



# Understanding of Technological Evolution and New-age Education

AI Professor in Silla University, S.Korea  
CEO of IACST



pkkim95@gmail.com



pkkim95

# Contents

1. Industrial Revolution and Connection
2. Digital World, Metaverse, and AI
3. Generative AI and Its Impact
4. New Education for a New World

# Questions

1. What is the 4<sup>th</sup> Industrial Revolution(IR)?
2. What will be the 5<sup>th</sup> IR?
3. What is the direction(goal) of Technological Evolution?
4. What is Metaverse and will it be the next Internet?
5. Should we change our education because of AI?
6. If so, what should be taught in AI-Era

# Part 1

## Industrial Revolution and Connection



# Industrial Revolution and Technological Evolution Trend

6mil-Ape

1543-Copernican System

1687-Universal Gravitation

1712-**Steam Engine**

1859-Theory of Evolution

1865-Electromagnetic Field

1882-**Electricity for Lighting**

1905,1915-Theory of Relativity

1911-Atomic Structure

1913-Ammonia Synthetic Fertilizer

1928-Antibiotic

1920'-Quantum Physics

1932-Neutron

1942-Nuclear Chain Reaction

1946-Vacuum Tube Computer

1953-DNA Structure

1958-Perceptron

1965-Cosmic Background Radiation

1969-**Internet(Arpanet)**

1974-Super String Theory

1998-Accelerating Universe

2006-Induced Pluripotent Stem Cells

2007-**iPhone**

2008-**Blockchain,Sharing Economy**(airB&B), Facebook

2012-Higgs Particle, Deep Learning

2015-Gravity Wave

2017-AlphaGo Zero

2022-Generative AI (chatGPT)

170 yr

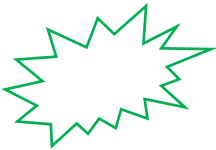
87 yr

38 yr

Next IR - 20 years later?

Exponential Knowledge Growth  
Change of Concept

# IR from a Connectivity Perspective



|                         | 1 <sup>st</sup> IR                                                       | 2 <sup>nd</sup> IR                 | 3 <sup>rd</sup> IR       | 4 <sup>th</sup> IR                     |
|-------------------------|--------------------------------------------------------------------------|------------------------------------|--------------------------|----------------------------------------|
| Connectivity Technology | Steam Engine (Steam)                                                     | Non-Digital Comm. (Electricity)    | Digital Comm. (Internet) | Mobile Digital Comm. (Mobile Internet) |
| Object of Connection    | Product, Cities                                                          | +Non-Digital Data, Electric Energy | +Digital Data            | +Human                                 |
|                         | # of connection grows, Rights of Individual increase                     |                                    |                          |                                        |
| Impacts of Connection   | Mass Production                                                          | Non-digital Platform Economy       | Digital Platform Economy | Personalization A.I                    |
| Economy                 | Platform-driven Monopoly, (Fake) Sharing Economy                         |                                    |                          |                                        |
| Adverse Effects         | Polarization                                                             |                                    |                          |                                        |
| Positive Change         | Empowerment of individual rights, Time savings, Productivity improvement |                                    |                          |                                        |

When connections change, the world changes.  
**Technological evolution is directed towards Individuals**  
**Next Connection ?**

# The 4<sup>th</sup> IR : Human Connections

- Artificial Intelligence : Learning by Connection
    - BackPropagation: 1960, 1986, NeoCognitron: 1979
    - AlexNet (2012)
  - Block Chain
    - "Computer Systems Established, Maintained, and Trusted by Mutually Suspicious Groups" by David Chaum (1982)
    - Bitcoin (2008)
  - Sharing Economy
    - "The Share Economy: Conquering Stagflation" by Martin L. Weitzman (1986))
    - AirBnB (2008), Uber (2009)
  - Metaverse
    - Snow Crash (1992) : Metaverse, Avatar
    - Second Life (2003), Roblox (2006)
- ✓ The Fourth IR became possible only after individuals are connected through mobile internet
- ✓ Understanding the essence of connection is the core of understanding change

