

# Artificial Intelligence

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# Artificial Intelligence

# AI dalam Karya Fiksi



# Revolution of Technology

- Hunter-gatherer
- Agricultural (neolithic) revolution – 10,000 BC
- 1<sup>st</sup> Industrial (mechanical) revolution – 1760 AD
- 2<sup>nd</sup> Industrial (electrical) revolution – 1870 AD
- 3<sup>rd</sup> Industrial (digital) revolution – 1947 AD
- 4<sup>th</sup> Industrial (internet) revolution – 2010 AD



# Apa itu Cerdas?

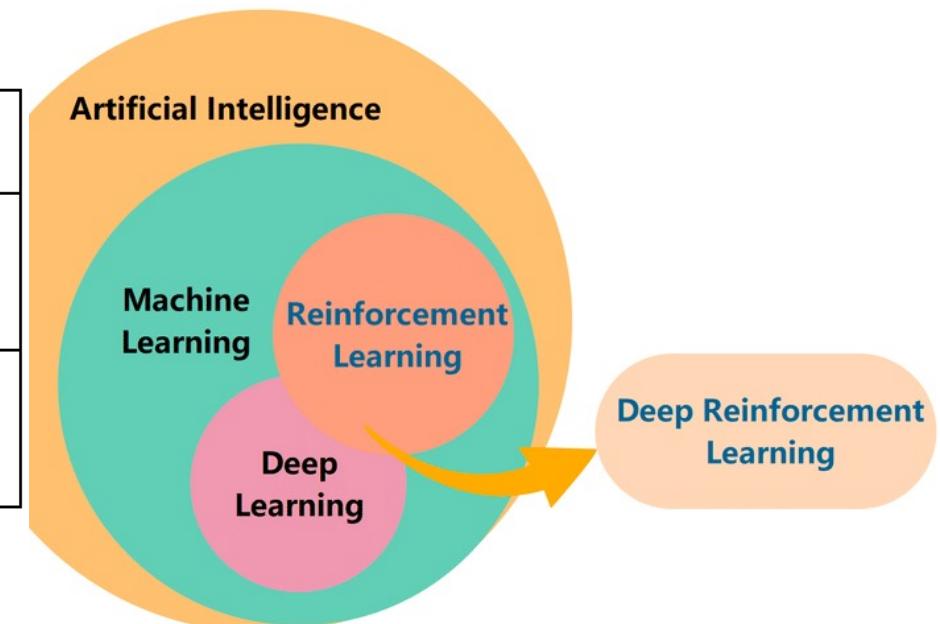
- Menghitung?
- Bermain catur?
- Turing test?

# Back to basic

- *Artificial Intelligence*: studi bagaimana komputer mampu meniru nalar/perilaku manusia
- AI memiliki subset ML dan ML memiliki subset DL (tidak semua AI adalah ML)

	<b>Human-Based</b>	<b>Ideal Rationality</b>
<b>Reasoning-Based:</b>	Systems that think like humans.	Systems that think rationally.
<b>Behavior-Based:</b>	Systems that act like humans.	Systems that act rationally.

*Four Possible Goals for AI According to AIMA*



# Type of AI

Type	Description	Progress
Reactive	Cannot learn. Automatically responding to a limited set or combination of inputs.	Early approach (classical AI)
Data Driven (Artificial Narrow Intelligence)	Capable of learning from observed data to make decisions	Widely used (contemporary AI)
Theory of Mind (Artificial General Intelligence)	Capable to better understand the entities it is interacting with by discerning their needs, emotions, beliefs, and thought processes	In progress
Self Aware (Artificial Super Intelligence)	Have emotions, needs, beliefs, and potentially desires of its own	Hypothetical

# Machine Learning

# **Classical AI vs Contemporary AI**

Descriptors	Classical AI	Contemporary AI
Approach	Knowledge Engineering and Expert System	Machine Learning and Big Data
Knowledge	hardcoded through pre-conceived rules by human experts	learned through observed data by machine learning model
Attitude	Close attitude towards reality	Open attitude towards new insight from reality
Style	More deterministic and explainable	More fuzzy and tacit

# Apa itu Machine Learning?

- Bill Gates (Microsoft): a breakthrough in machine learning would be worth ten microsofts
- Tony Tether (DARPA): machine learning is the next internet
- Jerry Yang (Yahoo): machine learning is today's discontinuity
- John Hennessy (Stanford): machine learning is the hot new thing
- Greg Papadopoulos (Sun): machine learning is going to result in a real revolution

# Machine Learning

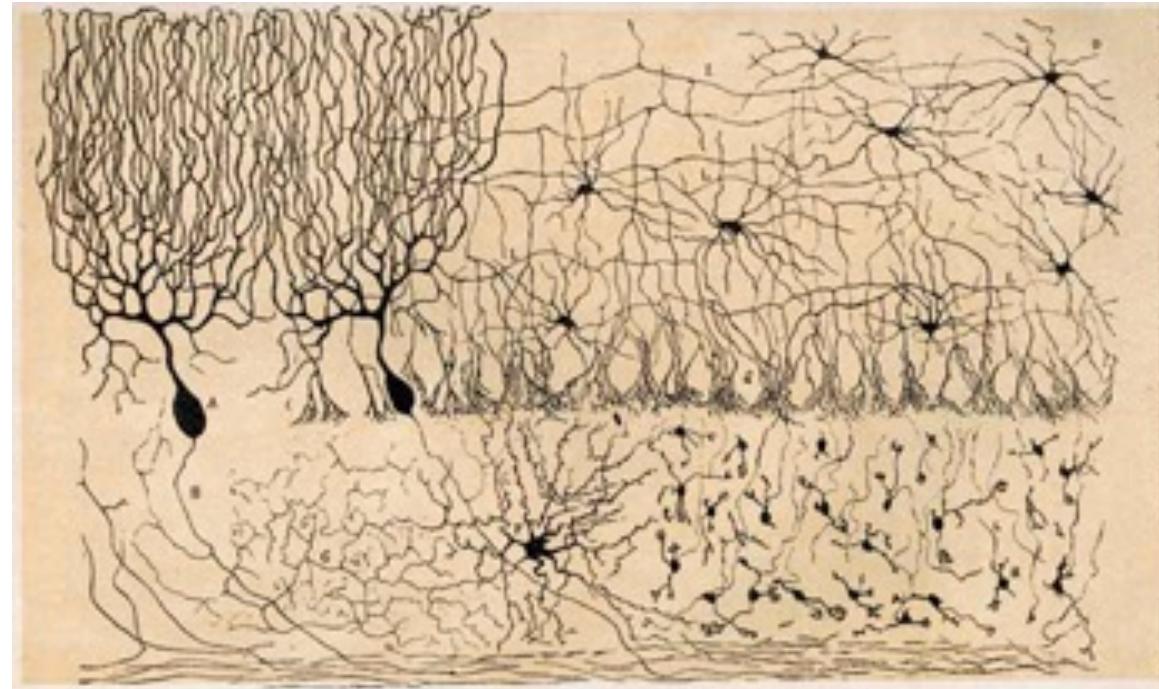
- Subset dari AI (AI kontemporer)



