

# AI 101 – Understanding Generative AI and Large Language Models

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**WORLD STANDARDS WEEK, 2023**

# AI Standards in Time Magazine !

TIME AI 100



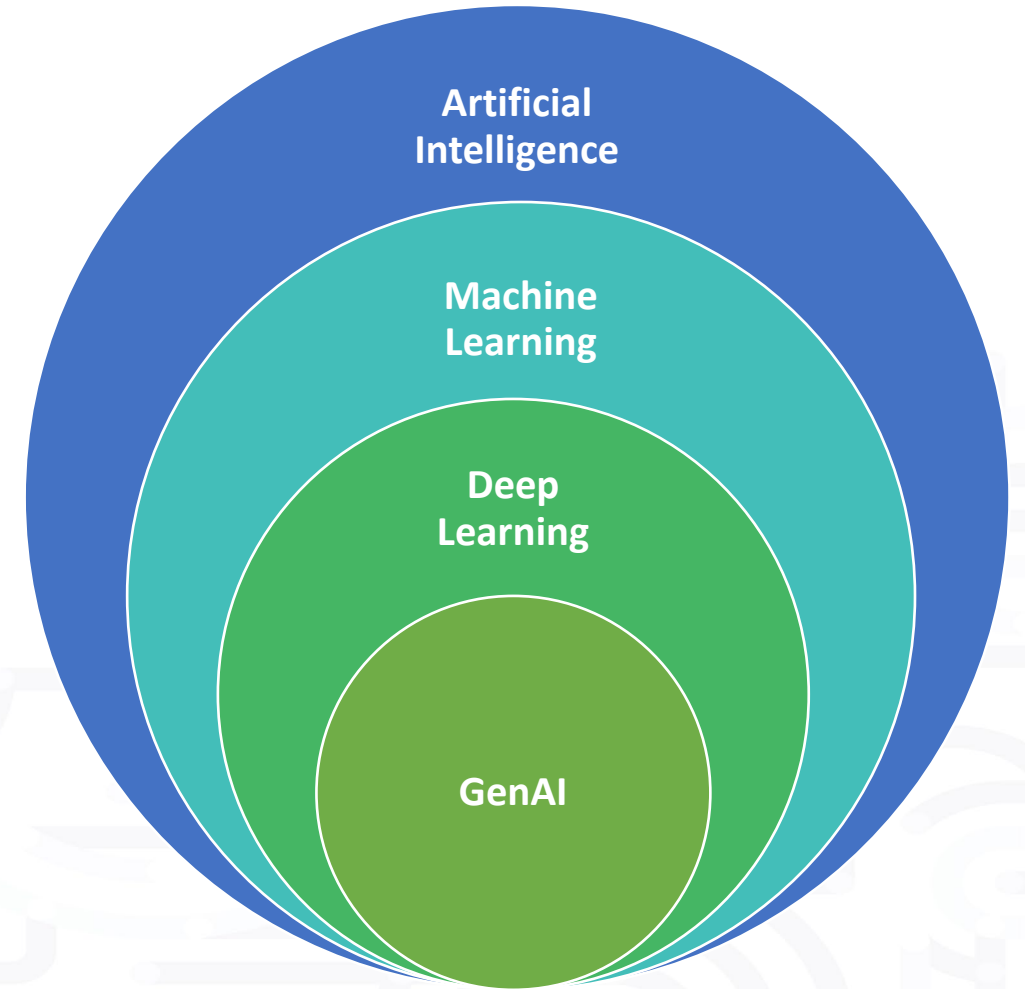
**Elham Tabassi**  
Associate Director of Emerging  
Technologies, NIST  
INCITS/Artificial Intelligence

