

WHAT IS MACHINE LEARNING?

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- **Definition:** Machine learning (ML) is the science of getting computers to learn from data **without being explicitly programmed**.
- **Origins:**
 - ML grew out of **artificial intelligence (AI)**, whose goal is to build intelligent machines.
- **Why ML is needed:**
 - Some tasks can be explicitly programmed:
 - Shortest path from A to B (e.g., GPS routing)
 - Many important tasks **cannot** be written as fixed rules:
 - Web search ranking
 - Speech recognition
 - Medical diagnosis from X-rays
 - Self-driving cars
 - For these problems, the only known solution is to let machines **learn patterns from data**.
- **Long-term goal:**
 - Build machines as intelligent as humans (**Artificial General Intelligence, AGI**).

Everyday Applications of ML

- **Web search ranking** (Google, Bing, Baidu)
 - Learns how to rank web pages by relevance
- **Photo tagging / face recognition** (Instagram, Snapchat)
 - Identifies and labels people in photos
- **Recommendation systems**
 - Suggests content based on past behavior (e.g., movies, music)
- **Speech recognition / voice assistants**
 - Voice-to-text for messages
 - Voice commands (e.g., "Hey Siri", "OK Google")
- **Spam filtering**
 - Flags scam or unwanted emails as spam