

# **Introduction to Machine Learning**

## **AI in Action: Videos & Demonstrations**

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# This Lecture: Videos + Discussion

**Format:** Watch videos, discuss, reflect

**Goal:** See the breadth of what ML can do today

**Materials:** `slides.pdf` (video-based presentation)

# ML Applications We'll Explore

Domain	Example	Video
Biology	AlphaFold protein structure	DeepMind
Math	Faster matrix multiplication	AlphaTensor
Code	AI pair programming	GitHub Copilot
Weather	10-day forecasts	GraphCast
Health	Medical diagnosis	Various
Creativity	Art, music, writing	DALL-E, Suno

# ML Gone Wrong

We'll also discuss:

- **Bias in ML systems** (hiring, justice, healthcare)
- **Deepfakes** and misinformation
- **Adversarial attacks** on ML models

Understanding limitations is as important as understanding capabilities.

# What is Machine Learning?

**Arthur Samuel (1959):**

"Field of study that gives computers the ability to learn without being explicitly programmed."

**Tom Mitchell (1997):**

"A computer program is said to learn from experience  $E$  with respect to task  $T$  and performance measure  $P$ , if its performance at  $T$ , as measured by  $P$ , improves with experience  $E$ ."

# The Task-Performance-Experience Framework

Component	Question	Example (Spam Filter)
<b>Task (T)</b>	What are we trying to do?	Classify emails as spam/not spam
<b>Performance (P)</b>	How do we measure success?	% of emails correctly classified
<b>Experience (E)</b>	What data do we learn from?	Database of labeled emails

# Key Insight

Traditional Programming:

Human writes RULES → Computer follows rules → Output

Machine Learning:

Human provides DATA → Computer discovers rules → Output

The shift: Instead of programming rules, we program the learning process.

**Let's Watch and Discuss!**

**Open slides.pdf for video demonstrations**

**Next lecture:** The Big Picture - How AI Actually Works