# Deep Learning

# Perkembangan Neurosains

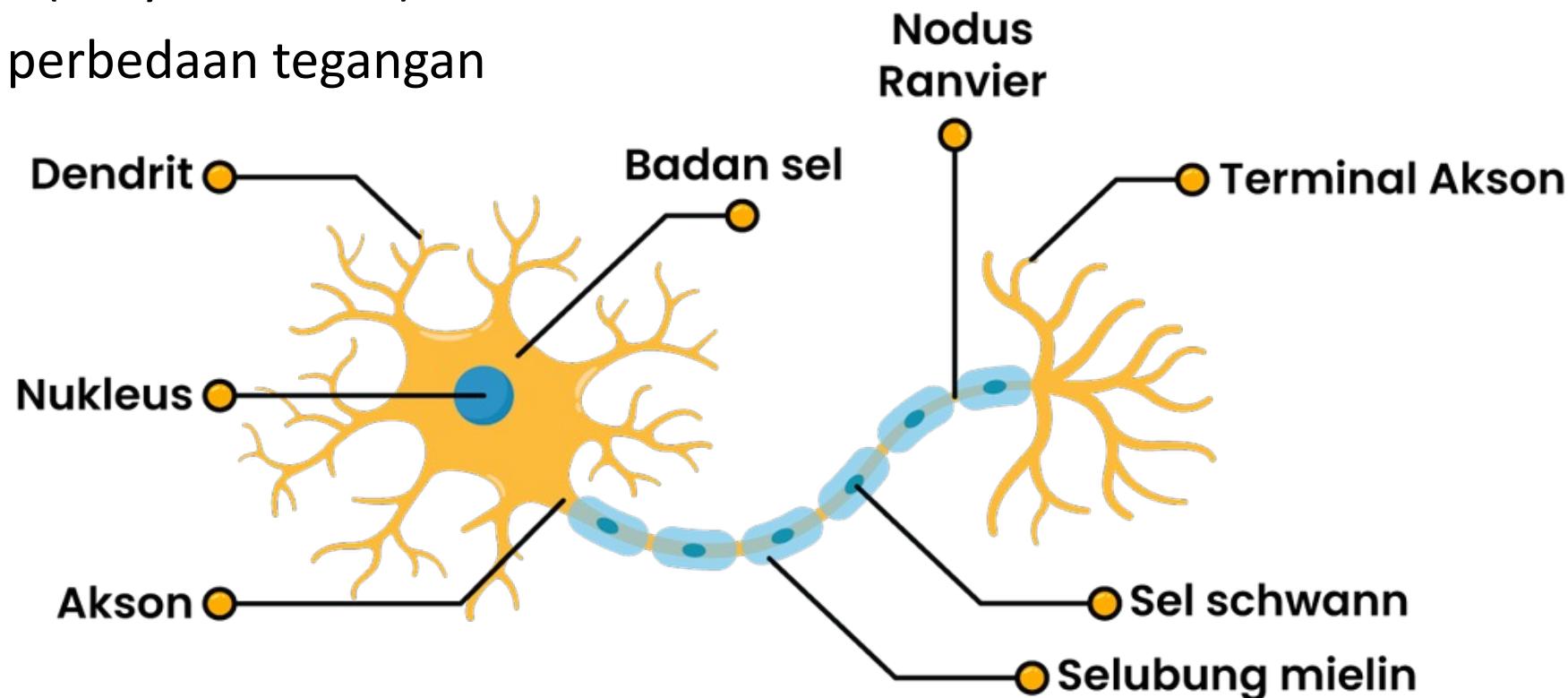
- Cajal: Doktrin Neuron
  - Sistem syaraf terdiri dari individual diskrit sel
- Hebb: Aturan Hebb
  - "Cells that fire together wire together."
- Loewi: Penemuan Neurotransmitter
  - Sel syaraf berkomunikasi melalui molekul ini
- Whittaker: Mekanisme Sinapsis
  - Akumulasi neurotransmitter di gelembung sinapsis
- Pengobatan Neurotransmitter
  - Pengaruh neurotransmitter pada emosi, memori, sistem motorik, dan kesehatan mental
- Pemetaan otak dan fungsinya
  - Kaitan suatu kegiatan dengan aktivitas bagian otak tertentu



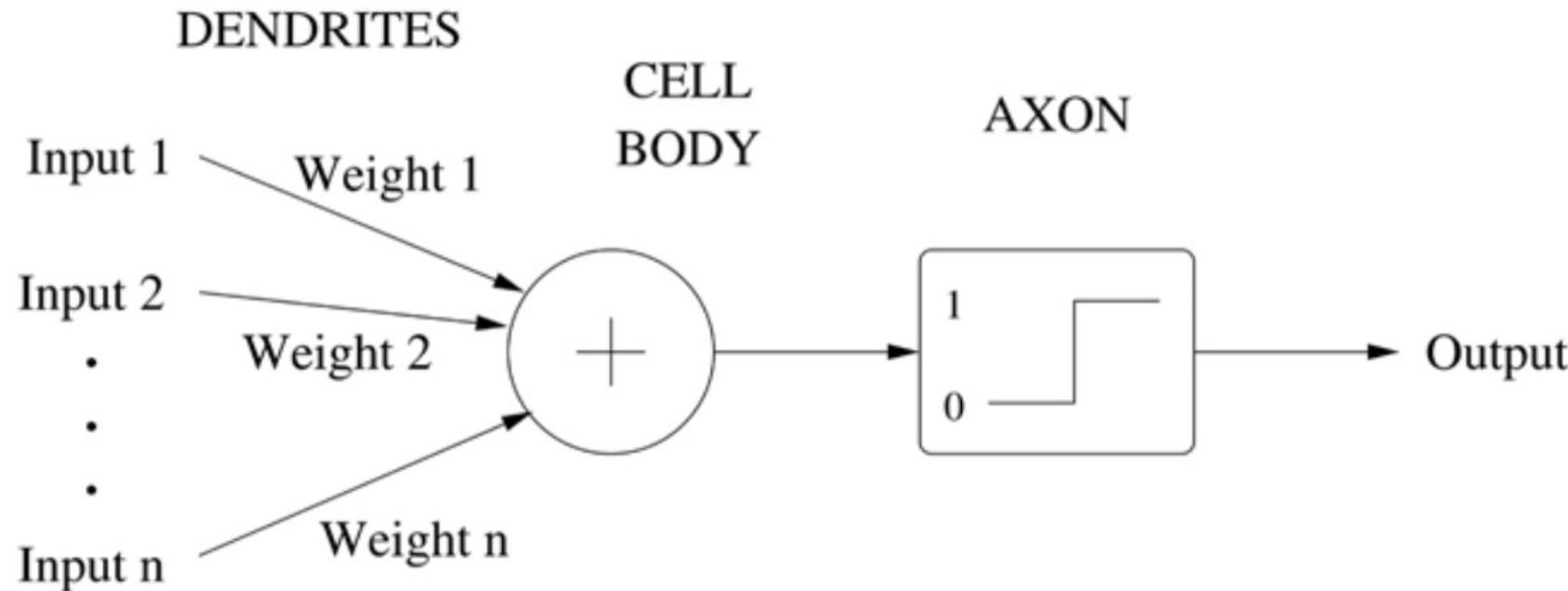
# Sel Syaraf

Komunikasi antar sel syaraf melalui sinyal elektrik dan kimiawi

- Input: sinyal elektrik
- Bobot: neurotransmitter (senyawa kimia)
- Aktivasi: batas ambang perbedaan tegangan
- Output: sinyal elektrik



# Perceptron (1958)



- Rosenblatt, Frank (1958), The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain, Cornell Aeronautical Laboratory, Psychological Review, v65, No. 6, pp. 386–408.

# NEW NAVY DEVICE LEARNS BY DOING

Psychologist Shows Embryo of Computer Designed to Read and Grow Wiser

WASHINGTON, July 7 (UPI) —The Navy revealed the embryo of an electronic computer today that it expects will be able to walk, talk, see, write, reproduce itself and be conscious of its existence.

The embryo—the Weather Bureau's \$2,000,000 "704" computer—learned to differentiate between right and left after fifty attempts in the Navy's demonstration for newsmen.

The service said it would use this principle to build the first of its Perceptron thinking machines that will be able to read and write. It is expected to be finished in about a year at a cost of \$100,000.

Dr. Frank Rosenblatt, designer of the Perceptron, conducted the demonstration. He said the machine would be the first device to think as the human brain. As do human be-

ings, Perceptron will make mistakes at first, but will grow wiser as it gains experience, he said.

Dr. Rosenblatt, a research psychologist at the Cornell Aeronautical Laboratory, Buffalo, said Perceptrons might be fired to the planets as mechanical space explorers.

## Without Human Controls

The Navy said the perceptron would be the first non-living mechanism "capable of receiving, recognizing and identifying its surroundings without any human training or control."

The "brain" is designed to remember images and information it has perceived itself. Ordinary computers remember only what is fed into them on punch cards or magnetic tape.

Later Perceptrons will be able to recognize people and call out their names and instantly translate speech in one language to speech or writing in another language, it was predicted.

Mr. Rosenblatt said in principle it would be possible to build brains that could reproduce themselves on an assembly line and which would be conscious of their existence.

1958 New York Times...

In today's demonstration, the "704" was fed two cards, one with squares marked on the left side and the other with squares on the right side.

## Learns by Doing

In the first fifty trials, the machine made no distinction between them. It then started registering a "Q" for the left squares and "O" for the right squares.

