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Click this link to watch a video of my session:

https://youtu.be/QSZt2mfTNX8

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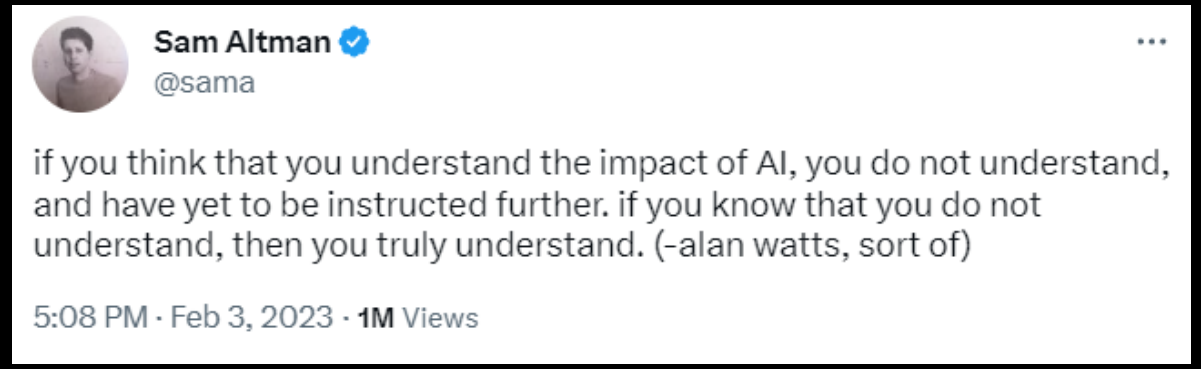
ChatGPT?
Implications of Generative AI for Higher Education and how this technology can be used to enhance student outcomes.

Robert Dixon



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AI's been around for a long time, why's it getting so much attention now?

The ChatGPT Phenomenon

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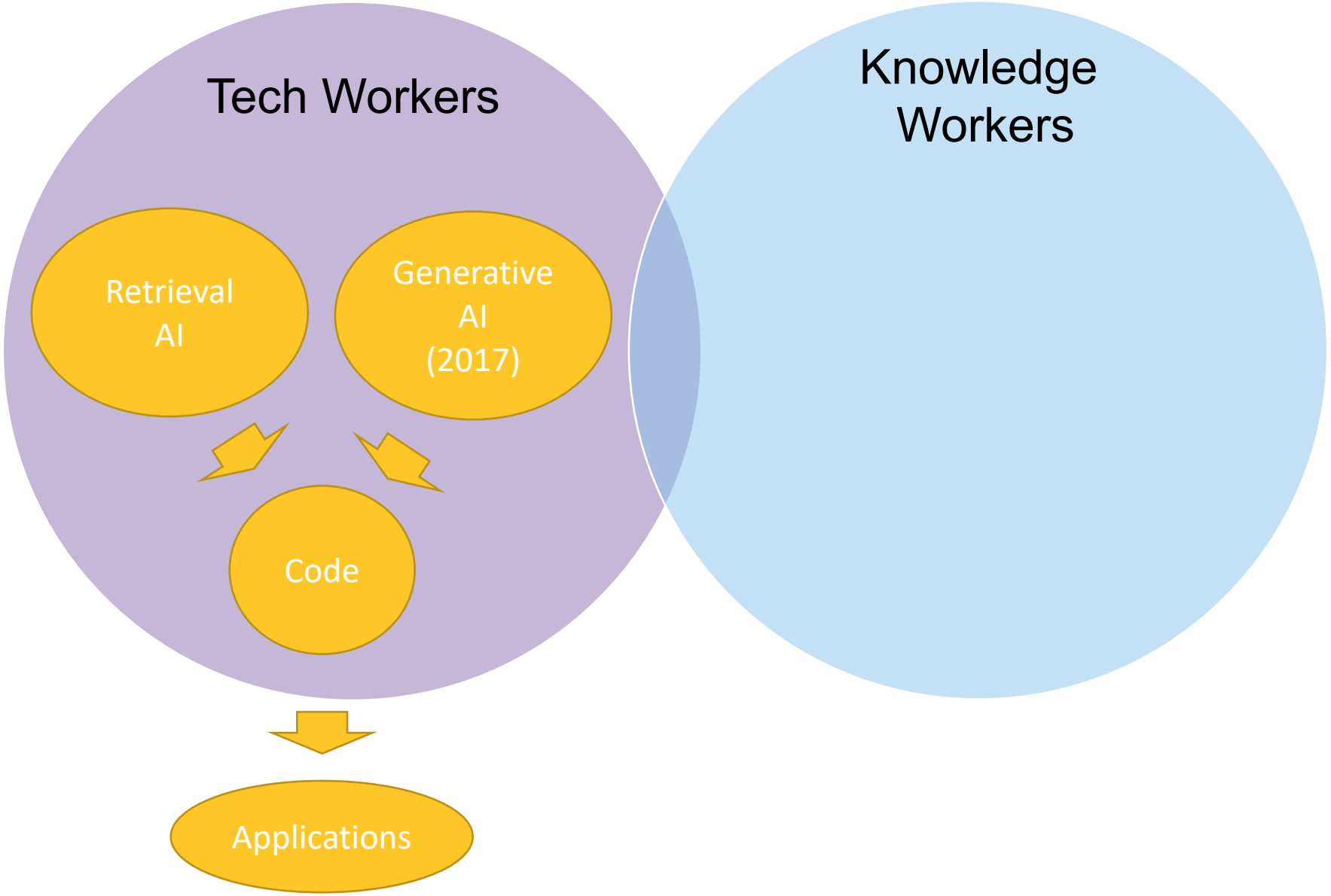
Pre 30/11/22



