

# Artificial Intelligence and Machine Learning

# Artificial Intelligence

Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind

# Artificial Intelligence

- It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.
  - John McCarthy (Stanford professor), 2004  
[jmc.stanford.edu/artificial-intelligence/what-is-ai/index.html](http://jmc.stanford.edu/artificial-intelligence/what-is-ai/index.html)

# Artificial Intelligence

- Alan Turing (father of computer science)
  - Computing Machinery and Intelligence
    - "Computing Machinery and Intelligence" is a seminal paper written by Alan Turing on the topic of artificial intelligence. The paper, published in 1950 in *Mind*, was the first to introduce his concept of what is now known as the Turing test to the general public.

[https://en.wikipedia.org/wiki/Turing\\_test](https://en.wikipedia.org/wiki/Turing_test)

# Artificial Intelligence

- Four potential goals or definitions of AI, which differentiates computer systems on the basis of rationality and thinking vs. acting:
  - Human approach:
    - Systems that think like humans
    - Systems that act like humans
  - Ideal approach:
    - Systems that think rationally
    - Systems that act rationally
- Alan Turing's definition would have fallen under the category of “systems that act like humans.”

# Artificial Intelligence

- Types of artificial intelligence—weak AI vs. strong AI
  - Weak AI—also called Narrow AI or Artificial Narrow Intelligence (ANI)
    - AI trained and focused to perform specific tasks
    - Weak AI drives most of the AI that surrounds us today
      - Apple's Siri
      - Amazon's Alexa
      - IBM Watson
      - Microsoft's Cortana
      - Google Assistant
      - Samsung's Bixby
      - Autonomous vehicles

Narrow might be a more accurate descriptor for this type of AI as it is anything but weak

# Artificial Intelligence

- Strong AI is made up of Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI)
  - Artificial general intelligence (AGI), or general AI, is a theoretical form of AI
  - A machine would have an intelligence equal to humans
    - Self-aware consciousness
    - Ability to solve problems
    - Ability to learn
    - Ability to plan for the future

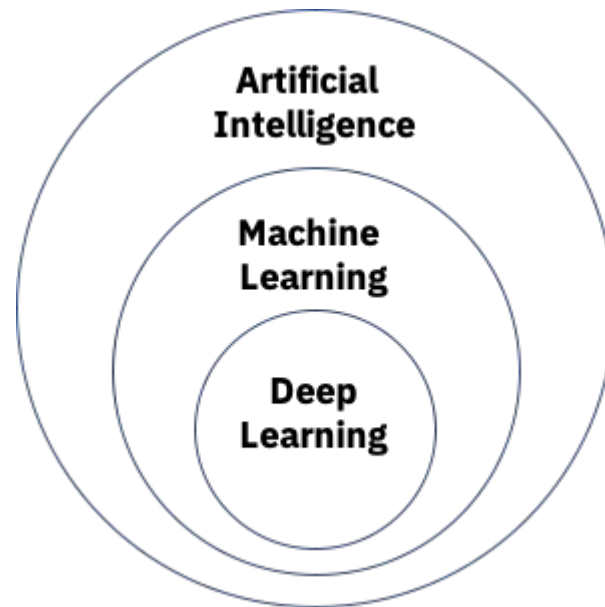
# Artificial Intelligence

- Artificial Super Intelligence (ASI)—also known as superintelligence—would surpass the intelligence and ability of the human brain. While strong AI is still entirely theoretical with no practical examples in use today, that doesn't mean AI researchers aren't also exploring its development. In the meantime, the best examples of ASI might be from science fiction, such as HAL, the superhuman, rogue computer assistant in 2001: A Space Odyssey.



# Machine Learning

- Machine learning is a sub-field of AI
- Consists of deep learning vs. machine learning



# Machine Learning

- Classical, or "non-deep", machine learning is more dependent on human intervention to learn
- Human experts determine the hierarchy of features to understand the differences between data inputs, usually requiring more structured data to learn.

# Machine Learning

- Deep learning is actually comprised of neural networks
- “Deep” in deep learning refers to a neural network comprised of more than three layers—which would be inclusive of the inputs and the output—can be considered a deep learning algorithm

# Artificial Intelligence

- There are numerous, real-world applications of AI systems today. Below are some of the most common examples:
  - Speech recognition
    - Also known as automatic speech recognition (ASR), computer speech recognition, or speech-to-text
  - Customer service
    - Online virtual agents replacing human agents
  - Computer vision
    - Enables computers and systems to derive meaningful information from digital images, videos and other visual inputs

# Artificial Intelligence

- Recommendation engines
  - Using past consumption behavior data, AI algorithms can help to discover data trends that can be used to develop more effective cross-selling strategies. This is used to make relevant add-on recommendations to customers during the checkout process for online retailers.
- Automated stock trading
  - Designed to optimize stock portfolios, AI-driven high-frequency trading platforms make thousands or even millions of trades per day without human intervention.

# Artificial Intelligence

- Future applications
  - Medical assistants
  - Psychological evaluations
  - Companion automatons

# Artificial Intelligence

## ChatGPT

- What is it?
- What are the issues surrounding it

# ChatGPT

A product of OpenAI, a company founded in 2015 by a group of investors that included Elon Musk

OpenAI conducts AI research with the declared intention of promoting and developing a friendly AI

OpenAI systems run on the fifth most powerful supercomputer in the world

It is a type of “deep” learning called a Large Language Model



# ChatGPT

GPT- What is it?