Dr. Rosenblatt said he could explain why the machine learned only in highly technical terms. But he said the computer had undergone a "self-induced change in the wiring diagram."

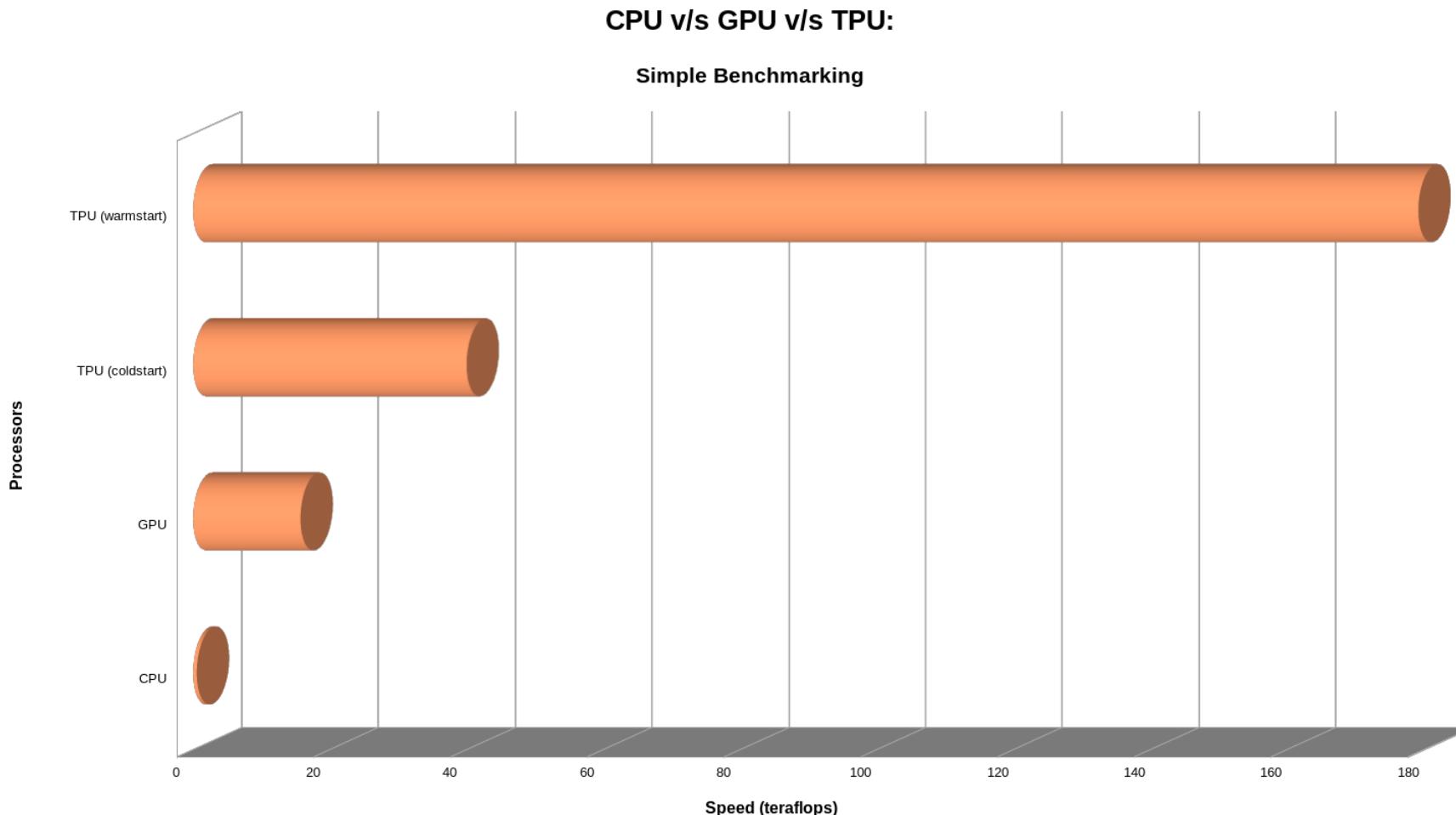
The first Perceptron will have about 1,000 electronic "association cells" receiving electrical impulses from an eye-like scanning device with 400 photo-cells. The human brain has 10,000,000,000 responsive cells, including 100,000,000 connections with the eyes.

# Mengapa deep learning baru berkembang di abad 21?

Deep learning harus terlebih dulu melalui beberapa kendala dan terobosan

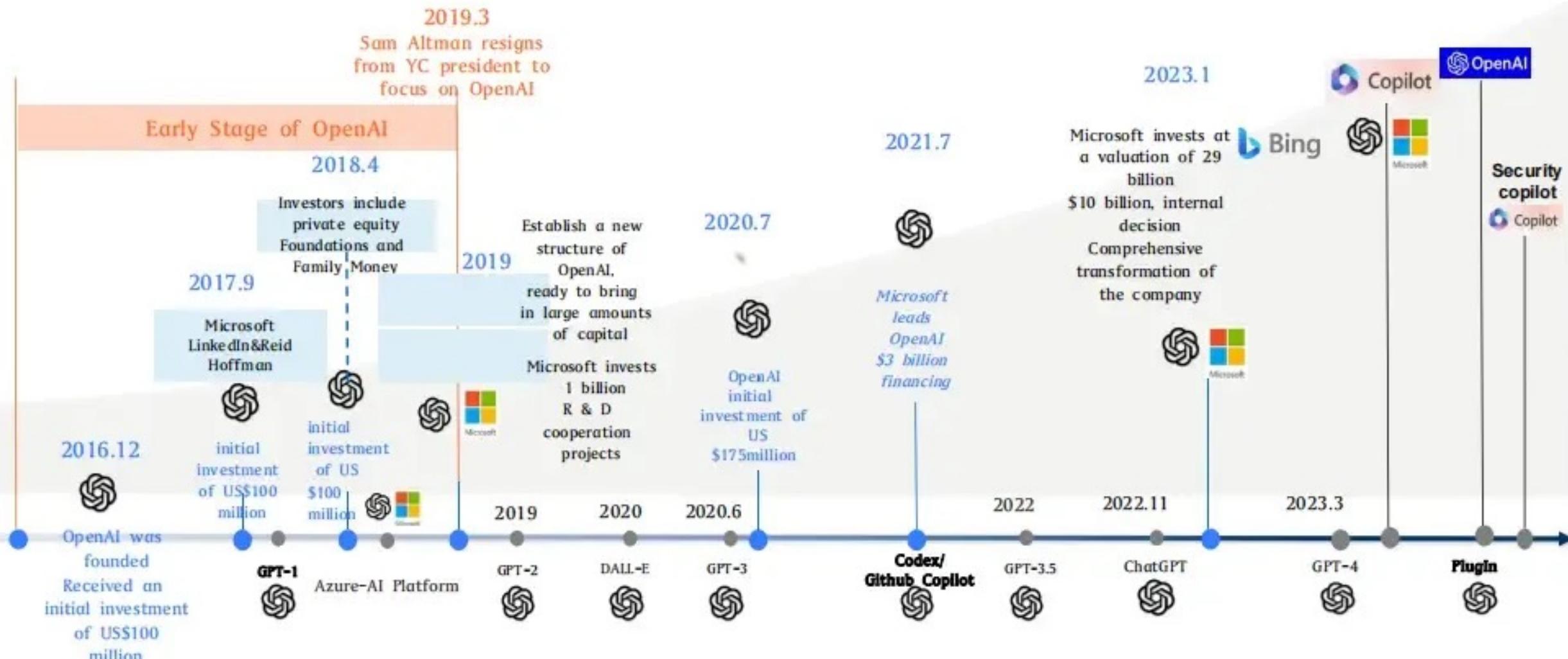
- 1958: Penemuan Perceptron
  - Memungkinkan model yang meniru sel syaraf
- 1974-1980: 1st AI Winter
  - Kelemahan Perceptron membuat dana riset di bidang ini dipotong drastis
- 1984: Penemuan Algoritma Backpropagation
  - Memungkinkan konstruksi model secara berlapis
- 1987-1993: 2nd AI Winter
  - Industri AI dirasa terlalu mahal dan tidak memiliki masa depan, dana riset di bidang ini dipotong drastis
- 2012: Penemuan mekanisme GPU untuk menghitung tensor
  - Memungkinkan pelatihan model, dengan arsitektur yang sangat dalam, dengan data yang sangat besar, secara cepat dan efisien melalui operasi tensor

