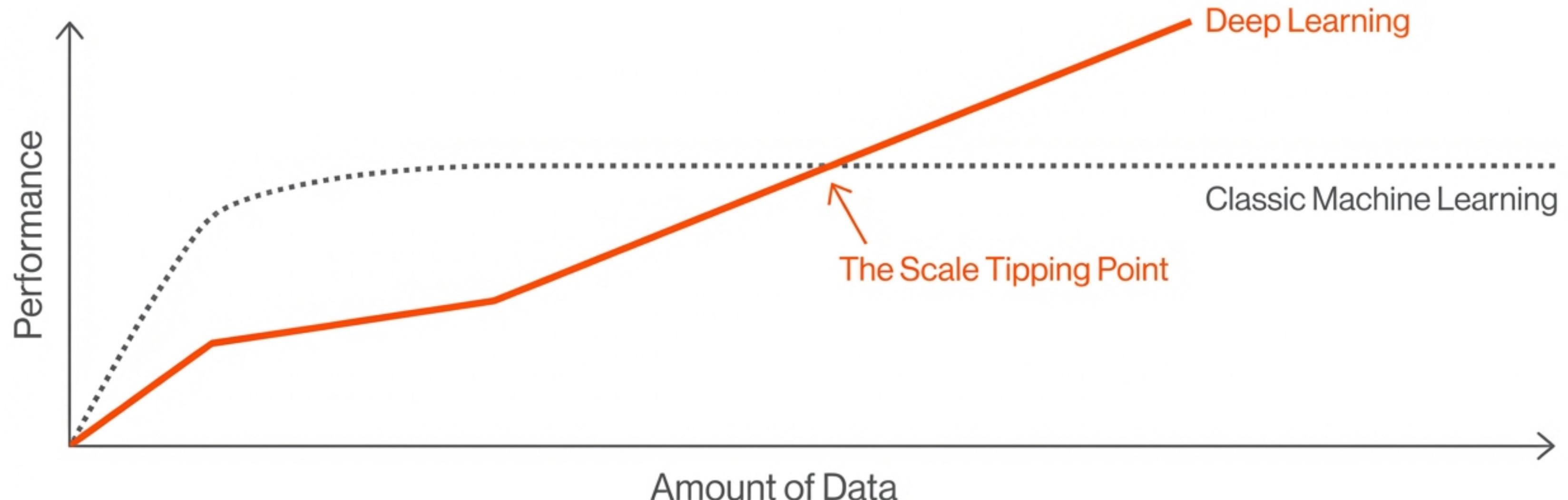
# The Hierarchy of Representation

As data moves through the layers, the representation becomes more abstract. Layer 1 sees pixels; Layer 2 sees edges; Layer 3 sees shapes; the final layers see objects.



# The Data Hunger

Classic ML reaches a limit where more data does not improve accuracy. Deep Learning, driven by Big Data and GPU power, continues to improve as data volume explodes.



