How AI Works

AI Made Easy for Decision Makers

December, 2023

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# About this Course

This is the series of courses in Fred Hutch DaSL’s “AI for Decision Makers” specialization on Coursera.

## 0.1 Specialization Sections

* Introduction
* Course 1: AI Possibilities
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* Course 3: Establishing AI Infrastructure
* Course 4: AI Policy

## 0.2 Available course formats

This course is available in multiple formats which allows you to take it in the way that best suites your needs. You can take it for certificate which can be for free or fee.

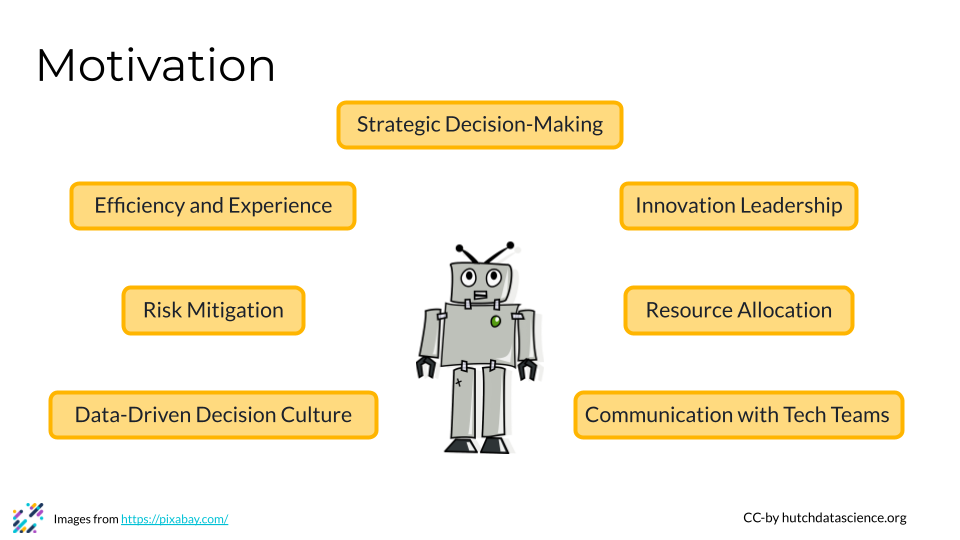
* The material for this course can be viewed without login requirement on this [Bookdown website](LINK%20HERE). This format might be most appropriate for you if you rely on screen-reader technology.
* This course can be taken for [free certification through Leanpub](LINK%20HERE).
* This course can be taken on [Coursera for certification here](LINK%20HERE) (but it is not available for free on Coursera).
* Our courses are open source, you can find the [source material for this course on GitHub](LINK%20HERE).

# 1 VIDEO Summary of This Course

# 2 Introduction

## 2.1 Motivation

How can understanding AI help you be a better leader?



We think understanding AI is essential for executives. It helps today’s leaders make strategic decisions, drive innovation, enhance efficiency, and foster a culture that embraces the transformative power of these technologies. Specifically, AI proficiency can help leaders in the following ways:

1. **Strategic Decision-Making:** Understanding AI and machine learning equips leaders to make informed decisions about integrating these technologies into business strategies, setting their teams up for success when working with AI.
2. **Risk Mitigation:** Familiarity with AI helps leaders assess risks associated with implementing these technologies, ensuring that ethical considerations, data privacy, and potential biases are addressed to mitigate negative consequences. Leaders can also implement more informed policies for their teams.
3. **Efficiency and Experience:** Leaders can explore how AI applications enhance operational efficiency, automate repetitive tasks, and assist employee learning and development, leading to increased productivity and breakthroughs. These improvements can also improve the experience of users or customers your organization serves.
4. **Resource Allocation:** AI resources can be expensive, including in terms of computing resources, subscription services, and/or personnel time. Understanding AI enables leaders to allocate resources effectively, whether in building in-house AI capabilities, partnering with external experts, or investing in AI-driven solutions that align with the organization’s mission.
5. **Innovation Leadership:** Leaders can foster a culture of innovation by understanding the transformative potential of AI. Awareness and knowledge can also enable leaders to identify opportunities for innovation, helping their teams match the rapidly evolving technological landscape.
6. **Data-Driven Decision Culture:** Leaders can promote a data-driven decision-making culture within their organizations, using AI insights to inform strategic planning, understand their teams better, and improve other key business functions.
7. **Communication with Tech Teams:** Executives and managers benefit from understanding AI event if they aren’t building tech, as it helps them effectively communicate with their technical teams. This can mean more effective collaboration and improved alignment between teams or departments.