# CPU vs GPU vs TPU



# Foundation Model

# LLM Company Timeline

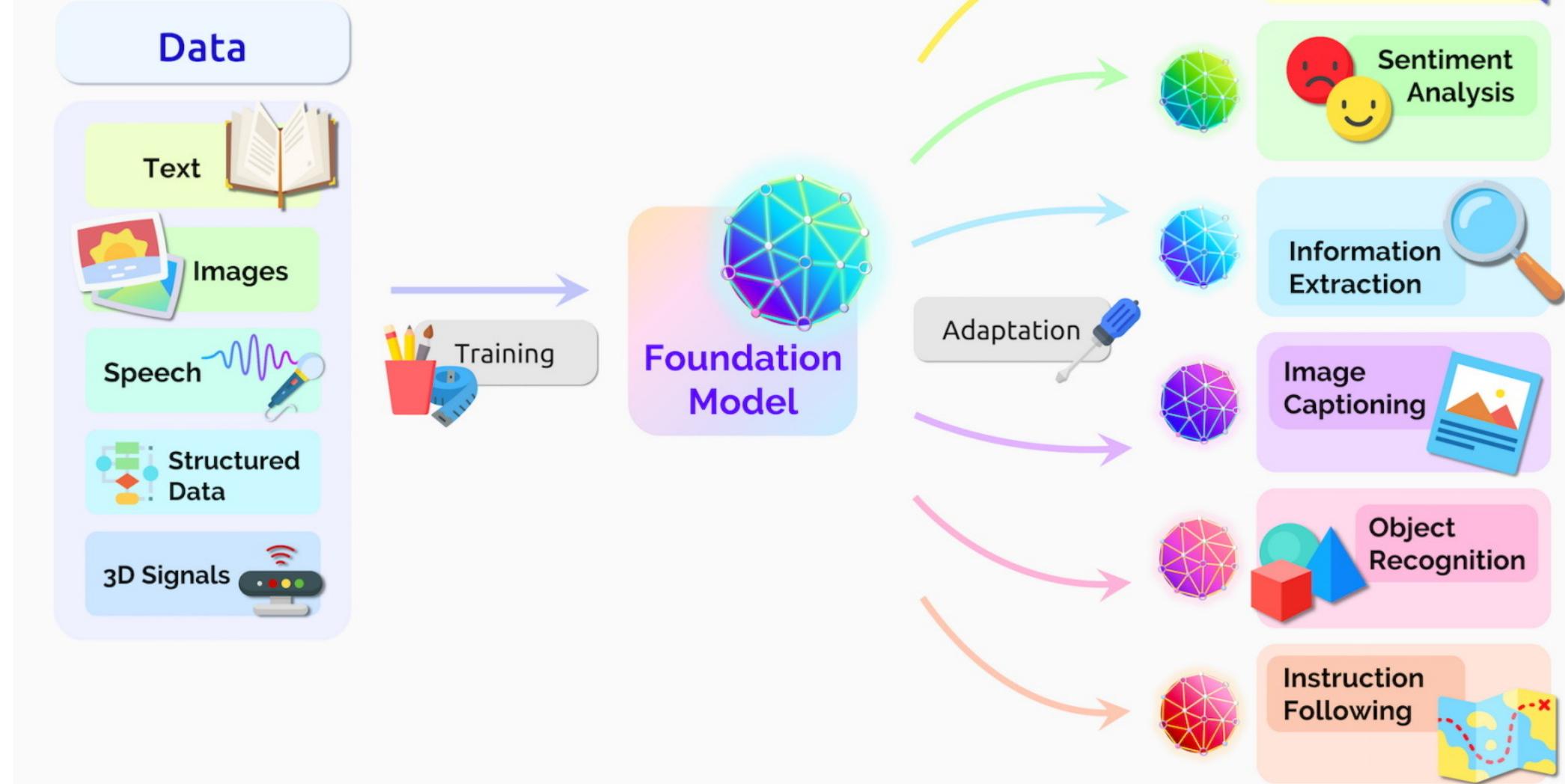


# Large Language Model Comparison

Model	Performance Metrics	Use Case Suitability	Parameter Count	Training Data	Architecture	Unique Functionalities
OpenAI GPT-4	- High accuracy - Low perplexity	Creative writing, chatbots, coding assistance	Over 175 billion	Trained on diverse internet content	Transformer-based autoregressive model	<ul style="list-style-type: none"> <li>- Excellent at generating coherent text</li> <li>- Versatile in generating human-like text</li> <li>- Robust API access for integration</li> </ul>
Google Gemini	- Strong reasoning	Multimodal tasks requiring text and images	Varies by version (up to 1 trillion)	Multimodal datasets including images and text	Transformer-based with multimodal capabilities	<ul style="list-style-type: none"> <li>- Integrates text with images; handles complex queries</li> <li>- Designed for complex reasoning tasks</li> </ul>
Meta AI LLaMA	- Competitive scores	Research projects and academic use	Up to 65 billion	Focused on publicly available data	Transformer-based	<ul style="list-style-type: none"> <li>- Open-source for customization</li> <li>- Community-driven improvements</li> </ul>
Anthropic Claude	- High user intent	Applications prioritizing safety and ethics	Varies by version	Curated to minimize bias and harmful outputs	Transformer-based	<ul style="list-style-type: none"> <li>- Focus on ethical AI use</li> <li>- Mechanisms to reduce harmful outputs</li> </ul>
Mistral	- Strong performance	Real-time applications, programming tasks	Up to 123 billion	Trained on multilingual datasets	Transformer-based with GQA and SWA	<ul style="list-style-type: none"> <li>- Advanced attention mechanisms (GQA)</li> <li>- Enhanced function calling capabilities</li> </ul>

# Foundation Model

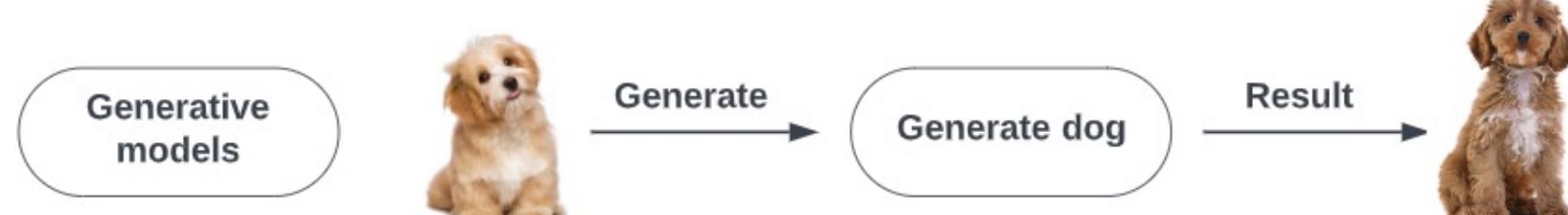
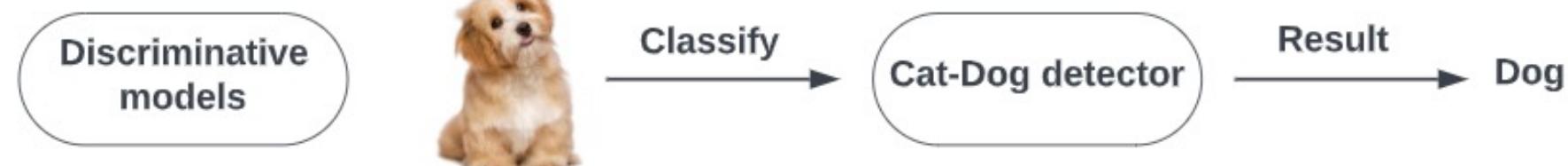
- <https://youtu.be/QPQy7jUpmyA?feature=shared>



# Generative AI

# Generative Model

- **Generative** models menghasilkan sampel data baru.
- **Discriminative** models membedakan antara berbagai jenis data yang berbeda.
- Coba sebutkan contoh generative dan discriminative AI di sekitar kalian



# CIT's Smart Attendance



## Take Form

In order to process the absent, you can either handle it with our AI (which requires you to take a picture), or assign the students manually.

Select course —

Select process —

Process Absent

### Result and Confirmation Form

Below is the results of the absent process, you need to check them and to confirm.