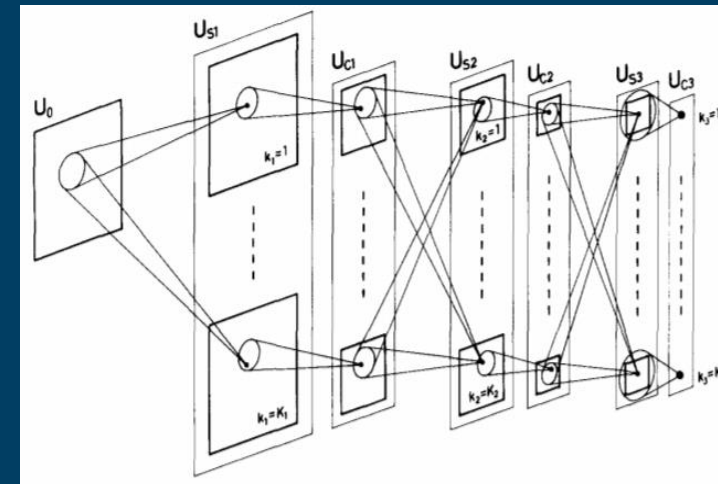
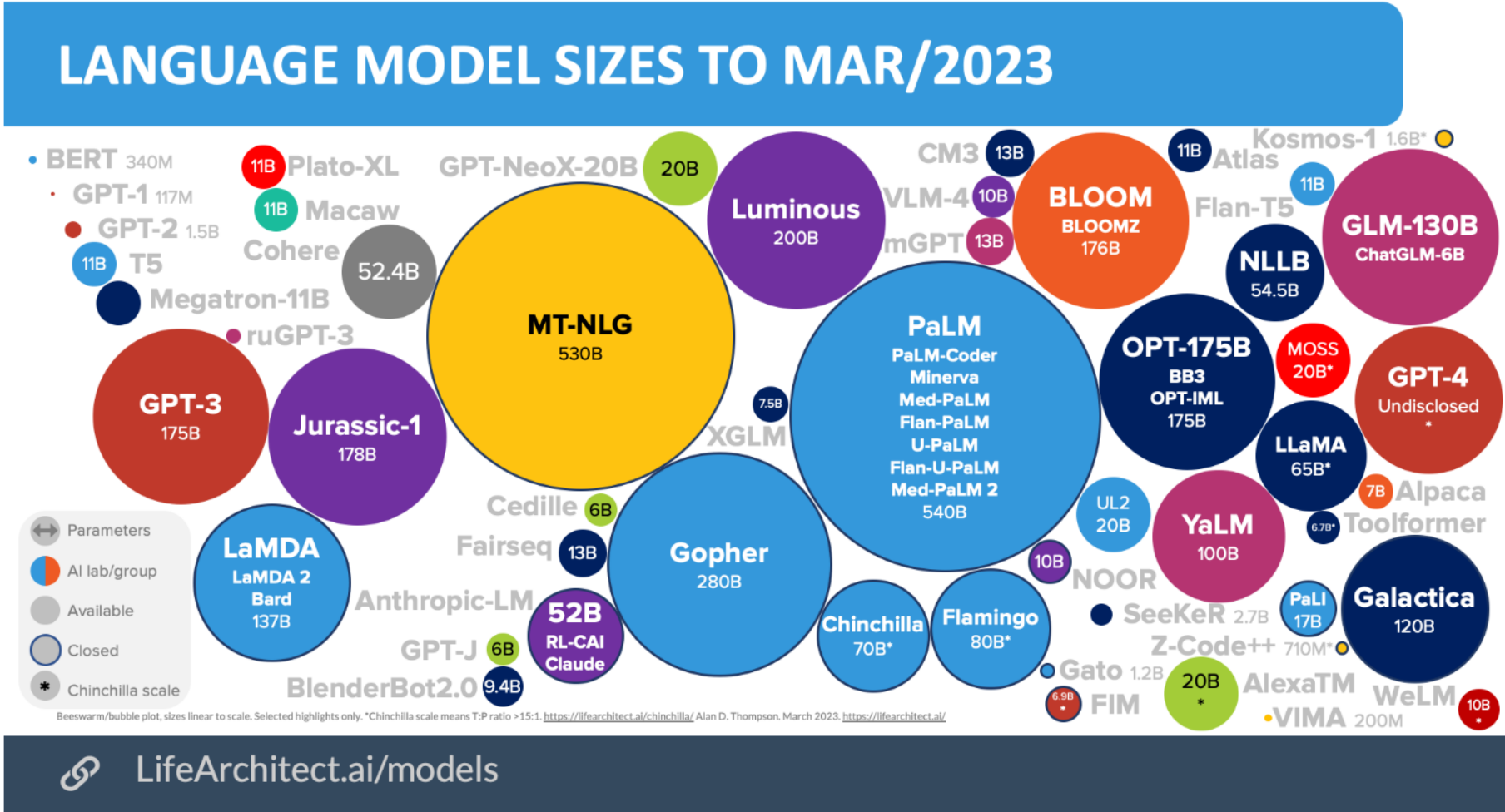


Fig. 2. Schematic diagram illustrating the interconnections between layers in the neocognitron

# Change of Connections



# LLMs and Connection



# Connection makes Strength/Power

"The Fourth Industrial Revolution is  
a phenomenon and technology derived from  
real-time **connections between individuals**"

**Power comes from connections !!!**

(Think about human brain and deep learning)