# Prompt: What is Generative AI?

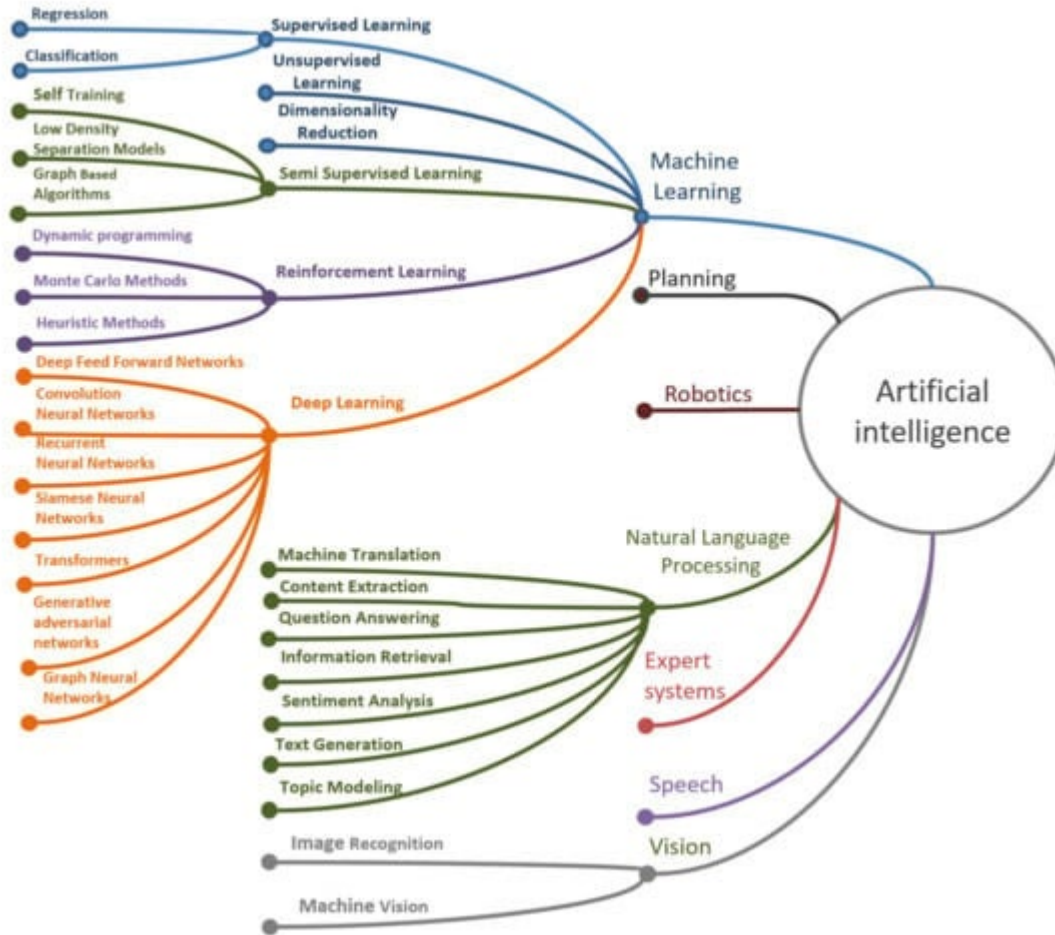
As per ISO/IEC JTC 1 TR 42103, Overview of Synthetic Data in the Context of AI Systems (ISO/IEC JTC 1 SC 42 Project in Progress), Generative AI is defined as, “an AI system which produces synthetic data”



\* Sources: Beatles in DC, courtesy Canvas Generative AI application, archives



# AI Defined



### 3.1.3 artificial intelligence

#### AI

<discipline> research and development of mechanisms and applications of [AI systems \(3.1.4\)](#)

Note 1 to entry: Research and development can take place across any number of fields such as computer science, data science, humanities, mathematics and natural sciences.