Dixon, R., 2023

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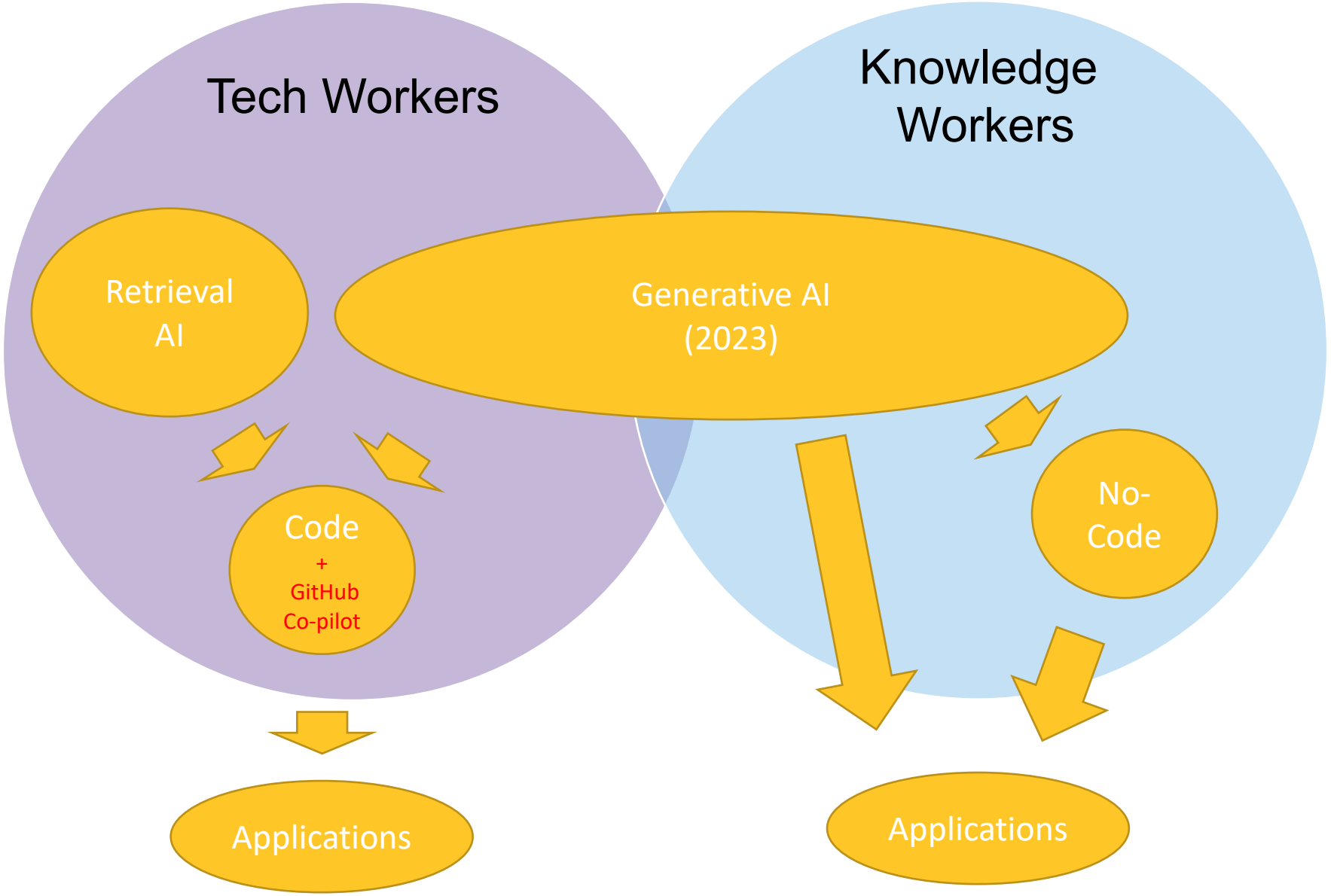
Post 30/11/22