Confirm

### Attending

Below is the list of attending student. Please proceed to 'Action' to move a student to other categories.

Search

Detected	Recognized	Name	Action

## Upload History

## Captioning App

[Home](#) [Batch](#) [Profile](#) [Logout](#)

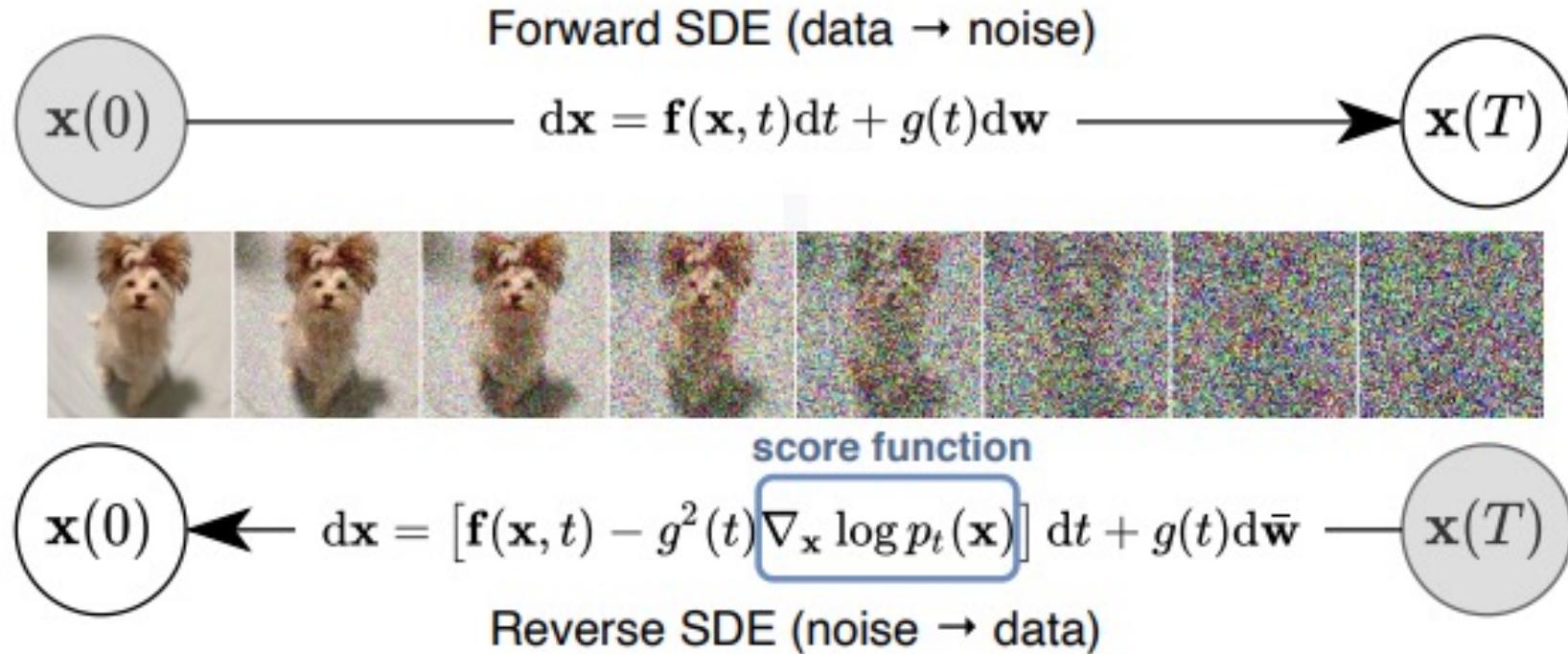
No file chosen, yet!

Select Model:

VIT + IndoBERT

# Demo

- Image Generator via Stable Diffusion



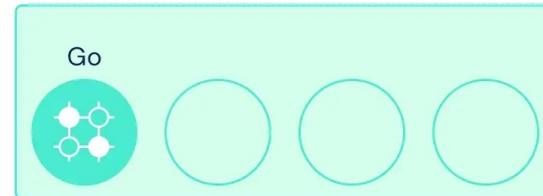
# Agentic AI

# Progress on AGI

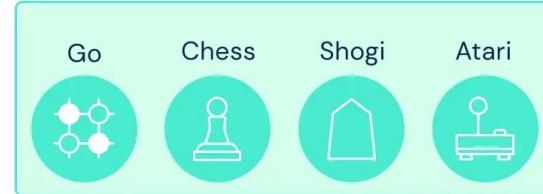
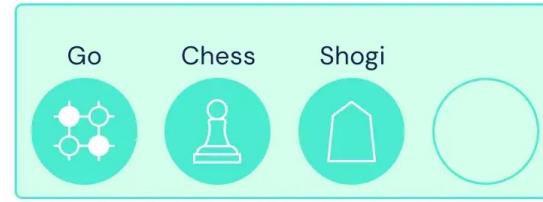
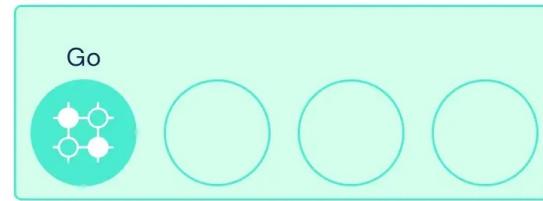
- <https://www.deepmind.com/blog/muzero-mastering-go-chess-shogi-and-atari-without-rules>



Domains



Knowledge



**AlphaGo** becomes the first program to master Go using neural networks and tree search  
(Jan 2016, Nature)

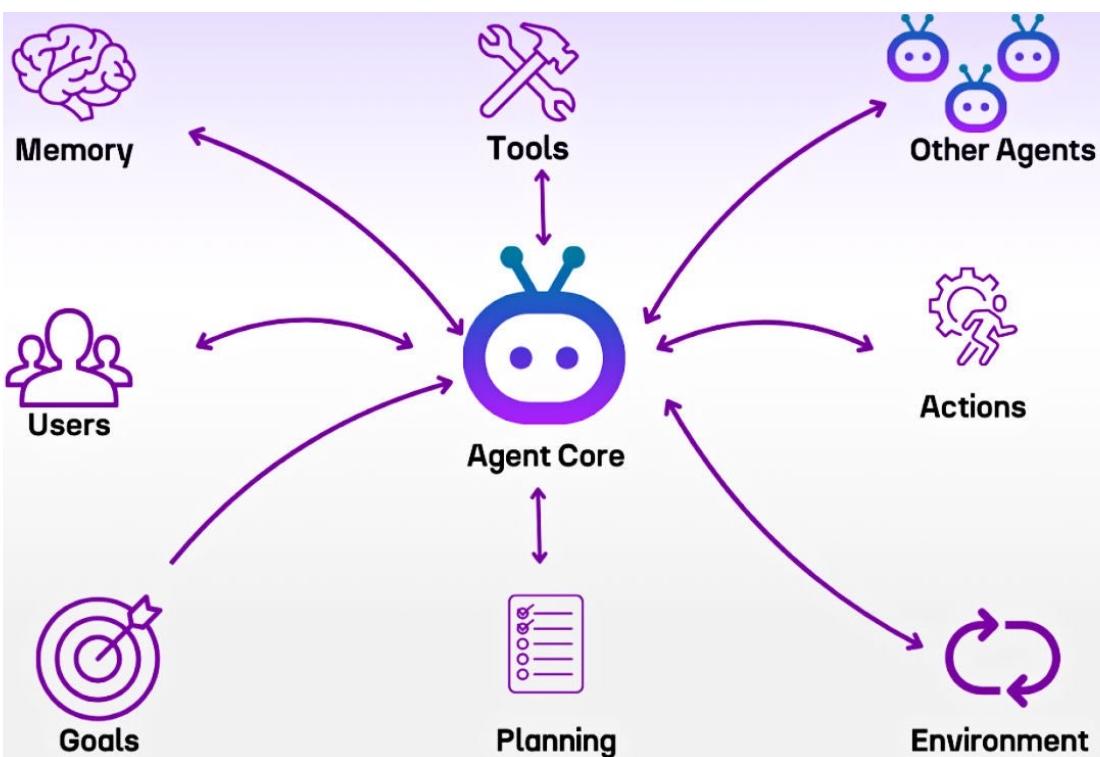
**AlphaGo Zero** learns to play completely on its own, without human knowledge  
(Oct 2017, Nature)