### 3.1.4 artificial intelligence system

#### AI system

engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives

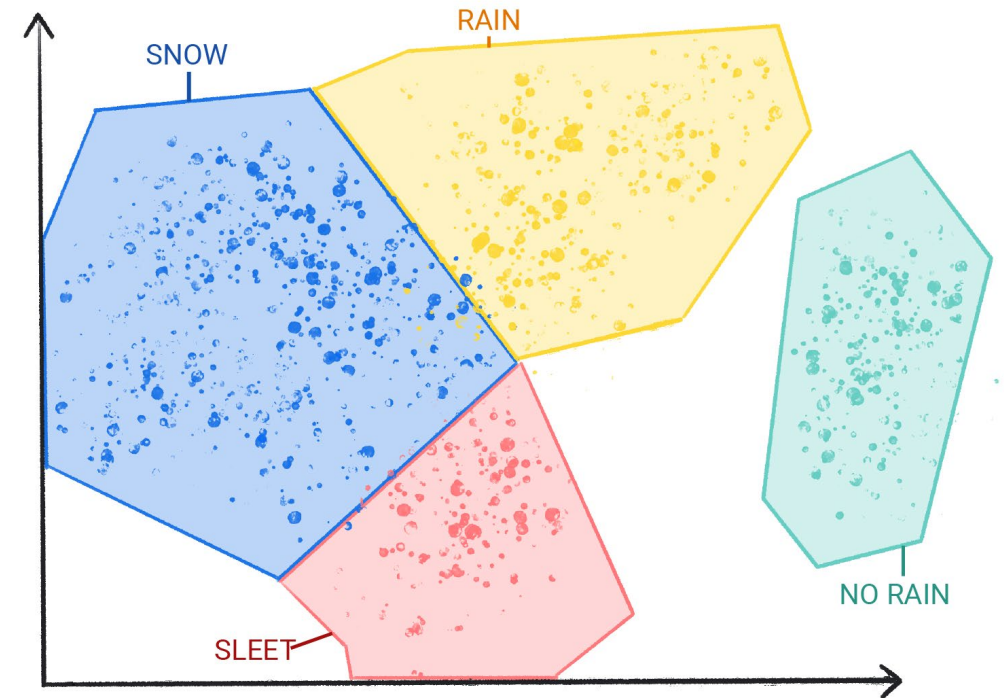
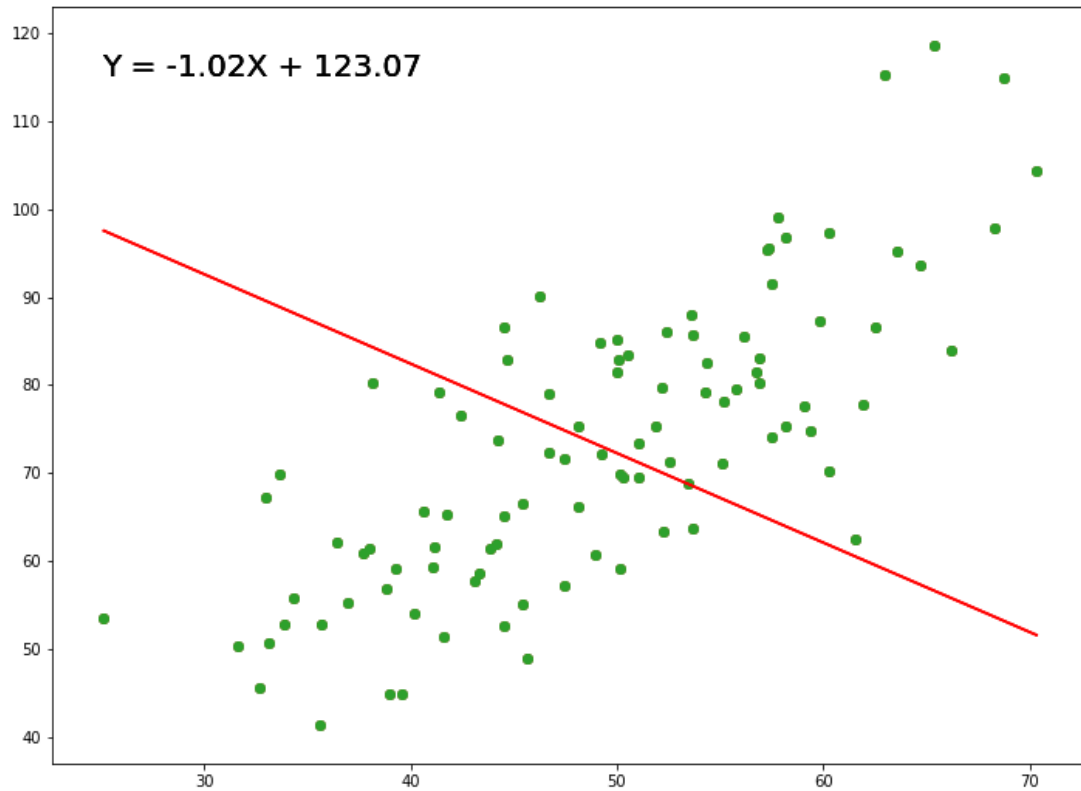
Note 1 to entry: The engineered system can use various techniques and approaches related to [artificial intelligence \(3.1.3\)](#) to develop a [model \(3.1.23\)](#) to represent data, [knowledge \(3.1.21\)](#), processes, etc. which can be used to conduct [tasks \(3.1.35\)](#).