Dixon, R., 2023

AI Could Lead To A 10-Fold Increase In Coding Productivity

Based on a 70% annualized drop in training costs and feedback loops, AI coding assistants like Copilot could increase the output of software engineers ~10-fold by 2030.

Github Copilot Example

Human Input

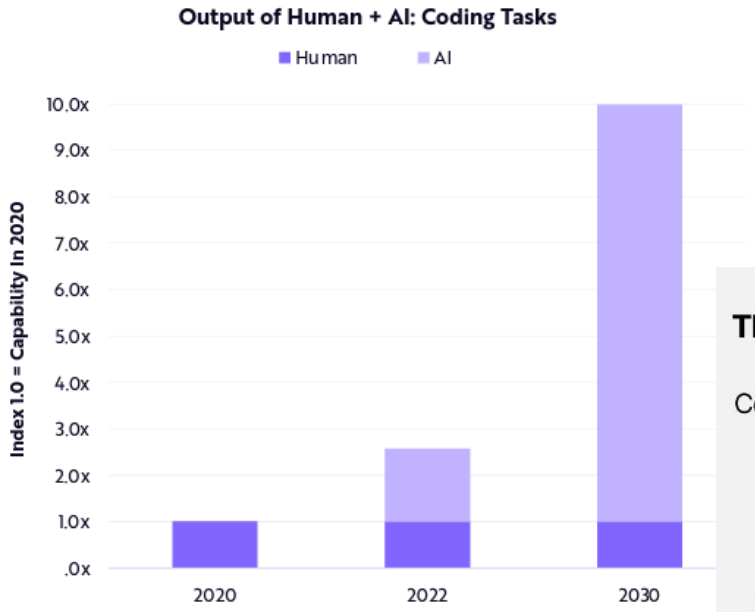
```
sentiments.ts  write_sql.go  parse_expenses.py  addresses.rb

#!/usr/bin/env ts-node

import { fetch } from "fetch-h2";

// Determine whether the sentiment of text is positive
// Use a web service
async function isPositive(text: string): Promise<boolean> {
  const response = await fetch(`http://text-processing.com/api/sentiment/`, {
    method: "POST",
    body: `text=${text}`,
    headers: {
      "Content-Type": "application/x-www-form-urlencoded",
    },
  });
  const json = await response.json();
  return json.label === "pos";
}
```