**AlphaZero** masters three perfect information games using a single algorithm for all games  
(Dec 2018, Science)

**MuZero** learns the rules of the game, allowing it to also master environments with unknown dynamics.  
(Dec 2020, Nature)

# Beyond Generative AI

- Agentic AI



Aspect	Agentic AI	Generative AI
<b>Purpose</b>	Automates decision-making and complex reasoning	Creates new content, such as text, images, or code
<b>Core functionality</b>	Executes tasks by understanding context and goals	Generates outputs based on patterns in training data
<b>Key strength</b>	Handles multi-step, logic-based workflows	Produces creative and human-like outputs
<b>Use cases</b>	Complex workflow automation, adaptive problem-solving	Content creation, brainstorming, creative writing
<b>Adaptability</b>	Continuously refines decisions based on real-time feedback	Primarily limited to improving content relevance or style
<b>Examples</b>	Automating supply chain logistics, troubleshooting system errors	Writing articles, designing graphics, coding prototypes

# Demo

- Vision Agent via Landing Vision

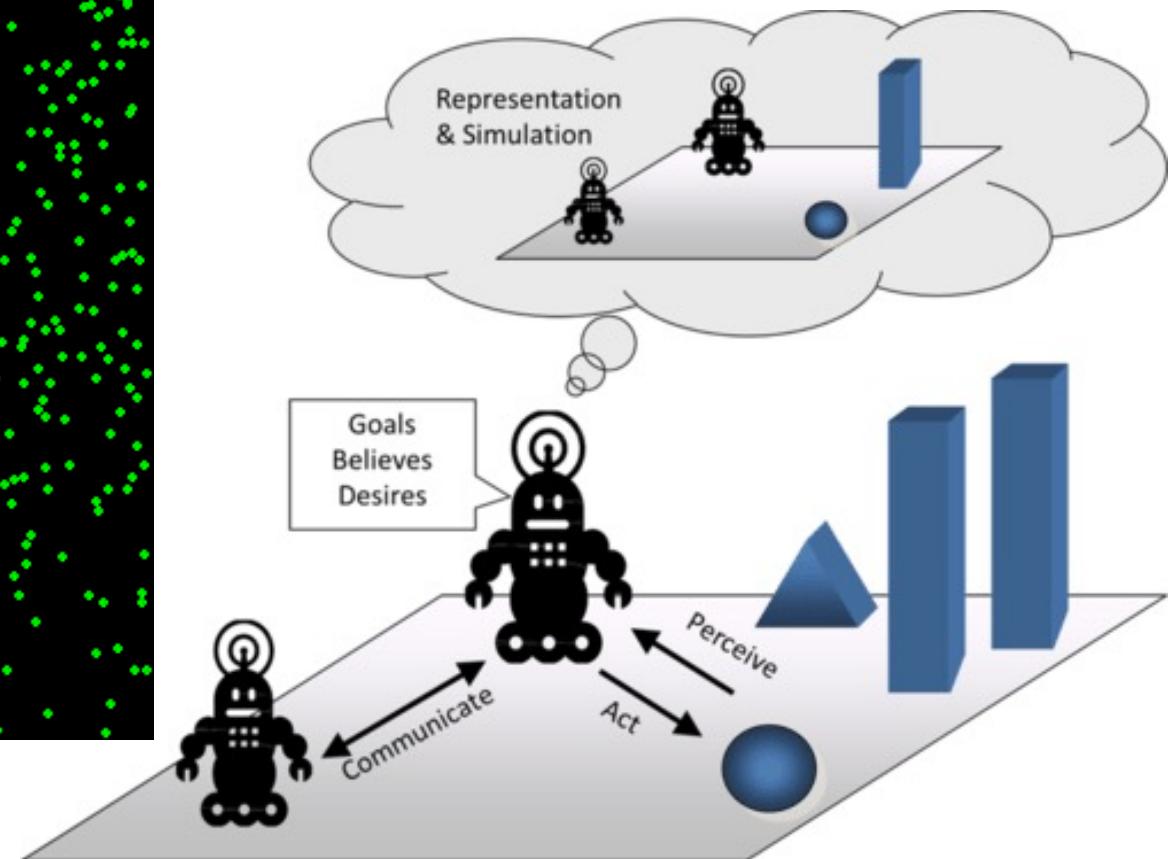
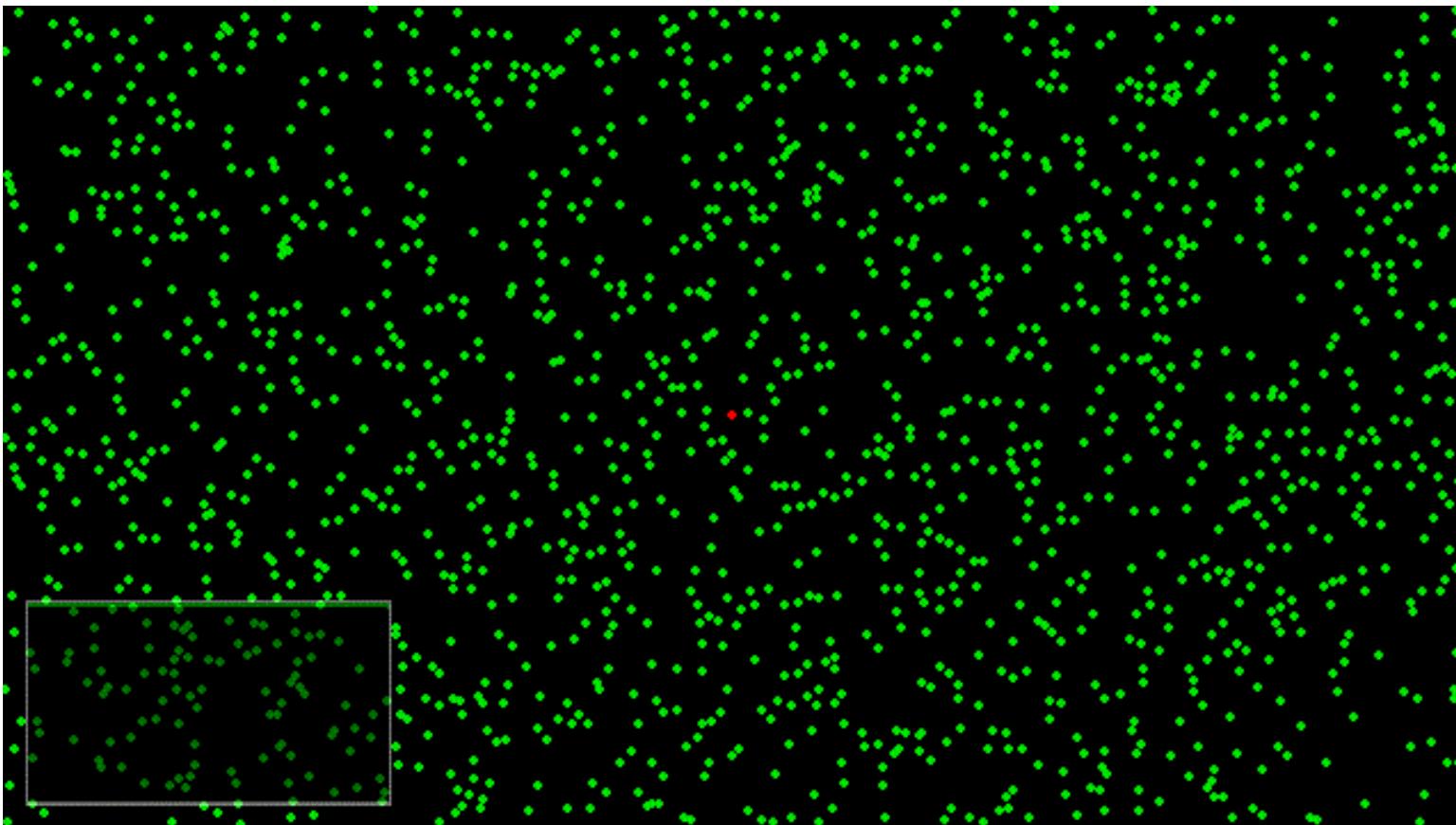
```
user_prompt = """
```

Write a program that counts soda cans in an image.

