

WEEK 1: AI FUNDAMENTALS AND PYTHON BASICS

DAY 2 (24/06/2025)

The Two Philosophies of AI Model Building:

Today's session focused on understanding the two core philosophies behind how AI systems are built and trained to make decisions — the **Rule-Based Approach** (the traditional way) and the **Learning-Based Approach** (the modern way).

Data is the Fuel of Intelligence

We began by revisiting the most important principle in AI — **Data is the fuel** that drives intelligent decision-making. Data represents raw, real-world information such as numbers, text, images, or audio that an AI system processes to learn patterns and make predictions. To make sense of this data, we apply **Data Modeling**, which structures and organizes the learning process so that the system can identify relationships and generate accurate results. Without good-quality data, even the most advanced AI models cannot perform effectively.

1. Rule-Based Approach (The Old Way)

This was the earliest form of AI, where human experts explicitly defined all the rules a system had to follow. The AI did not learn — it simply executed instructions written by programmers.

Example:

If an email contains the word “*prize*” and is from an unknown sender, mark it as **SPAM**.
If it contains the word “*meeting*” and is from a known contact, mark it as **IMPORTANT**.

In this approach, the system follows a set of *if-then* conditions designed by humans.

Limitation:

This type of system is rigid and cannot handle real-world complexity. It fails when new or unseen conditions arise that don't fit the predefined rules. For example, if a spam email uses

different words, the rule-based system won't recognize it. Such systems work only for very simple, predictable tasks.

2. Learning-Based Approach (The Modern Way)

This approach forms the foundation of **modern Artificial Intelligence** and **Machine Learning (ML)**. Instead of relying on hardcoded rules, the system **learns directly from data** — discovering patterns, relationships, and decision logic on its own. This makes AI flexible, adaptive, and capable of handling complex, real-world problems.

The learning-based approach is divided into three main categories:

i. Supervised Learning

In supervised learning, the model is trained using **labeled data**, meaning we provide both the **input (X)** and the **correct output (Y)**. The system's goal is to learn the mapping between X and Y so that it can predict the correct output for new, unseen inputs.

Example:

We show an AI thousands of images labeled as “*cat*” or “*dog*.” By learning the visual features that distinguish one from the other, the AI can later classify new images accurately.

This is like teaching a student with examples and answer keys — the system learns from both the question (input) and the answer (output).

ii. Unsupervised Learning

In unsupervised learning, the model is given **unlabeled data** — only the inputs (X) — and must find patterns or groupings on its own.

There are no predefined answers, and the AI explores the data to identify hidden structures or relationships.

Example:

A company might use unsupervised learning to group customers with similar purchasing habits without knowing anything about them in advance. This helps in targeted marketing or customer segmentation.

iii. Reinforcement Learning

Reinforcement Learning is inspired by how humans and animals learn through experience. Here, the AI interacts with an **environment**, takes **actions**, and receives **feedback** in the form of **rewards or penalties**. Over time, it learns which actions maximize its total rewards.

Example:

Training an AI agent to play a video game or control a self-driving car. The AI receives a reward for correct moves and penalties for mistakes, gradually improving its performance through trial and error.

Reflection

Today's session deepened my understanding of how AI systems evolve and learn. I found it fascinating that traditional rule-based systems were completely dependent on human logic, while modern AI systems are data-driven and self-improving. The concept of **machine learning** made me realize that the real power of AI lies in its ability to adapt — to learn from experience and perform better over time. I also understood that choosing the right learning approach — supervised, unsupervised, or reinforcement — depends on the type and availability of data.