Meta-learning and the Evolution of Machine Learning

Learning How to Learn: The Chef’s Story

A skilled chef **quickly** adapts to new cuisines

Doesn’t start from **scratch**

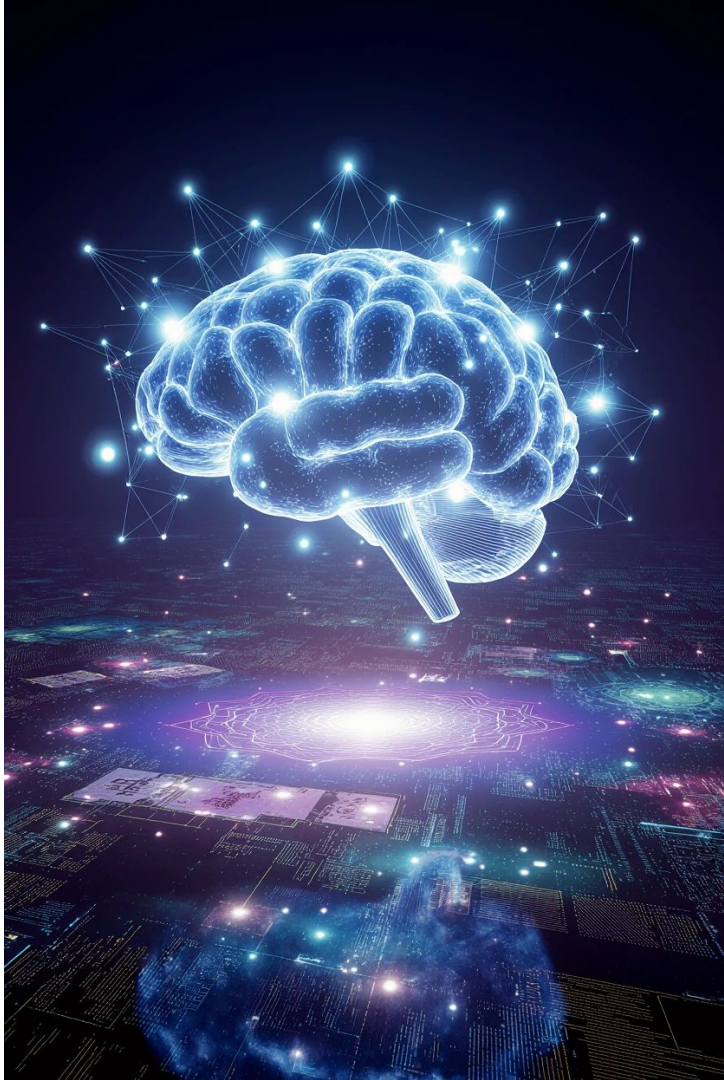
Uses **foundational knowledge** from prior dishes

What is Meta-learning?

“**Learning to learn**” — a model improves how it learns

Learns from a **distribution of tasks** instead of just one

Quickly adapts to new tasks with few examples



How Have YOU Learned to Learn?