Note 2 to entry: AI systems are designed to operate with varying levels of [automation \(3.1.7\)](#).

[Source: ISO/IEC 22989:2022\(en\), Information technology — Artificial intelligence — Artificial intelligence concepts and terminology](#)

“Colloquially, the term ‘artificial intelligence’ is applied when a machine mimics ‘cognitive’ functions that humans associate with other human minds, such as ‘learning’ and ‘problem solving’.” (Wikipedia)

# Machine Learning: Regression and Clustering

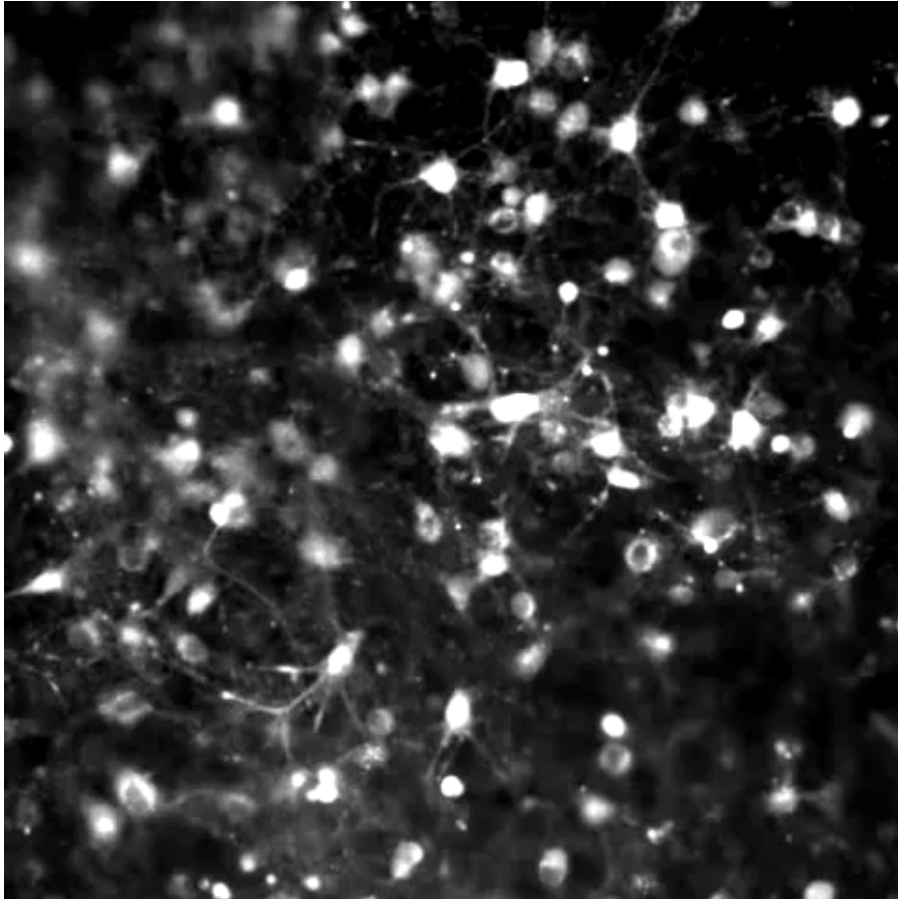


[Source: Linear Regression Using Least Squares | by Adarsh Menon | Towards Data Science](#)

[Source: What is Machine Learning? | Google for Developers](#)

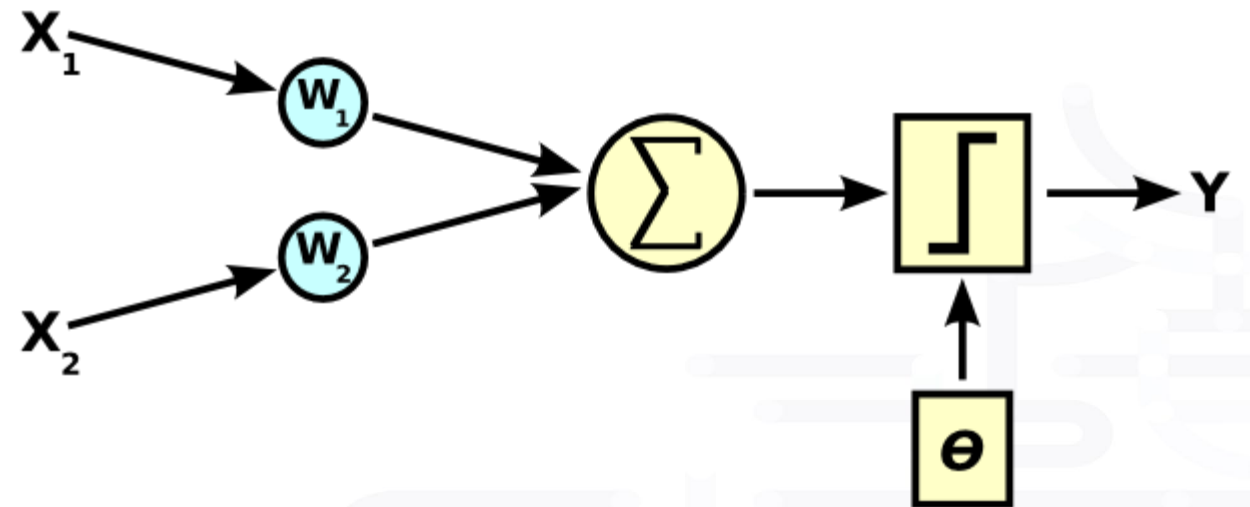
# Neural Networks

## Biological Neurons



Source: Live Neuronal Activity - courtesy of Michelle Kuykendal & Gareth Givanasen  
Secondary: a.i. art blog — Pindar Van Arman's cloudpainter