# Part 2

## Digital World, Metaverse and AI



# Digital World and Market Capitalization

Sep.12, 2023 <https://8marketcap.com/>

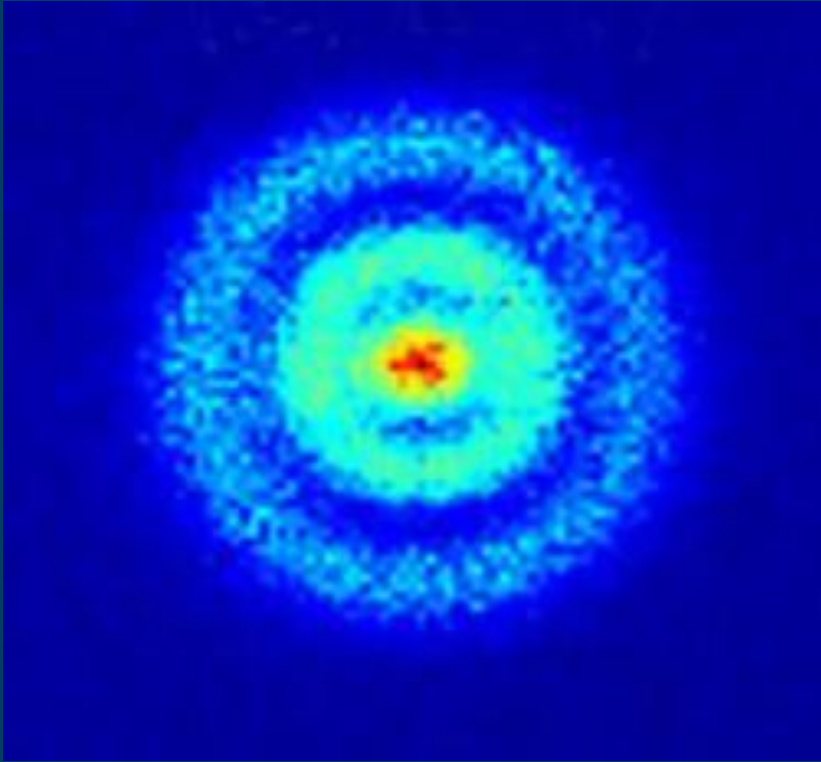
|    |                                                                                     |                           |            |    |                                                                                     |                        |          |
|----|-------------------------------------------------------------------------------------|---------------------------|------------|----|-------------------------------------------------------------------------------------|------------------------|----------|
| 1  |    | Gold                      | \$12.846 T | 16 |    | Exxon Mobil            | \$114.16 |
| 2  |    | Apple                     | \$2.804 T  | 17 |    | Novo Nordisk           | \$199.54 |
| 3  |    | Microsoft                 | \$2.51 T   | 18 |    | UnitedHealth           | \$479.38 |
| 4  |    | Saudi Aramco              | \$2.181 T  | 19 |    | Walmart                | \$164.34 |
| 5  |    | Alphabet (Google)         | \$1.73 T   | 20 |    | JPMorgan Chase         | \$144.46 |
| 6  |    | Amazon                    | \$1.476 T  | 21 |    | LVMH                   | \$799.87 |
| 7  |    | Silver                    | \$1.298 T  | 22 |    | SPDR S&P 500 ETF Trust | \$448.45 |
| 8  |    | NVIDIA                    | \$1.115 T  | 23 |    | Tencent                | \$41.2   |
| 9  |    | Tesla                     | \$868.34 B | 24 |    | Mastercard             | \$416.69 |
| 10 |    | Berkshire Hathaway        | \$797.42 B | 25 |    | Johnson & Johnson      | \$162.66 |
| 11 |   | Meta Platforms (Facebook) | \$793.47 B | 26 |   | Procter & Gamble       | \$154.75 |
| 12 |  | Eli Lilly                 | \$565.36 B | 27 |  | Samsung                | \$53.66  |
| 13 |  | Visa                      | \$514.16 B | 28 |  | Broadcom               | \$859.14 |
| 14 |  | Bitcoin                   | \$504.16 B | 29 |  | iShares Core S&P 500   | \$450.9  |
| 15 |  | TSMC                      | \$464.7 B  | 30 |  | Oracle                 | \$126.71 |

Which types of companies are growing big?

Imagine a life without a Smartphone

Aren't we already living in the digital world?