The program should output the count, draw bounding boxes around each detected can, and display the confidence score for each prediction. Additionally, calculate the inventory percentage based on a maximum capacity of 35 cans. If the inventory is below 50%, the program should output a status of "Needs Restocking." If the inventory is above 50%, it should output a status of "Healthy.""""

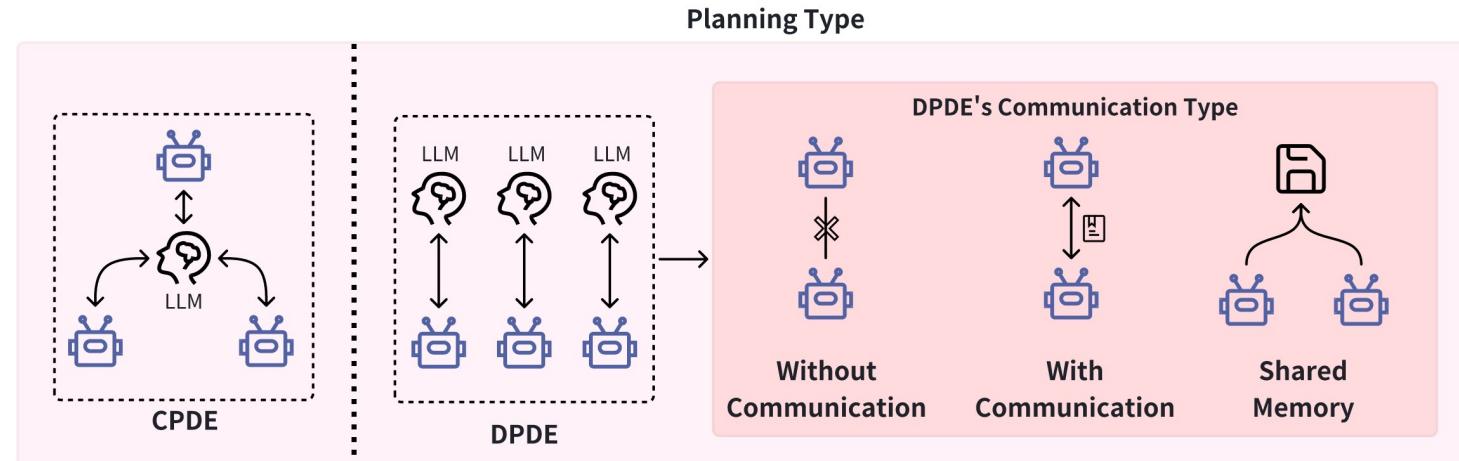
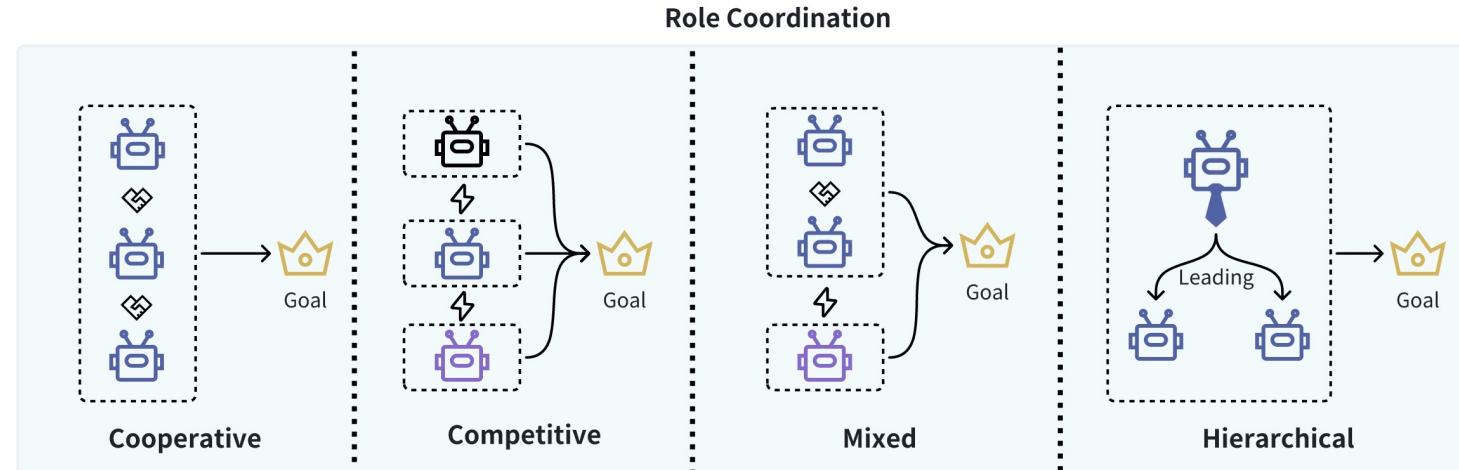


# Agent Based Model



# Multi-Agent System

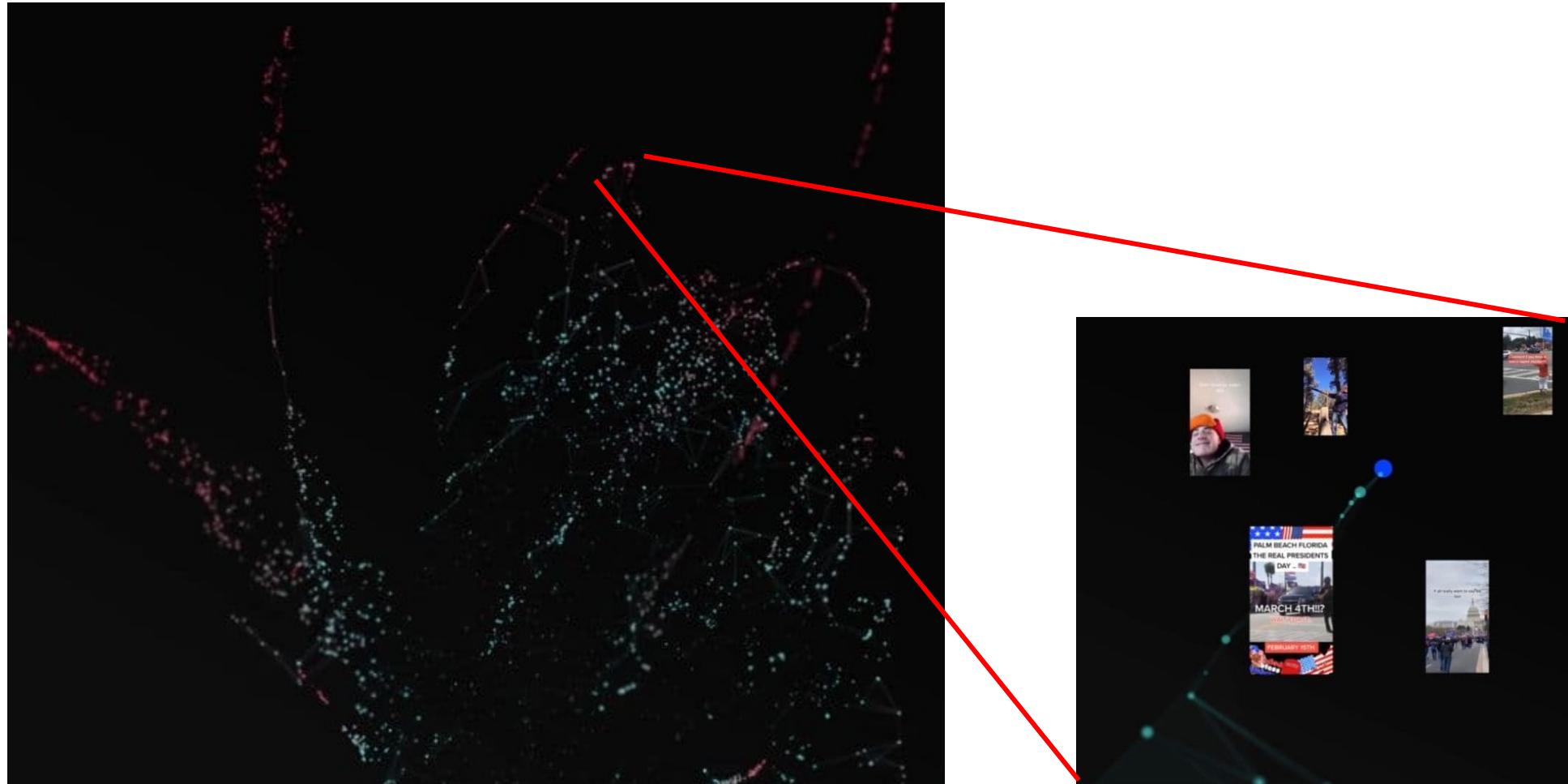
- <https://www.youtube.com/watch?v=lgMKiIEbfN8>
- <https://www.youtube.com/watch?v=fsVJuN75vzE>