GPT stands for Generative Pre-trained Transformer

It is a large-scale unsupervised language model developed by OpenAI that is capable of generating human-like text.

[en.wikipedia.org/wiki/Generative\\_pre-trained\\_transformer](https://en.wikipedia.org/wiki/Generative_pre-trained_transformer)

# ChatGPT

OpenAI created a GPT AI engine that is now in its 4<sup>th</sup> generation - therefore known as GPT-4

GPT-4 has a web and API interface into it to allow user and program access to GPT-4 facilities

GPT-4 has many AI facilities available, like one to convert programming code from one programming language to another

The most well known facility and the one of most interest to us is the chat facility

# ChatGPT

The primary web interface to GPT-4 (“playground”) gives access to all the facilities.

So if one wants to chat one must select the chat function from a drop-down list of available functions while in playground.

When OpenAI decided to open up GPT to the world they created a new web interface that went straight to the chat function and called it: ChatGPT

Released November 2022

# ChatGPT

ChatGPT has been free but may not be available much longer

Openai and Microsoft have a contract to merge GPT with Microsoft's search engine Bing

Currently the new Bing with GPT is built in to the Edge browser and can be accessed from other web browsers by going to [bing.com](https://bing.com)

However, the chat function will likely still be available from OpenAI through their “playground” interface

# Dall-E

One additional product from OpenAI is the Dall-E graphic generation and editing interface

It is capable of producing some pretty amazing art work from text input

Dall-E can be accessed from the Edge browser by clicking the Image Creator button. From other browsers by going to [openai.com/product/dall-e-2](https://openai.com/product/dall-e-2)

# ChatGPT

## ChatGPT issues

- GPT very often returns wrong information (one writer called this tendency “hallucinations”)
  - Estimates are as high as 40% of completions
  - One writer asked GPT-4's predecessor GPT-3 to write an article about this year's superbowl game. GPT-3 returned an article about last years.
  - A major problem is that GPT-4 has no current event data past 2022

# ChatGPT

But there is an even bigger issue:

- Writers for newspapers and magazines are using GPT to do their writing for them
- College students are using GPT to write term papers and theses for them
- Very likely school children are using GPT to complete schoolwork assignments

One has to question whether there is any real learning going on

# ChatGPT

- There was a story recently about pastors using ChatGPT to write their sermons
- With GPT's ability to write computer code there may be fewer jobs in the IT field, especially in computer programming jobs
- CNBC ran an article about Alejandro Lopez-Lira, a finance professor at the University of Florida, who says that large language models (like GPT) may be useful when forecasting stock prices
- Insider web magazine recently ran an article about GPT-4 passing the US medical licensing exam with flying colors



# ChatGPT

- A law technology company recently identified three areas where large language models (like GPT) can have repercussions for areas of law:
  - AI can supply new tools that can listen to a spoken sentence and then generate that voice into any conversation – thus making recordings difficult to verify
  - ChatGPT can create text that “sounds good” but has no basis in reality. The problem they highlighted with this is folks who are considering legal action search on legal questions and getting bad advice, that they believe, that would encourage them to take (or not take) legal actions (remember – GPT is wrong 40% of the time – it hallucinates)

# ChatGPT

- Another problem area they identified is lawyers themselves. If they use GPT for legal citations there is a good chance they will be wrong.
  - GPT was asked for citations on a very specific question and got a three or four paragraph answer that looked brilliant. Unfortunately, the first paragraph stated the law incorrectly, and the second paragraph cited a case it said was the best precedent, and the case it cited was totally made up, along with the case number and page number it was supposed to be in.
- Finally, AI can be used to alter images. It has the ability to take a couple of photos of an individual and from them impose that individual into any other photo and have the authenticity of that photo be very difficult to verify. This will make photographic evidence become suspect.

# ChatGPT

## Solutions to the dilemma

- ChatGPT may not be available much longer.  
However, the new Bing will still do the same thing. And if the writers and students know how to access the “playground” feature this may not be enough
- In January of this year a college student developed a ChatGPT detection tool called GPTzero
- OpenAI announced in February they are developing ChatGPT detection tools as well

# Additional AI Applications

As an interesting side note, Google is trying to keep up with their own version of AI to incorporate into the Google search engine called Bard, based on their LaMbDa AI engine

Bard failed miserably on its first demo

But we shall see....

# Additional AI Applications

Recently the Recording Academy, the organization behind the Grammys, added a new rule to limit nominations for a Grammy. AI generated songs have become ubiquitous enough in the recording industry that the Recording Academy decided to promulgate a rule barring AI generated music from being nominated unless there is evidence a human was involved in at least part of the generation of the music.

Watch out – that next song you can't get out of your head may be AI generated

# Just when you thought it couldn't get worse

In a paper published in March, artificial intelligence scientists at Stanford University and Canada's MILA institute for AI proposed a technology that could be far more efficient than GPT-4

Known as Hyena, the technology is able to achieve equivalent accuracy on benchmark tests, such as question answering, while using a fraction of the computing power. In some instances, the Hyena code is able to handle amounts of text that make GPT-style technology simply run out of memory and fail.