# Quantum and Digital World

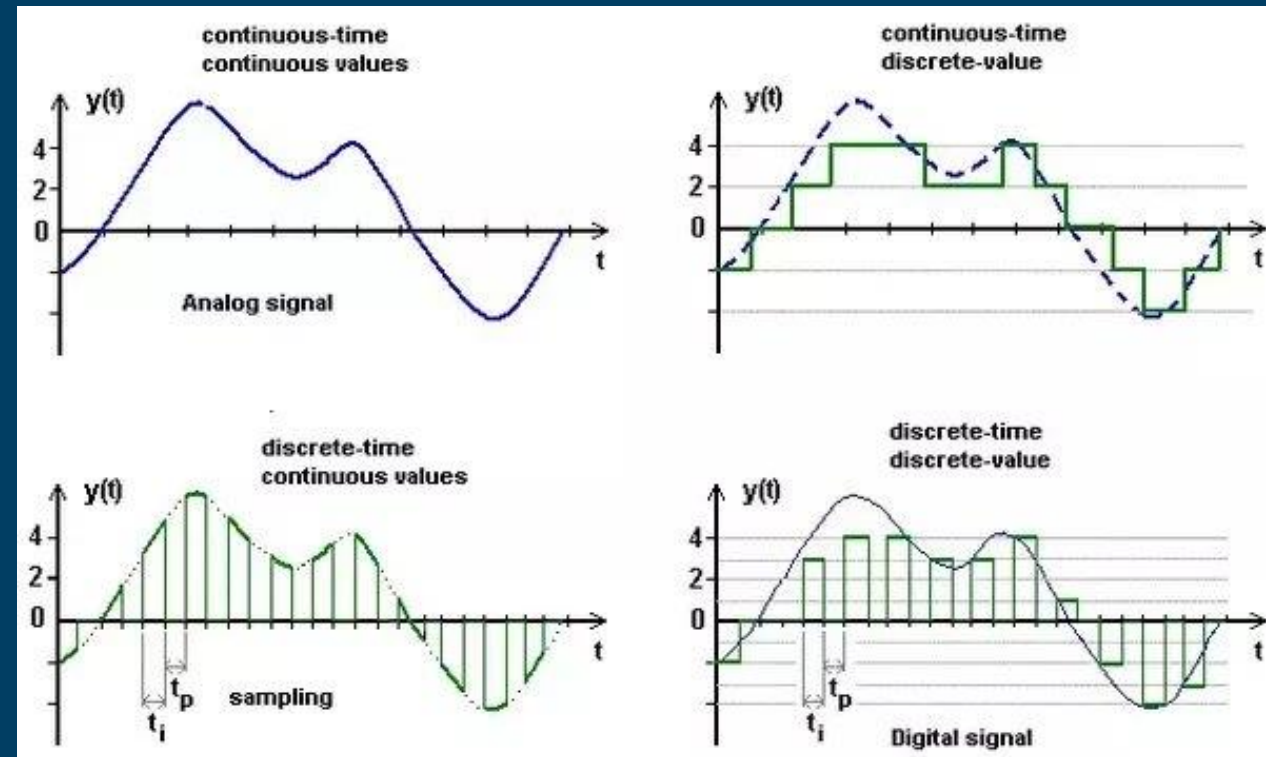


The first direct observation of **the orbital structure of an excited hydrogen atom**, made using a newly developed "quantum microscope." (Stodolna et al. / Physical Review Letters)

Planck constant:  $6.62607015 \times 10^{-34} \text{ m}^2 \text{ kg} / \text{s}$

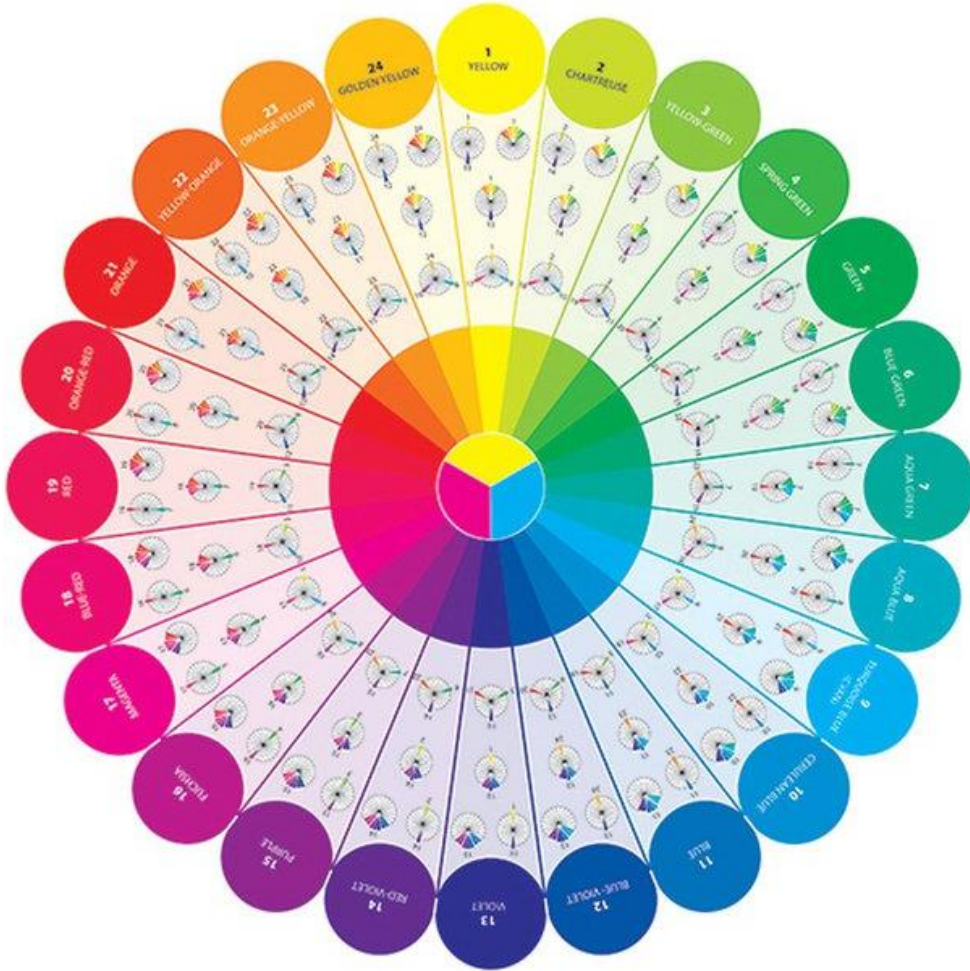
Planck length:  $1.6 \times 10^{-35} \text{ m}$