# Ethics of AI

# Implikasi Praktis Reduksionisme

- Contoh: Algoritma TikTok --> reduksi spasial (aktivitas manusia = operasi tensor)
- Konsekuensi:
  - Polarization
  - Addiction
  - Etc



# Studi Kasus

- Deep Fake



# Studi Kasus

## • Image Enhancement

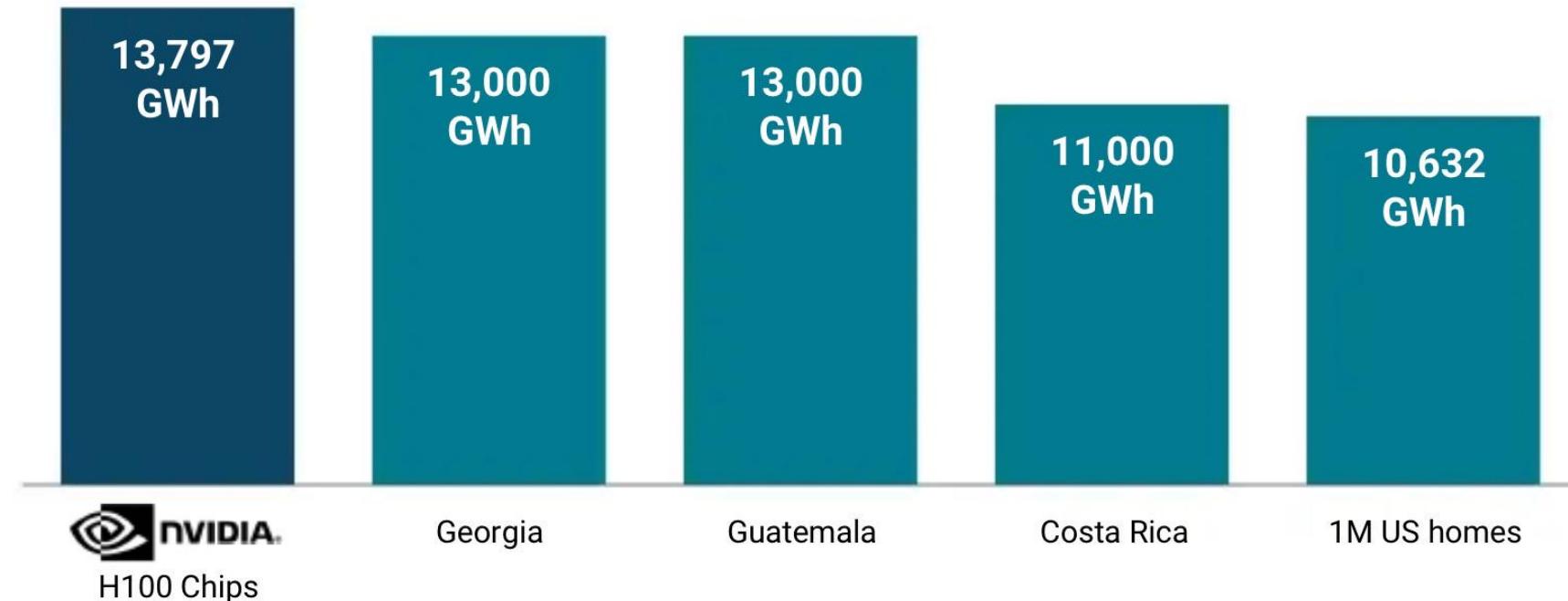
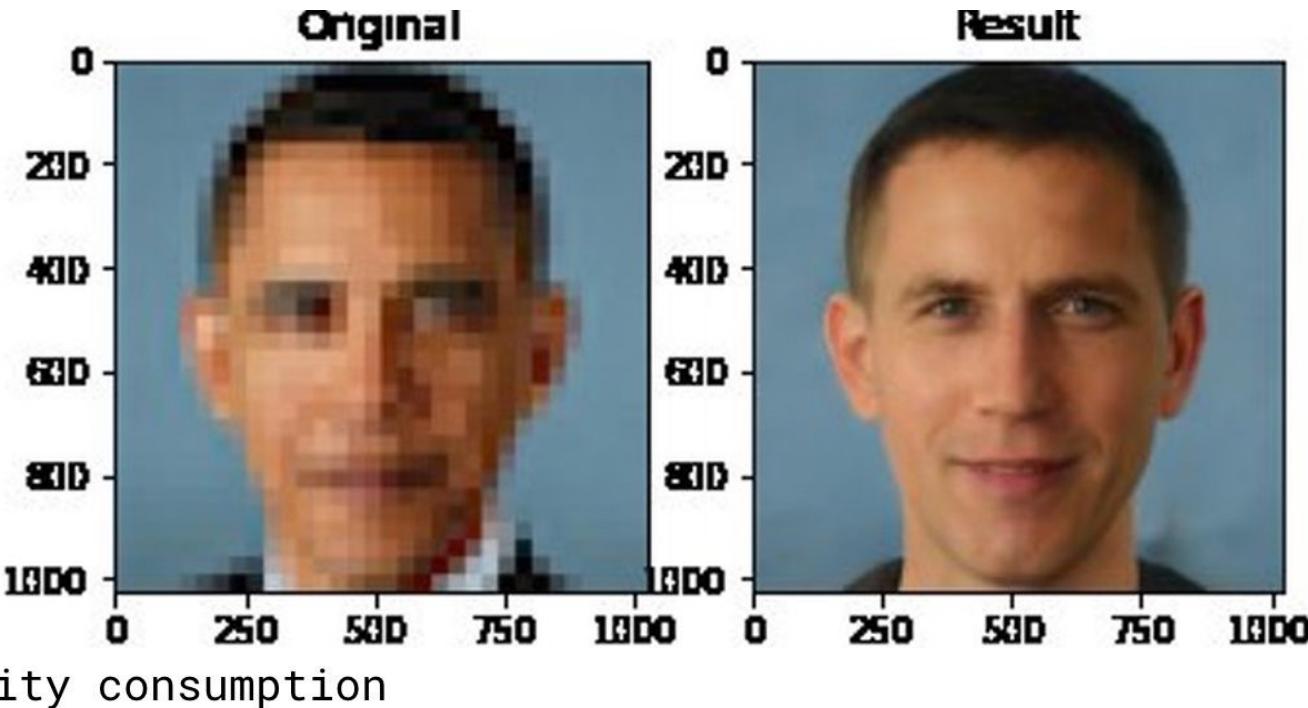
The screenshot shows a Jupyter Notebook interface. On the left, there is a code editor with the following Python script:

```
+ Code + Text  
input_folder = 'inputs/user_upload'  
result_folder = f'results/user_upload_{CODEFORMER_FIDELITY}/final_results'  
input_list = sorted(glob.glob(os.path.join(input_folder, '*')))  
for input_path in input_list:  
    img_input = imread(input_path)  
    basename = os.path.splitext(os.path.basename(input_path))[0]  
    output_path = os.path.join(result_folder, basename+'.png')  
    img_output = imread(output_path)  
    display(img_input, img_output)
```

On the right, there are two images side-by-side. The left image is labeled "Input" and shows three men standing outdoors in front of green foliage. The right image is labeled "CodeFormer" and shows the same three men, but their faces appear more defined and the overall image has better contrast and color balance.

# Implikasi Etis

- Resiko AI:
  - Bias
  - Halusinasi
  - Konsen
  - Keamanan
- Konsiderasi lain:
  - Energi
  - Kontrol
  - Kriminalitas
  - Akuntabilitas



# Beberapa Artikel Tambahan

- <https://www.thegospelcoalition.org/article/the-faqs-what-christians-should-know-about-artificial-intelligence/>
- <https://erlc.com/resource-library/statements/artificial-intelligence-an-evangelical-statement-of-principles/>

# Tuhan Memberkati