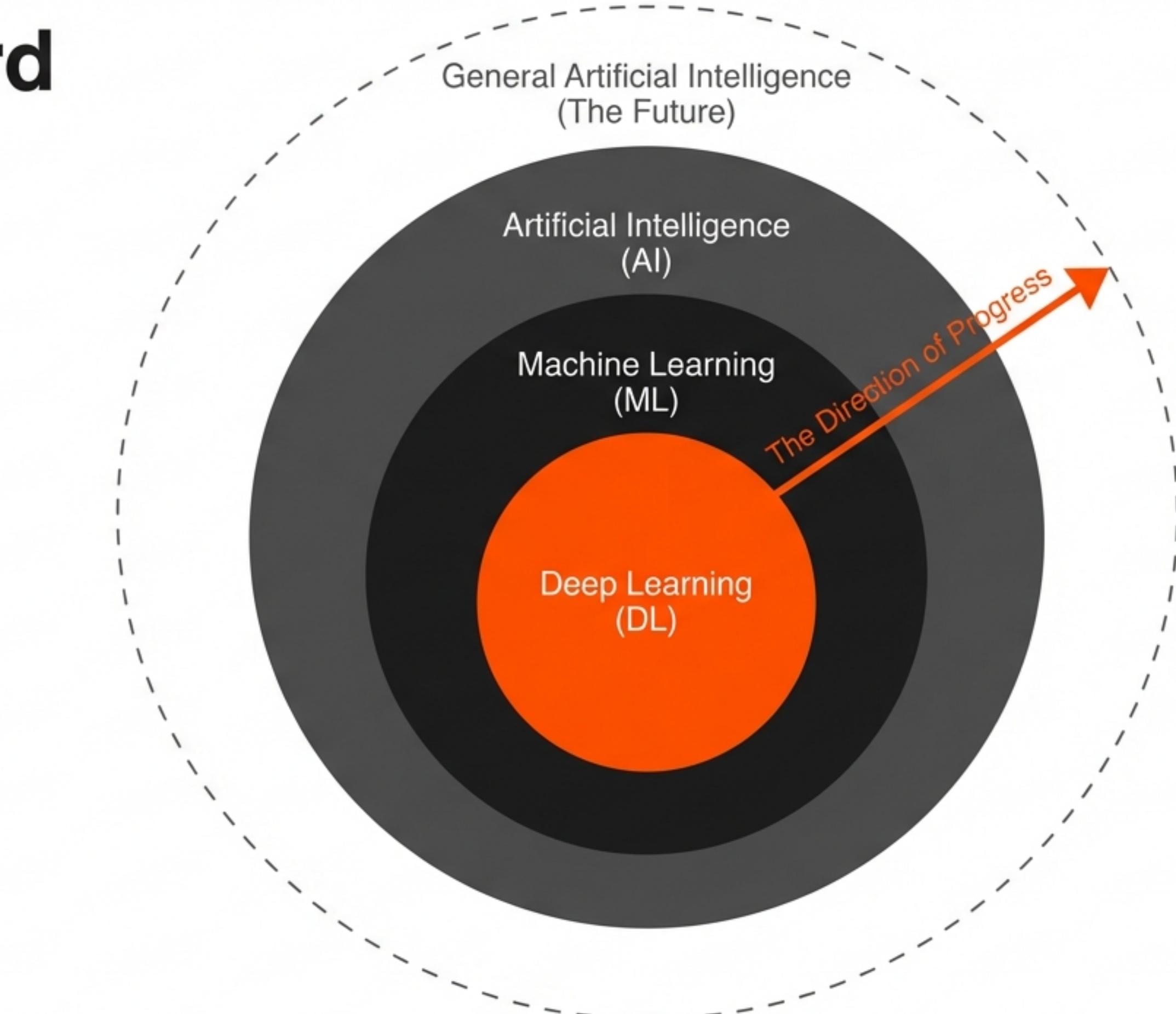
# Choosing the Right Tool

Do not use a cannon to kill a mosquito. For limited or structured data, classic Machine Learning is often superior.

USE MACHINE LEARNING WHEN...	USE DEEP LEARNING WHEN...
<ul style="list-style-type: none"><li>• Data is Structured (Excel, Tables)</li><li>• Small to Medium Data Volume</li><li>• Interpretability is critical (The ‘Why’)</li></ul>	<ul style="list-style-type: none"><li>• Data is Unstructured (Images, Audio, Text)</li><li>• Massive Data Volume</li><li>• High Computational Power available</li></ul>
Fraud Detection, Sales Forecasting	Self-Driving Cars, NLP, Vision

# The Path Forward

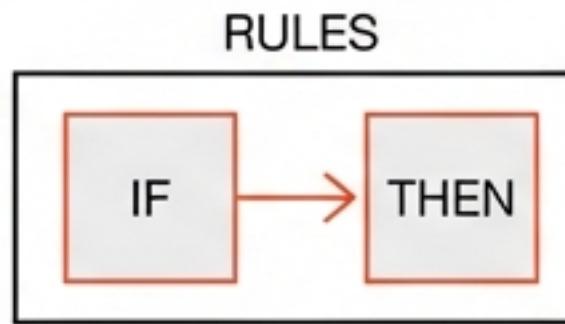
We have mastered specific tasks (Weak AI). The next horizon is General AI, but we are not there yet. Success lies in applying the correct level of intelligence—ML or DL—to the specific problem.



# Visual Glossary

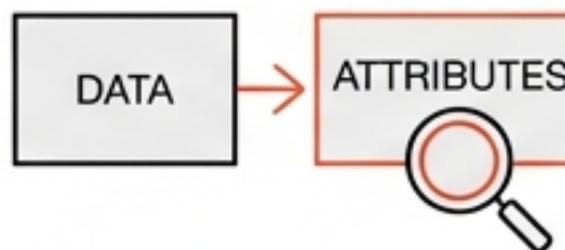
## Symbolic AI:

Rule-based intelligence using explicit programming (If-Then).



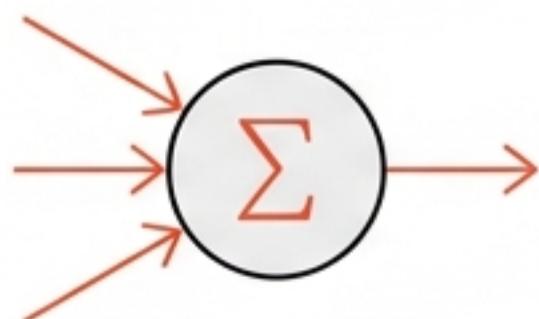
## Feature Extraction:

The process of identifying key data attributes (manual in ML, automated in DL).



## Perceptron:

The fundamental unit of a neural network (an artificial neuron).



## Structured Data:

Data organised in tables, rows, and columns (e.g., Excel).

A diagram of a data table consisting of 4 rows and 5 columns. The first column contains orange squares, while the other four columns contain white squares.

## Unstructured Data:

Complex data without a pre-defined model (e.g., images, audio, text).



## Weak AI:

Intelligence focused on a specific, narrow task.

