Week 1: Core A.I. Technologies

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# Core A.I. Technologies

## What exactly is “artificial intelligence”

Dreams of artificial intelligence trace back to philosophical debates in ancient Greece. Prometheus would mold handfuls of clay into images of the gods, and later these creatures were given life. The sprouting of ideas came from mathematics, biology, and computer science before eventually producing modern artificial intelligence. While these different domains have unique perspectives, they propose four distinct categories of intelligent systems (Lukac, Milic, & Nikolic, 2018). The first divide asks if the system *thinks* or *acts*, or more precisely, can reason about the problem. Each of these top-level categories contains subcategories of applications that mimic *humans* versus *rational* actors.

Within a smart car are multiple features that fit into these various areas. For instance, traditional cruise controls attempt to *act human* by following a fixed speed. Meanwhile, a vehicle with an adaptive cruise will *act rationally* through avoid an accident by compensating to slow traffic. The design of some autonomous cars includes capabilities to *think human*, like crawling toward a stop sign, giving the appearance of a human driver.

## Description of Technology

There are three high-level categories of artificial intelligence, specifically rules and heuristics, machine learning, and deep learning (Buchanan, 2005).

1. Before 1962, applications would rely on practical techniques for reducing the trial-and-error search space. This heuristic-centric approach is useful for chess and other video game engines. Despite criticism for being naïve, many LOB (Line of Business) applications continue to leverage this technique successfully.
2. In 1963, Edward Feigenbaum and Julian Feldman’s *Computers and Thought* centralized many ideas across the computing industry. Their literature and new programming paradigms, such as McCarthy’s LISP, lay the foundation that became machine learning. Researches use these tools to build statistical models that represent a situation. For instance, if a customer purchases bread, what else could you recommend? Perhaps butter, jam, and deli meat.
3. In 1949, neural scientists found that the human brain transmits signals between a weighted graph of neurons (Lukac, Milic, & Nikolic, 2018). Despite unlocking the biological key to mimicking cognitive learning, the processing power was unavailable until the early 2000s. Today, researchers use neural networks to extract patterns to nebulous problems that met or exceed human capacities.

## Purpose and Function

Traditional software follows the model of *data* plus *rules* equals *outcomes.* In contrast, intelligent systems use data and outcomes to derive rules. This distinction can be valuable when the *rules* are fuzzy or not entirely understood.