1. Difference between AI, ML, and DL

What is Artificial Intelligence (AI)?

Artificial Intelligence is a **broad branch of computer science** that aims to create systems that can **perform tasks that normally require human intelligence**. This includes things like:

- **Understanding language:** chatbots, voice assistants.
- **Visual perception:** facial recognition in smartphones.
- **Decision making:** automated trading in stock markets.
- **Problem-solving:** robots planning the best way to complete tasks.

So, AI is an **umbrella term** — it includes everything that makes a machine *appear smart*.

What is Machine Learning (ML)?

Machine Learning is a **subset of AI**. Instead of programming every single rule, we **teach the machine to learn from data**. This makes the system **adaptable**, so it can improve its performance over time.

How it works:

- We feed the computer a lot of **historical data**.
- The system finds **patterns** in that data.
- It uses these patterns to **predict or decide** things in new situations.

Example:
If you upload lots of cat and dog photos, a machine learning model learns how to tell them apart. Over time, it gets better as it sees more images.

Types of Machine Learning:

- **Supervised Learning:** The data is labeled (e.g., “This is a cat”, “This is a dog”).
- **Unsupervised Learning:** The data isn’t labeled — the system finds hidden groups or patterns by itself (like customer segmentation).
- **Reinforcement Learning:** The system learns by trial and error, getting rewards for doing tasks correctly (like training a robot to walk).

What is Deep Learning (DL)?

Deep Learning is a **specialized subfield of ML**. It uses **artificial neural networks** — models inspired by the way the human brain works.

Key feature:
These networks have **many layers** (that’s why it’s called “deep”). Each layer processes data and passes it to the next, helping the system learn **complex patterns**.

Where it’s used:

- Image recognition (unlocking your phone with your face).

- Speech recognition (Siri, Google Assistant).
- Self-driving cars (understanding surroundings in real time).
- Medical diagnostics (detecting tumors in scans).

In Otherwods:

- **AI**: The big goal — machines that act smart.
- **ML**: One method to achieve AI — teach machines to learn from data.
- **DL**: An advanced way to do ML — using deep neural networks for really complex tasks.

2. Real life applications of AI

1 **Healthcare:**

- Detecting diseases in medical images (like X-rays or MRIs).
- Virtual health assistants that remind patients to take medicine.
- Predicting disease outbreaks using data trends.

2 **Transport:**

- Self-driving cars (Tesla, Waymo).
- AI in traffic control systems to reduce congestion.
- Ride-sharing apps (Uber, Ola) that match drivers with passengers using AI.

3 **Finance:**

- Detecting unusual spending patterns to catch fraud.
- Robo-advisors for investment suggestions.
- Credit scoring and loan approvals.

4 **Social Media:**

- Facebook and Instagram use AI to recommend posts and filter content.
- Face tagging in photos.
- Detecting harmful content or spam.

5 **Entertainment:**

- Netflix or YouTube recommending what to watch next.
- Video game characters that adapt to how you play.

6 **Smart Homes:**

- Smart assistants (Alexa, Google Home) controlling lights, music, and appliances.
- Smart thermostats that learn your temperature preferences.