Planck time:  $5.39 \times 10^{-44} \text{ s}$



<https://www.quora.com/What-is-the-difference-between-a-continuous-time-signal-and-an-analog-signal>

# Quantized World and Connection



How many different colors can human eyes differentiate?  
: 8 million ~ 10 million

Why human eyes have limit in recognizing different colors?  
: Connection and Performance

Moving to a digital world is very natural !!!

# Play – Basic Human Instinct

## *Epic of Gilgamesh*



The [Deluge](#) tablet of the *Gilgamesh* epic in [Akkadian](#)

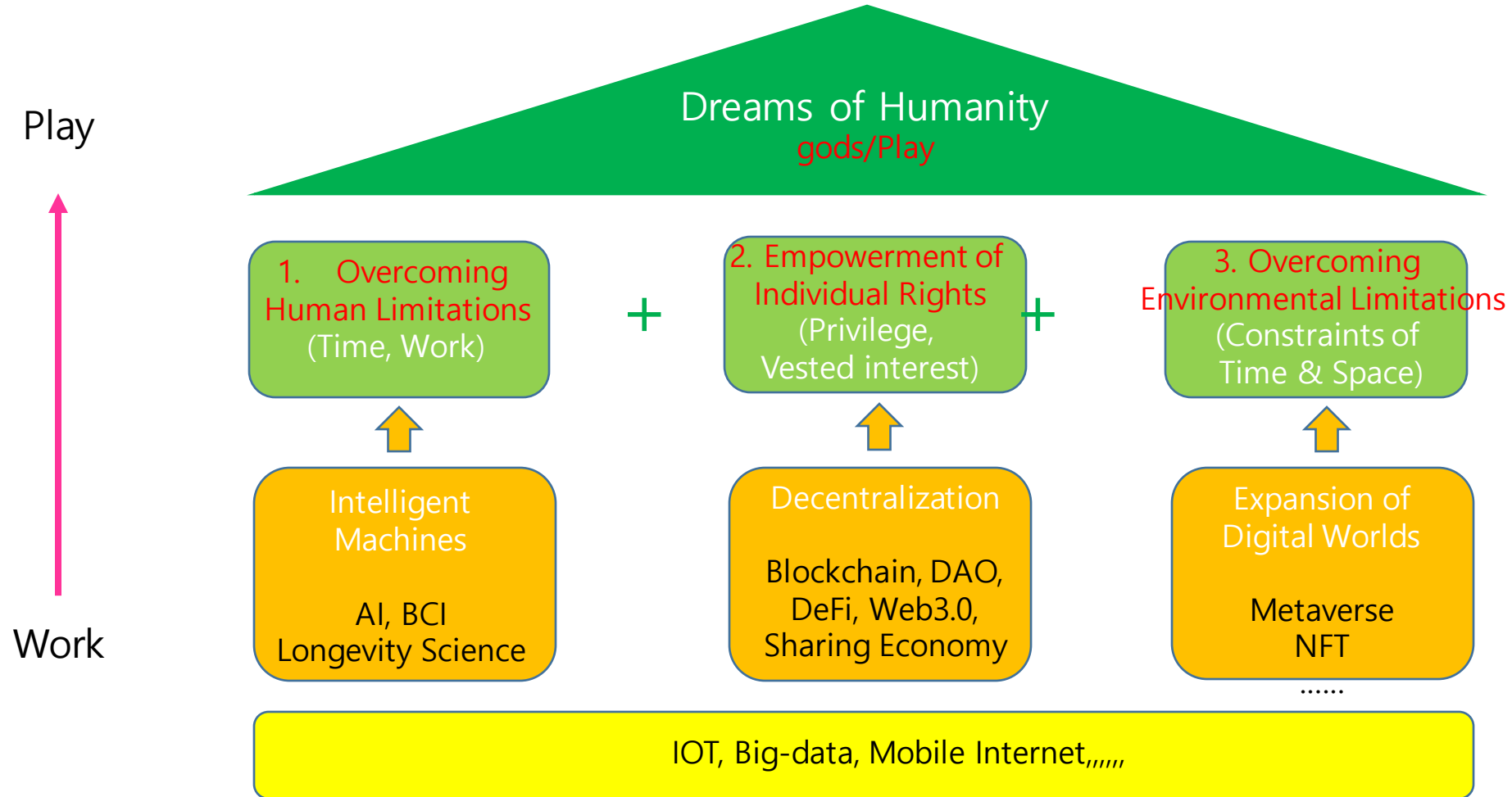
|            |                                 |
|------------|---------------------------------|
| Written    | ca. 2100–1200 BC <sup>[1]</sup> |
| Country    | <a href="#">Mesopotamia</a>     |
| Language   | <a href="#">Akkadian</a>        |
| Media type | <a href="#">Clay tablet</a>     |