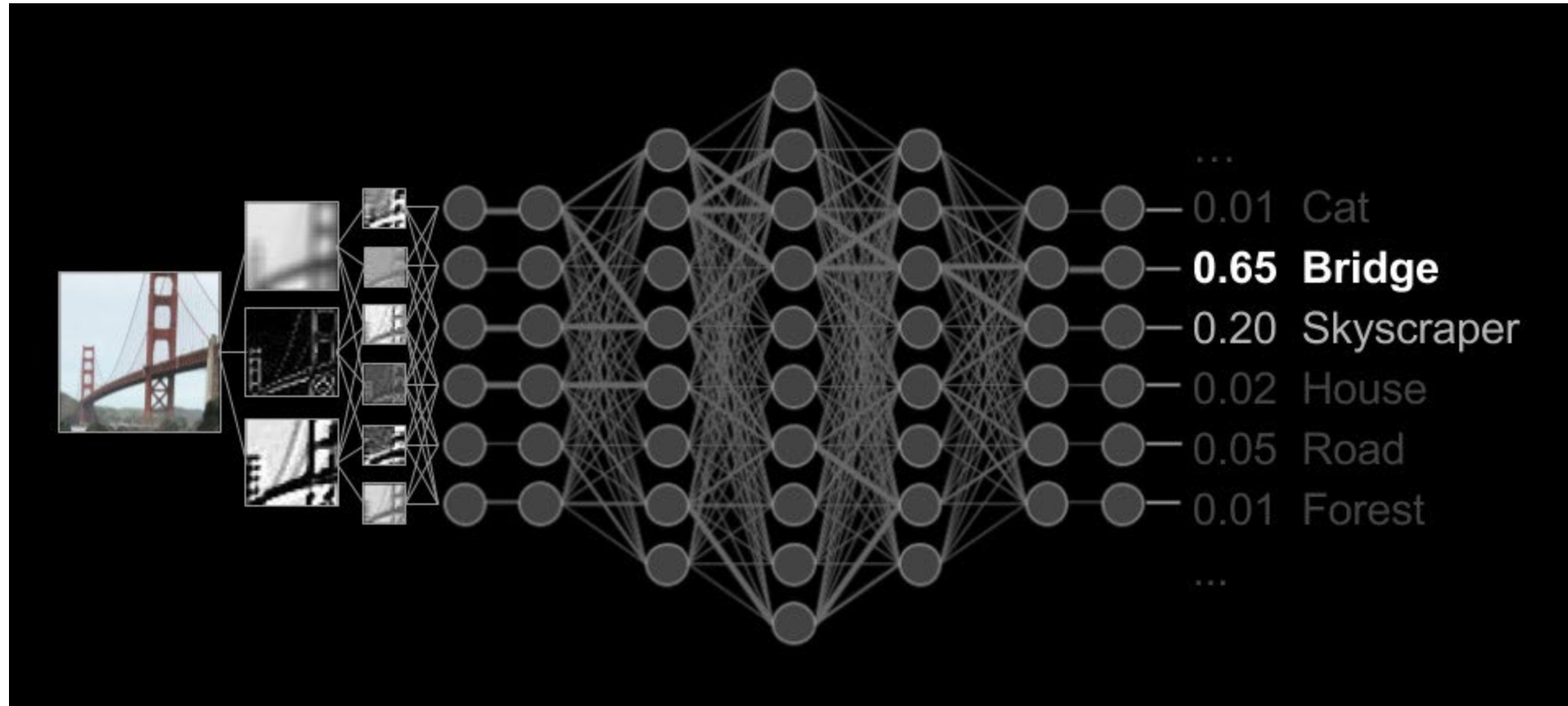
## AI Neuron



$$Y = \text{Activation function}(\sum(\text{weights} * \text{input} + \text{bias}))$$