Think of a time you **learned something new faster**

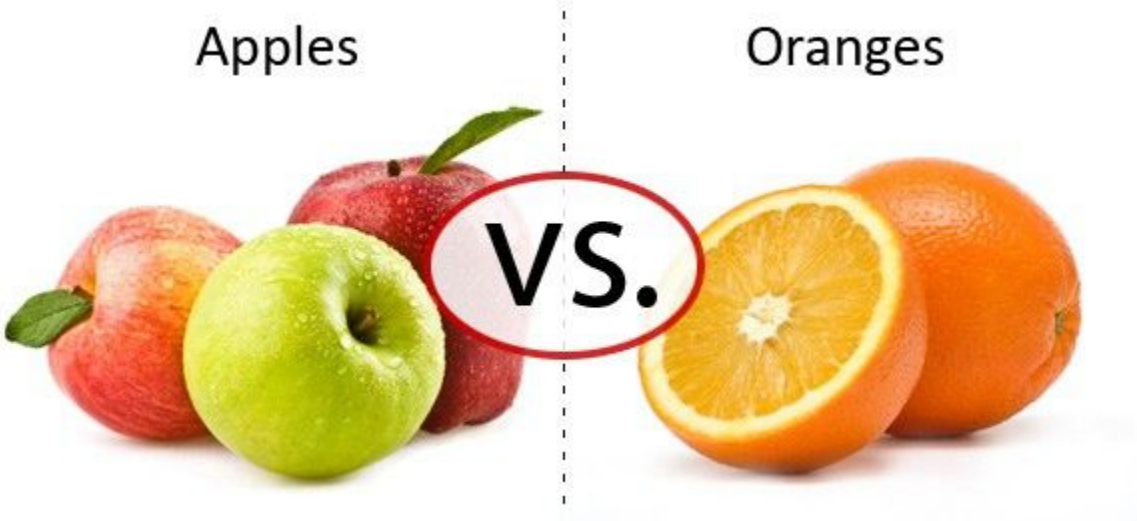
Pair up with a neighbor to discuss

Share one or two examples with the group

Fruit Recognition: A Comparison

Traditional ML: Train on thousands of apple images

Meta-learning: Train on many fruit types, learn to generalize



Key Differences: Traditional ML vs Meta-learning

Feature	Traditional ML	Meta-learning
Learns on	One big task	Many small tasks
Needs data	A lot!	Very little (per task)
Adaptability	Low	High
Generalization	Narrow	Broad

Small Group Discussion: Which Approach Would You Choose?

When would Traditional ML be better?

When would Meta-learning shine?

The Chess Analogy

Imagine learning chess from watching only 3 games

Hard to grasp strategies, right?

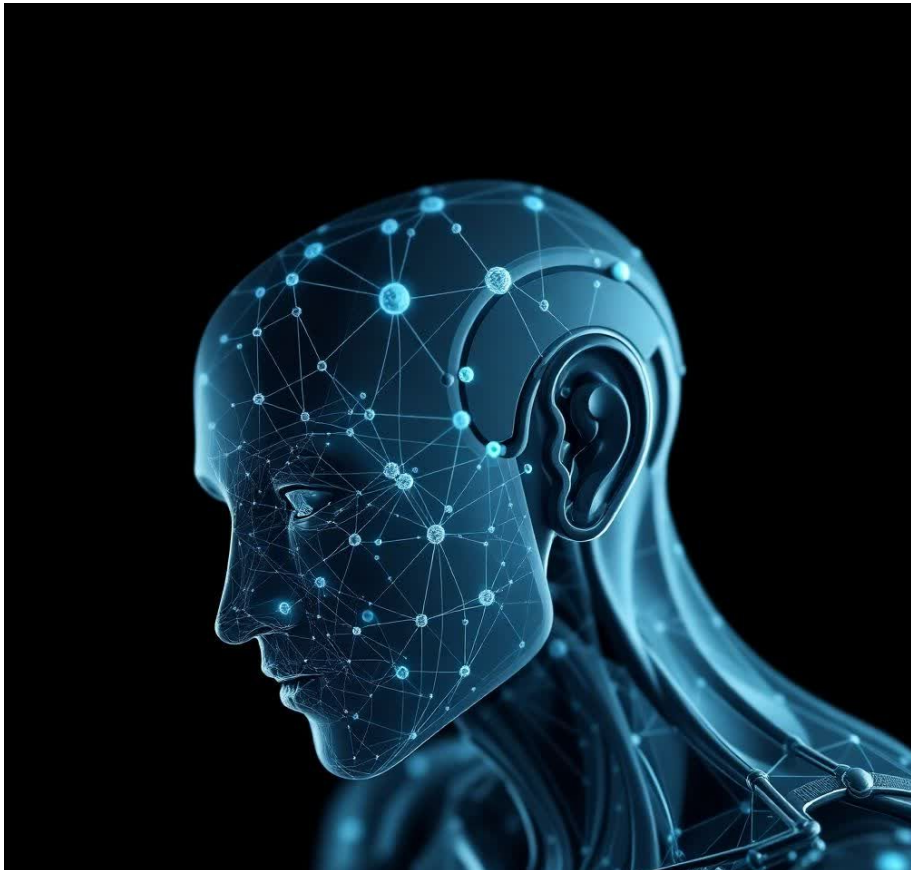
Same happens when ML has little data

What Makes Learning Hard?

Overfitting: Model **memorizes** instead of learning

Data is **expensive or rare** (e.g., medical)

Long training times, poor results on new tasks



Big Models, Small Datasets = Trouble

Deep networks = large engines

Need lots of data (fuel)

Small datasets = bad performance

One-shot Learning in Real Life

You meet a new person once

Next time you **recognize** them instantly

That’s **one-shot learning**

Few-shot, One-shot, Zero-shot – What Are These Learning Paradigms?

Few-shot: 5-10 examples per class

One-shot: Exactly 1 example

Zero-shot: No examples; just use knowledge + descriptions

Real-World Importance of Efficient Learning

Medical diagnosis: few samples

New product identification

Conversational AI & personalization

Quiz Time!

1. What does meta-learning mean in simple terms?
2. Why is traditional ML poor with small datasets?
3. What’s an example of one-shot learning in humans?
4. What is zero-shot learning?
5. Name a real-world use-case of few-shot learning.