Play without Empathy and Communication

Eat, Love, and Play

# Technological Evolution and Human Dream



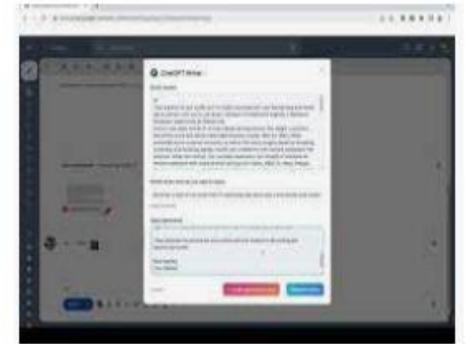
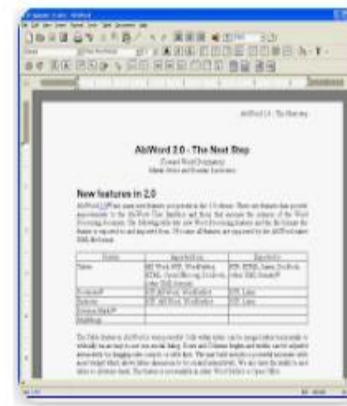
“Human history began when men created **gods**. It will end when men become **gods**.”

# Part 3

## Generative AI and Its Impact



# AI can replace Humans



Human control

AI can controls

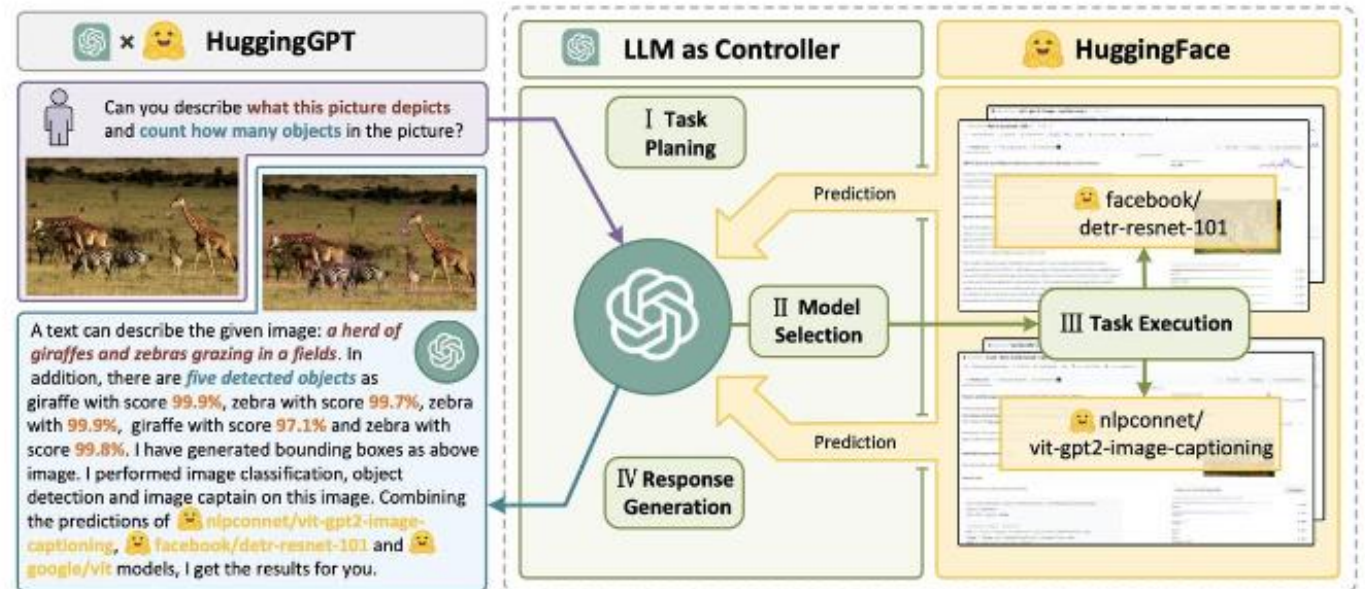
# Automatic Agent

## 1. Autonomous Agents : AutoGPT.....



chatGPT is just beginning

## 2. LLM Controller : HuggingGPT.....



# Simple Usage of AI Agent (Python Code)

```
1 import os
2 from langchain.llms import OpenAI
3 from langchain.agents import load_tools, initialize_agent, AgentType
4
5 os.environ["OPENAI_API_KEY"] = "sk-r8zDrchK02d7G57tNp5dT3[REDACTED]GBiMGwTDKGW4uQdFv"
6 os.environ["HUGGINGFACEHUB_API_TOKEN"] = "hf_mkvaVivwXWbs[REDACTED]RYhsguBJxJbAC"
7
8 llm = OpenAI(model_name="text-davinci-003")
9
10 tools = load_tools(["wikipedia", "llm-math"], llm=llm)
11 agent = initialize_agent(tools, llm, verbose=True,
12                         agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION)
13
14 agent.run("""What's the top 3 expensive cars worldwide in 2023 and calculate
15           price differences of each car from 2022""")
```

# AI changes world

**FORTUNE**

RANKINGS ▾

MAGAZINE ▾

NEWSLETTERS

PODCASTS

MORE ▾

SEARCH

SIGN IN

Subscribe Now

TECH • A.I.

## ‘Out-of-hand’ flood of ChatGPT-like A.I.-generated stories forces prominent science fiction magazine to stop accepting submissions

BY PRARTHANA PRAKASH

February 22, 2023 at 9:51 PM GMT-9

Updated February 23, 2023 at 12:46 PM GMT-9



<https://fortune.com/2023/02/22/flood-chatgpt-ai-generated-content-science-fiction-writing-clarkesworld-stops-submissions/>

# AI changes world

## TV and film writers are fighting to save their jobs from AI. They won't be the last



By Samantha Murphy Kelly, CNN Business

Updated 5:28 PM EDT, Thu May 4, 2023

"AI is already displacing human labor in many other areas of content creation—copywriting, journalism, SEO writing, and so on," he said. "The WGA is simply trying to get out-in-front of and to protect their members against ... 'technological unemployment.'"

<https://edition.cnn.com/2023/05/04/tech/writers-strike-ai/index.html>



Stephanie Elam/CNN

# AI changes world

TECHNOLOGY EXECUTIVE COUNCIL

## How generative A.I. and ChatGPT will influence jobs at all professional levels

PUBLISHED TUE, MAY 16 2023 • 11:34 AM EDT



Mikaela Cohen  
@MIKKA\_\_ELLA

