

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)
Task (T)	What are we trying to do?	Classify emails as spam/not spam
Performance (P)	How do we measure success?	% of emails correctly classified
Experience (E)	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