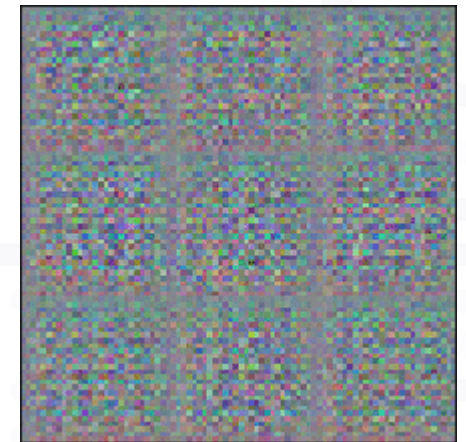
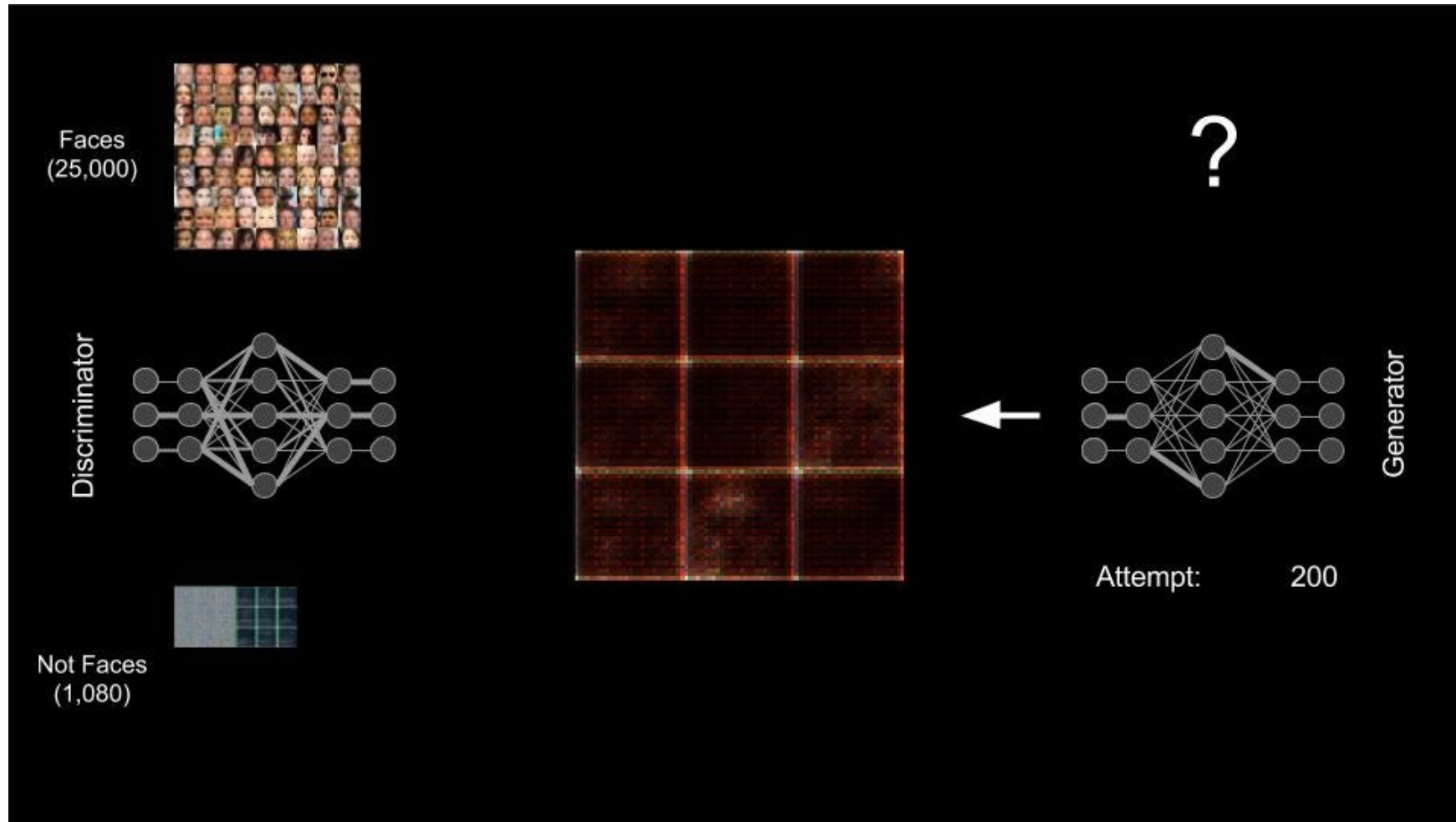
Source: Wikipedia

# Deep Learning – Training and Inference



[Source: a.i. art blog — Pindar Van Arman's cloudpainter](#)

# Generative AI - Images



Source: a.i. art blog — Pindar Van Arman's cloudpainter

Source: a.i. art blog — Pindar Van Arman's cloudpainter



# Generative AI Language Models- Autocomplete

When I hear rain on my roof, I \_\_\_\_\_ in my kitchen

cook soup 9.4%

warm up a kettle 5.2%

nap 2.5%

relax 2.2%

jog...