SHARE



A recent report by Goldman Sachs estimates that approximately 300 million global jobs could be exposed to automation, and one-fourth of all work could be replaced by generative artificial intelligence.

With chatbots now able to write content and create visuals, AI threatens to disrupt jobs like designers and software engineers, and take over a wide range of repetitive work tasks now handled by humans. But at a broader level, AI is emerging as a job influencer, with still-unknown implications from the highest executive roles down to call center operations.

<https://www.cnbc.com/2023/05/16/how-generative-ai-chatgpt-will-change-jobs-at-all-work-levels.html>

# The Two Faces of AI Technology

Very High Productivity

Freedom from Working

Time Saving

Creative Problem Solving

Benefits

Winner-Takes-All Instinct

Widening Gap

Change of Value Systems

Replacement of Traditional  
Human Works and Value

Threats

# Event horizon, Singularity, and Generative AI



We're entering into the Event Horizon.

# AI and Natural Intelligence

## What is Natural Intelligence?

What should we do now?

- Intelligence : intelligere(Latin) = comprehend, perceive
- the capacity for *logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, critical thinking, and problem-solving*. (wikipedia)
- the ability to *perceive* or *infer* information, and to *retain(represent)* it as knowledge to be *applied* towards adaptive behaviors within an environment or context. (wikipedia)
- A very general mental capability that, among other things, involves the ability to *reason, plan, solve problems, think abstractly, comprehend complex ideas, learn* quickly and learn from experience. (Wall Street Journal, 1994)

► **Natural Intelligence**: Ability to **understand and learn environment** (situation, knowledge, problems,...), **represent** it properly to use, and to **find questions and problems**. (PK Kim)

To have NI, It needs ability of Learning, Recognition, Inference, Abstraction, Planning, Critical Thinking, Creative Thinking, Problem Finding, Imagination, and Communication.

# Part 4

## New Education for a New World



# Questions again

1. Why we're teaching STEAM, -E DESIGN THINKING, and CODING?
2. How will you teach or use AI in your education?
3. What are conditions of modern professionalism education?
4. Does the condition still effective for today and tomorrow?
5. What are problems of today's education

# Problem Finding and Problem Solving



*Guernica (1937)*

- Whats the dfference?