## 2.2 Target Audience

This specialization is intended for executives, decision-makers, and business leaders across industries, including executives in C-suite positions, managers, and directors. Our goal is for these learners to understand the strategic applications of AI and machine learning in driving innovation, improving operations, creating supportive working environments, and gaining an innovative edge.

We also believe that learning is a life-long process. This specialization is targeted toward those who value continuous learning and want to stay ahead in today’s fast-paced technology landscape.



## 2.3 Curriculum

The course covers…

# 3 Introduction to AI Possibilities

## 3.1 Introduction

This course aims to help decision makers and leaders understand artificial intelligence (AI) at a strategic level. Not everyone will write an AI algorithm, and that is okay! Our rapidly evolving AI landscape means that we need executives and managers who know the essential information to make informed decisions and use AI for good. This course specifically focuses on the essentials of what AI is and what it makes possible, to better harmonize expectations and reality in the workplace.

### 3.1.1 Motivation

This course will help you with your understanding of AI, helping you make strategic decision and cultivate a business environment that embraces the benefits of AI, while understanding its limitations and risks.

### 3.1.2 Target Audience

This course is targeted toward industry and non-profit leaders and decision makers.

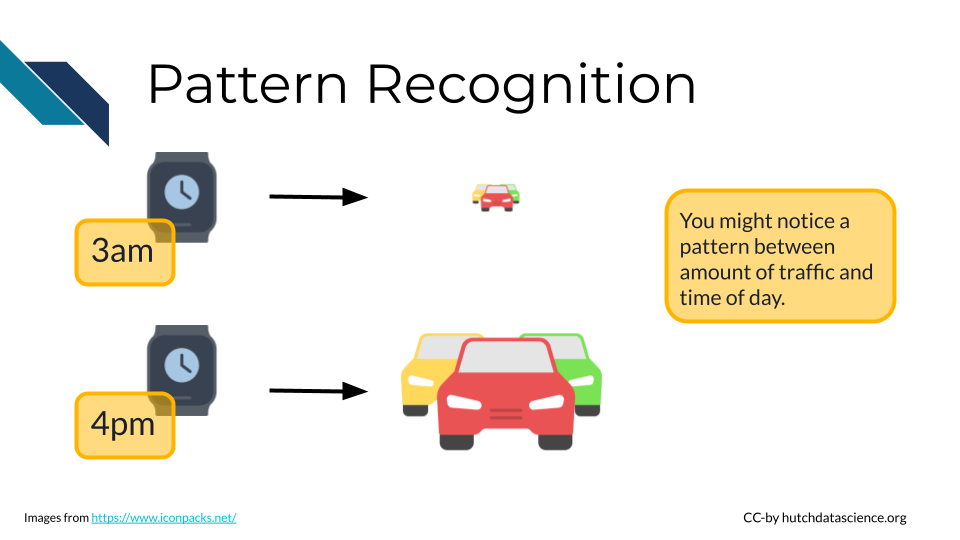
### 3.1.3 Curriculum Summary

In this course, we’ll learn about what Artificial intelligence is, and what it isn’t. We’ll also learn the basics of how it works, learn about different types of AI, and set some ground rules for minimizing the harms and maximizing the benefits of AI.