- A language model is a machine learning model that aims to predict and generate plausible language.
- Words or characters are converted into numerical tokens.
- Estimate the probability of a [token](#) or sequence of tokens occurring within a longer sequence of tokens.

Source: [Introduction to Large Language Models](#) | [Machine Learning](#) | [Google for Developers](#)

# Generative AI LLMs- Attention is All You Need

- Encoder-Decoder Architecture
- Attention Mechanism

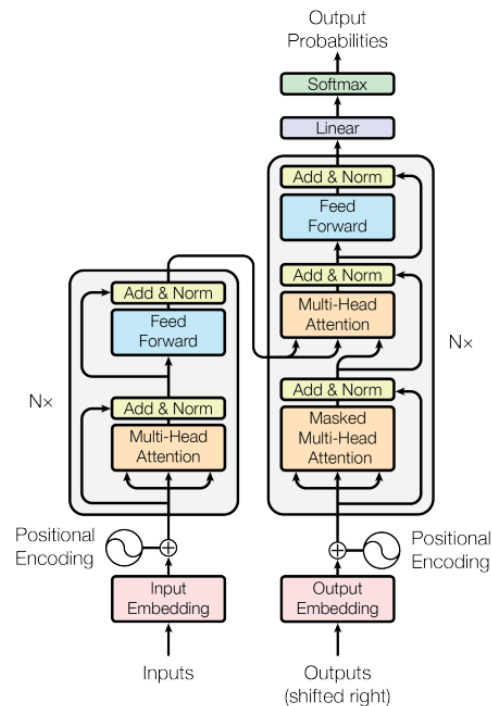


Figure 1: The Transformer - model architecture.

## Example - Original Text:

Original Text: "In a groundbreaking discovery, scientists have found a new exoplanet orbiting a distant star. This exoplanet, named 'Kepler-452b,' is located in the habitable zone of its star, meaning it could potentially support liquid water and, therefore, life. Kepler-452b is about 1.6 times the size of Earth and orbits a sun-like star called Kepler-452. This discovery raises exciting possibilities for the search for extraterrestrial life beyond our solar system."

## Summary:

Summary: "Scientists have discovered a new exoplanet, Kepler-452b, in the habitable zone of a sun-like star. It's 1.6 times the size of Earth and could potentially support life, sparking excitement in the search for extraterrestrial life."

Source: ChatGPT- prompt: example requested for this presentation

# Challenges with GenerativeAI

- **Hallucinations**
- **Copyright**
- **Bias**
- **Adversarial Attacks (Security)**
- **Misinformation and Deepfakes**
- **Data Privacy**
- **Lack of Accountability**
- **Environmental Impact**
- **Workforce Displacement**
- **Regulations and Governance**

# Prompt: Will Generative AI Rewrite the Future?

ChatGPT: 10/6/23, 8:55 PM (PST)

Generative AI has the potential to influence the future significantly, but its impact will depend on technological advancements, regulatory decisions, ethical considerations, and societal choices. While it won't single-handedly "rewrite" the future, it will play a substantial role in shaping it through innovation, economic changes, and addressing important ethical and social implications.

# For More Information

- [A Beginner's Guide to Large Language Models \(nvidia.com\)](#)
- [How LLMs are Unlocking New Opportunities for Enterprises \(nvidia.com\)](#)
- [Prompt engineering overview | Microsoft Learn](#)
- [Introduction to Large Language Models | Machine Learning | Google for Developers](#)
- [Intel® AI Academy](#)
- [\[1706.03762\] Attention Is All You Need \(arxiv.org\)](#)
- [Stanford CS 25 | Transformers United](#)
- [a.i. art blog — Pindar Van Arman's cloudpainter](#)

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