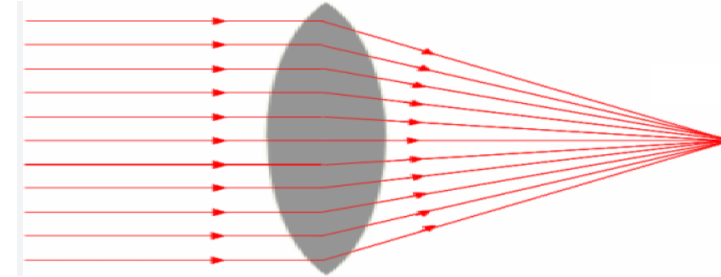
Théâtre D'opéra Spatial (2022)

# Convergence: Intended Cooperative Problem Solving

融

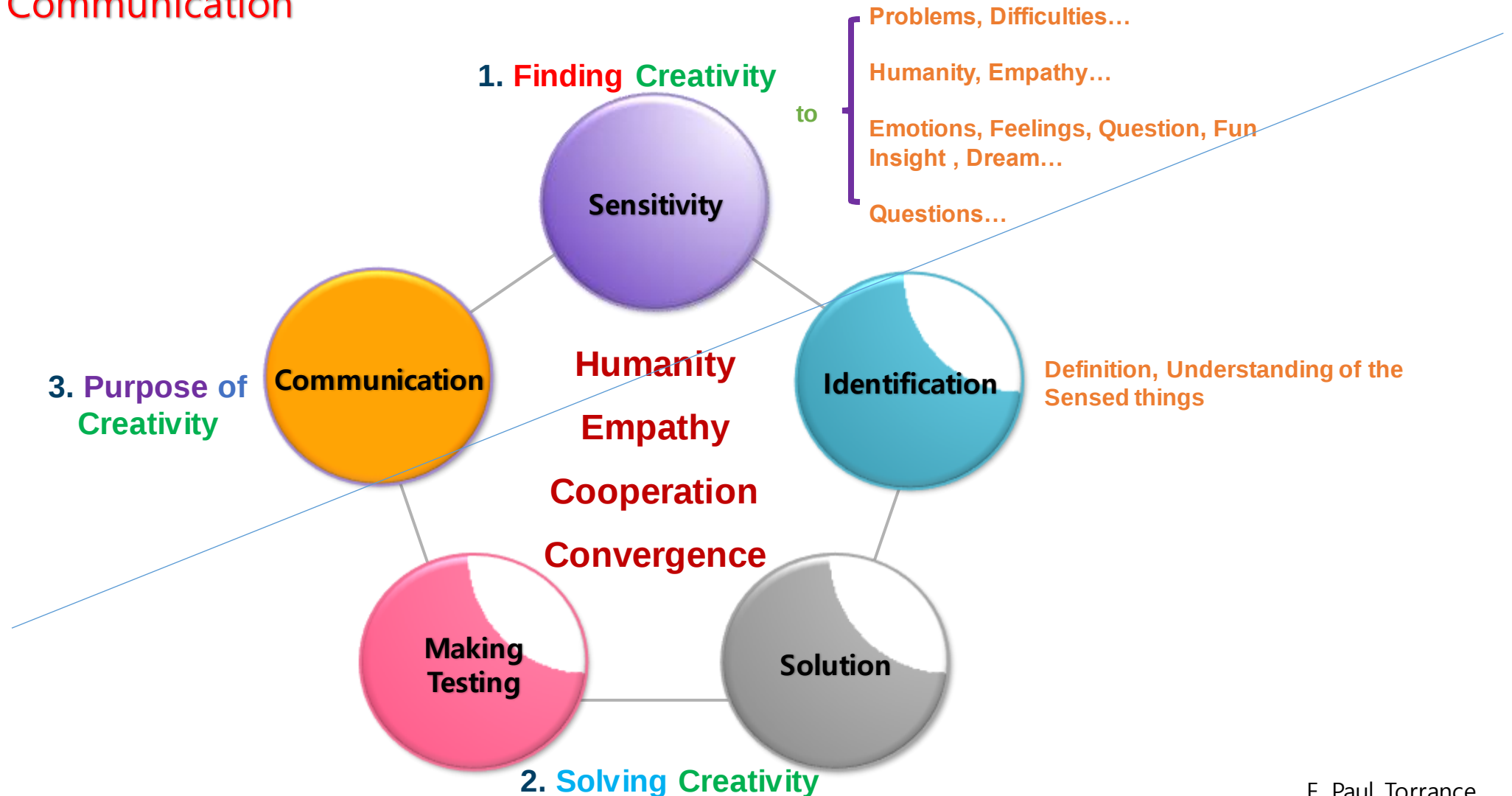


合



# Again, "Creativity for Communication"

## Problem Finding Creativity Creativity for Communication



# New Education

---

- Transform traditional Professionalism Education.
- Provide them with AI-Convergence Experience.
- Help them become more sensitive to evolving AI technology.
- Don't underestimate the potential of AI technology.
- Educate students to possess better communication ability.
- Emphasize problem-finding creativity and problem-solving within the context of humanity.