# 4 What Is AI

## 4.1 Machines Can Learn Like Us

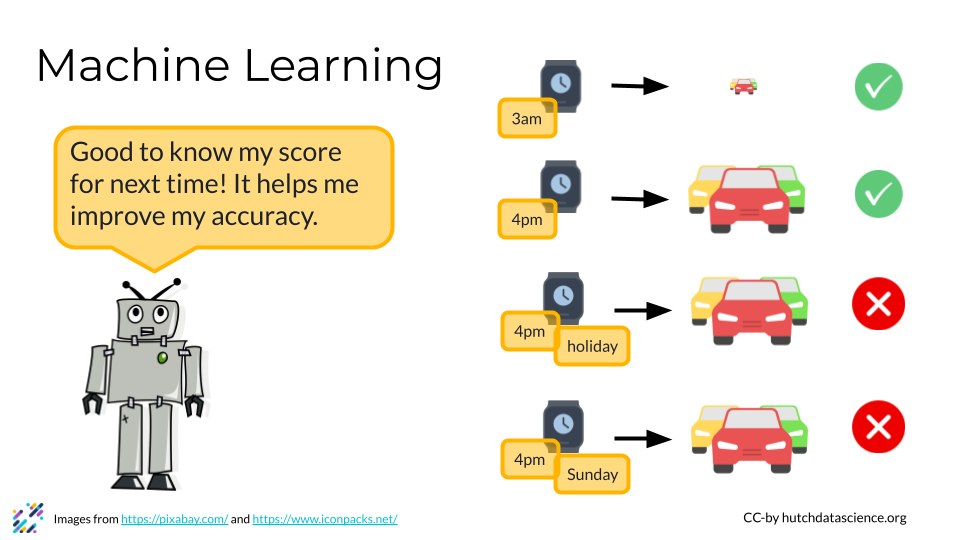
Human beings are powerhouses when it comes to pattern recognition and processing ([Mattson 2014](#ref-Mattson2014)). We are constantly observing the world around us, collecting data to learn and make decisions. For example, we might notice a pattern between the amount of traffic on roads in a city, and the time of day.



Much like the human brain, machine learning detects patterns within data. **Machine learning** is at the heart of artificial intelligence, allowing computers to learn and make predictions. In more complex machine learning, computers make millions of calculations, mastering the mapping of inputs (observations) to outputs (predictions). This process mirrors how humans learn through experience.

**Machine Learning**: Machine learning is a way for computers to learn from examples and improve their performance over time, resembling how humans learn from experience.

A machine learning system refines its understanding by continuously updating its parameters based on the feedback received from the provided data. For example, our system might be guessing traffic by time of day, but also judging its accuracy while accounting for other factors, such as whether or not it was a work day, if some workers are on holiday, or how many people live in the city.



The rise of machine learning has been propelled by our ability to collect vast amounts of data and sophisticated types of AI and computing power which we will learn about later.

## 4.2 The Data Explosion

Let’s revisit the traffic example. If you drive once at a specific time of day and observe the traffic around you, you have one data point. You can do this a bunch of times and collect more data. Historically, this is the way data has been collected, and you could manage that data in an Excel Spreadsheet. However, as computer storage and data collection methods have become more sophisticated, our ability to collect data has exploded in scale. It’s not hard to imagine that using traffic cameras, dashcams, and car sensors could collect a lot more information than any one person.

Data comes in many shapes and forms. Think about how much text information is freely available on the internet! Using that as input data, artificial intelligence systems can look for patterns of words that typically go together. For example, you’re much more likely to see the phrase “cancer is a disease” than “cancer is a computer program”. We can see this in action using the AI ChatGPT below.



## 4.3 AI In Practice

### 4.3.1 Amazon Recommendations

Amazon’s recommendation engine uses AI algorithms to analyze user behavior and past purchases, providing personalized product recommendations. This enhances the shopping experience, increases customer engagement, and drives sales.

### 4.3.2 Another Example

Text here.

