



Understanding AI, Machine Learning, and Agentic Systems

This presentation explores the key concepts in artificial intelligence, from basic machine learning to advanced agentic systems. We'll clarify the relationships between these technologies and explain how they're transforming our digital landscape.



The AI Landscape: Key Concepts

Artificial Intelligence (AI)

Computers trained to perform tasks that typically require human intelligence, like pattern recognition and understanding visuals, voice, or text.

Machine Learning (ML)

Machines learn from data to make predictions without explicit programming. You provide **input and output**, and it figures out the equation itself.

Generative AI

Creates new content like text, images, audio, or video based on prompts. Powered by Large Language Models (LLMs) and other specialized models.

Statistical Machine Learning

Key Characteristics

- Uses algorithms like linear regression, decision trees, and k-means
- Works well with **structured data** (organized in rows and columns)
- Requires less computational power than deep learning

Common Tasks

- **Classification:** Grouping into categories (spam/not spam)
- **Regression:** Predicting continuous numbers (home prices)
- **Clustering:** Grouping unlabeled data based on patterns
- **Outlier Detection:** Finding anomalous data points



Supervised Learning

Training with **labeled data** (input-output pairs)



Unsupervised Learning

Finding patterns in **unlabeled data** without specific guidance

Deep Learning: Neural Networks

Deep Learning uses **neural networks** inspired by the human brain. It excels with **unstructured data** like images, videos, audio, and text.

Requirements:

- Large amounts of training data
- Powerful GPUs for processing

Popular frameworks: PyTorch (beginner-friendly) and TensorFlow (fine-grain control)





The Koala Analogy: How Neural Networks Learn

Specialized Learning

Imagine students (neurons) each specializing in a part of a koala (eyes, nose, ears)

Information Passing

They pass their findings (scores) to others who make higher-level decisions (face, body)

Feedback Loop

A "supervisor" gives the final answer. If wrong, the error is passed back so they can adjust (backward error propagation)



Deep Learning vs. Statistical ML: When to Use Each

Data Type

Statistical ML: Structured data (tables, spreadsheets)

Deep Learning: Unstructured data (images, video, audio, text)

Feature Complexity

Statistical ML: Simple features, clear patterns

Deep Learning: Complex features requiring pattern recognition

Data Volume

Statistical ML: Can work with moderate data sizes

Deep Learning: Performs better with huge training datasets



Generative AI & Large Language Models

Generative AI

- Creates new content (text, images, audio, video)
- Powered by Large Language Models for text
- Reacts to prompts with low autonomy
- Examples: GPT, DALL-E, AudioGen, Sora

Large Language Models (LLMs)

- Neural networks trained on enormous text data
- Contain trillions of parameters
- Like a "stochastic parrot" predicting next words
- Fine-tuned with Reinforcement Learning with Human Feedback (RLHF)

Agentic AI: Beyond Simple Generation

1

Goal-Oriented Planning

Works toward high-level goals without detailed instructions

2

Multi-step Reasoning

Breaks complex goals into multiple logical steps

3

Autonomous Decision-Making

Performs actions without needing permission for every step

4

Heavy Tool Usage

Integrates with external tools and systems through APIs

5

Proactivity

Actively works toward goals rather than just reacting to questions

The HR Assistant Analogy: Levels of AI Capability



Simple Chatbot

Answers policy questions using Retrieval Augmented Generation (RAG)



Tool-Augmented Chatbot

Takes simple actions (apply for leave) using APIs, but lacks full autonomy



Agentic AI Assistant

Handles complex goals like "onboard a new intern," planning and executing multiple steps autonomously



Generative AI vs. Agentic AI: Key Differences

Generative AI

- Creates content based on prompts
- Reactive to user requests
- Minimal autonomy
- Limited planning capability
- Minimal tool usage
- Example: Simple ChatGPT Q&A

Agentic AI

- Performs actions toward goals
- Proactively reasons and plans
- High autonomy
- Multi-step planning
- Heavy tool usage via APIs
- Example: ChatGPT using tools for deep research

Generative AI is a **component** within an Agentic AI system, specifically the part that uses LLMs to generate text, summarize, or extract information.