## 4.4 What Is and Is Not AI

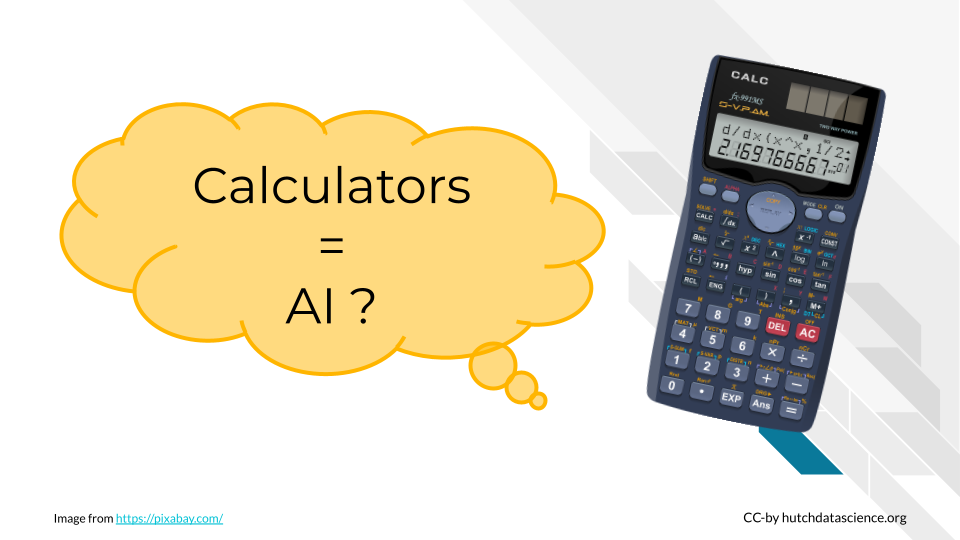
It can be tricky to understand what is and isn’t AI. Let’s look at a few of examples that might seem like AI, but are not.

### 4.4.1 Smartphones



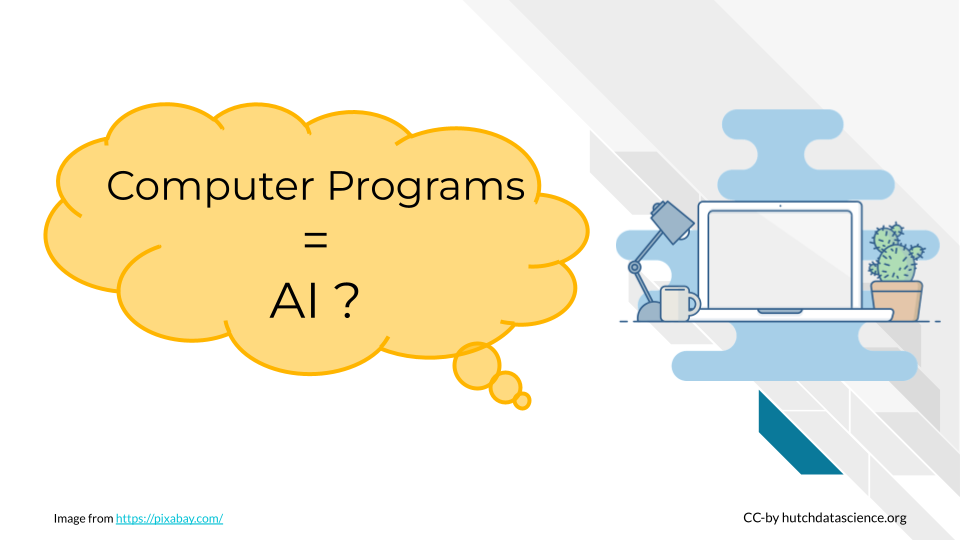
The name “smartphone” implies these devices are making decisions and are powered by AI. While there are some features on smartphones that are powered by AI models, like virtual voice assistants and facial recognition, the device as a whole isn’t considered AI.

### 4.4.2 Calculators



Many of us use basic calculators, as you might find in Microsoft Excel, every day. AI also makes many calculations. Is it just a scaled=up calculator? No, because AI also makes decisions on new data based on patterns. Traditional calculators can only execute predefined operations.

### 4.4.3 Computer Programs



Computers follow set procedures for problem solving and computation. Everyday computers use these proceedures, also called algorithms, to help automate repetitive tasks and save time. However, this isn’t generally considered AI. AI systems exhibit the ability to learn, adapt, and handle new inputs for tasks that might be more complicated.

### 4.4.4 Are You Dealing With AI

It can be tricky to determine what kind of tools or systems are AI, especially if you don’t come from a computational background. Here are a few questions on which you can reflect to determine if you’re dealing with AI or not.

**Does it Learn and Improve Over Time?** : AI systems can learn from feedback and enhance performance without explicit programming.

**Can it Perform Tasks Without Explicit Instructions?** : AI can carry out tasks beyond explicit programming, showcasing adaptability and autonomous decision-making when presented with new data or prompts.

**Does it Exhibit Human-Like Intelligence in its Actions?** : AI mimics aspects of human intelligence, such as problem-solving, pattern recognition, and understanding natural language, even when presented with new data or instructions it hasn’t encountered before.

### 4.4.5 DISCUSSION Is It AI

Consider the following examples. Are they examples of AI? Why or why not? Click to expand and see the answer.

**A smartfridge that lets you know when replacement parts are needed**

This is not AI. The computer in the fridge is typically programmed to look for specific signs of wear or time passing.

**Speed cameras on the highway**

Speed cameras on highways typically use specialized technology and are not explicitly powered by AI. These cameras are often equipped with radar or lidar sensors for measuring vehicle speed between checkpoints.

While the core functionality of speed cameras relies on sensor technology and predetermined speed thresholds, AI elements may be incorporated in some advanced systems. For example, AI could be used to enhance image recognition accuracy for reading license plates. However, the fundamental operation of speed cameras is rooted in sensor-based speed detection, not AI.

**Suggested accounts on Instagram**

This is considered AI. Social media algorithms, like Instagram’s, make recommendations based on user behavior. For example, if you spend a lot of time viewing a page that was recommended, the system interprets that as positive feedback and will make similar recommendations. Typically, these recommendations get better over time as the user generates more user-specific data.

# 5 VIDEO What Is AI and What It Is Not

# 6 VIDEO How AI Works

# 7 How AI Works

# 8 VIDEO Different Types of AI

# 9 Types of AI

How they work..

# 10 VIDEO Real Life Possibilities

What type of AI for specific possibilities - case studies

# 11 What Is Possible

What is possible with AI? What’s still fantasy?

# 12 VIDEO What Is Possible

# 13 VIDEO What Is NOT Possible

# 14 Ground Rules for AI

Ground rules - don’t do bad things with AI!

# 15 VIDEO Knowing the Ground Rules

# 16 Introduction to Avoiding AI Harm

## 16.1 Motivation

## 16.2 Target Audience

The course is intended for …

## 16.3 Curriculum

The course covers…

# 17 Introduction to Establishing AI Infrastructure

## 17.1 Motivation

## 17.2 Target Audience

The course is intended for …

## 17.3 Curriculum

The course covers…

# 18 Introduction to AI Policy

## 18.1 Motivation

## 18.2 Target Audience

The course is intended for …

## 18.3 Curriculum

The course covers…

# About the Authors

These credits are based on our [course contributors table guidelines](https://www.ottrproject.org/more_features.html#giving-credits-to-contributors).

| Credits | Names |
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| Lead Content Instructor(s) | [FirstName LastName](link%20to%20personal%20website) |
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| Content Contributor(s) (include section name/link in parentheses) - make new line if more than one section involved | Wrote less than a chapter |
| Content Editor(s)/Reviewer(s) | Checked your content |
| Content Director(s) | Helped guide the content direction |
| Content Consultants (include chapter name/link in parentheses or word “General”) - make new line if more than one chapter involved | Gave high level advice on content |
| Acknowledgments | Gave small assistance to content but not to the level of consulting |
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| Figure Artist(s) | Created figures/plots for course |
| Videographer(s) | Filmed videos |
| Videography Editor(s) | Edited film |
| Audiographer(s) | Recorded audio |
| Audiography Editor(s) | Edited audio recordings |
| **Funding** |  |
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| Funding Staff | Staff members who help with funding |

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## withr 2.3.0 2020-09-22 [1] RSPM (R 4.0.2)   
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## yaml 2.2.1 2020-02-01 [1] RSPM (R 4.0.3)   
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## [2] /usr/local/lib/R/library

# 19 References

Mattson, Mark P. 2014. “Superior Pattern Processing Is the Essence of the Evolved Human Brain.” *Frontiers in Neuroscience* 8. <https://doi.org/10.3389/fnins.2014.00265>.