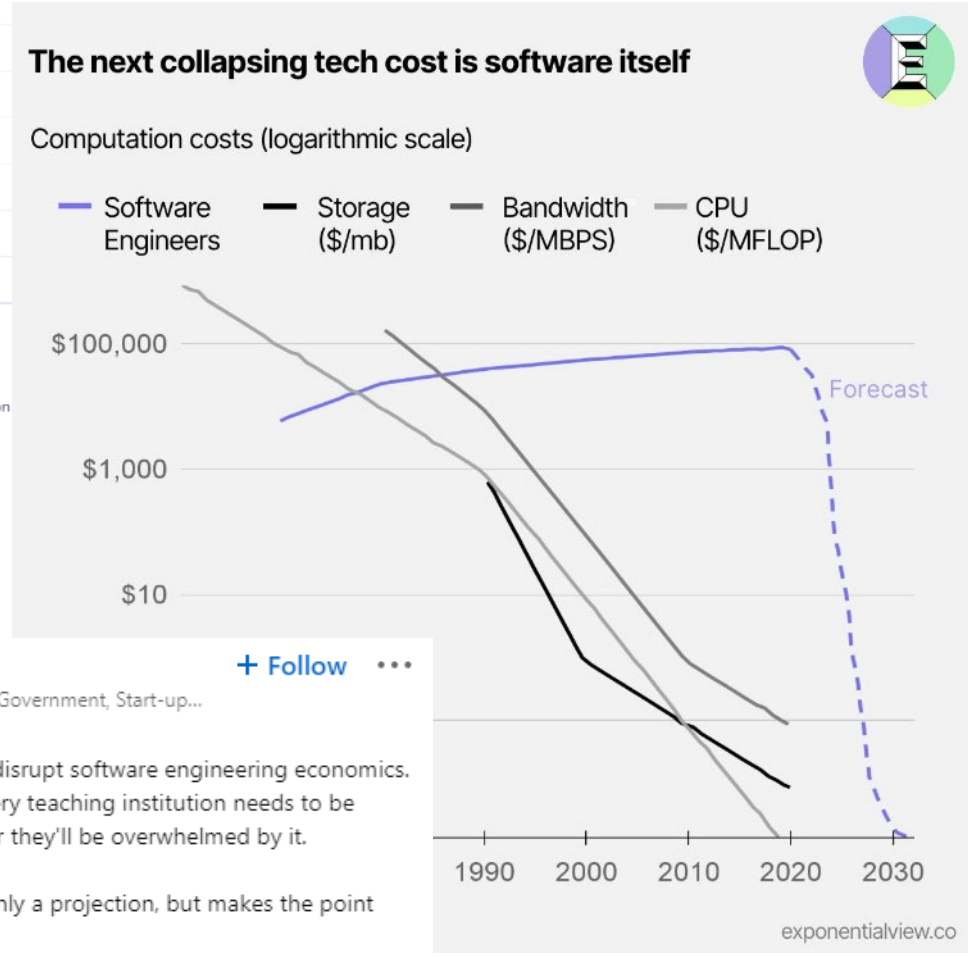
Copilot



Sources: ARK Investment Management LLC, 2023. GitHub 2023. Forecasts are inherently limited and cannot be relied upon. For informational purposes only and should not be considered investment advice or a recommendation sell, or hold any particular security. Past performance is not indicative of future results.

Ark Invest, 2023

Falling Software Development Costs



Mark Logan • 2nd
Chief Entrepreneurial Advisor to Scottish Government, Start-up...
3w •

+ Follow

AI is eating software. LLMs will dramatically disrupt software engineering economics. Every engineer, every software company, every teaching institution needs to be thinking hard about how to ride this wave, or they'll be overwhelmed by it.

This chart, courtesy of Exponential View, is only a projection, but makes the point well.

SK Ventures, 2023

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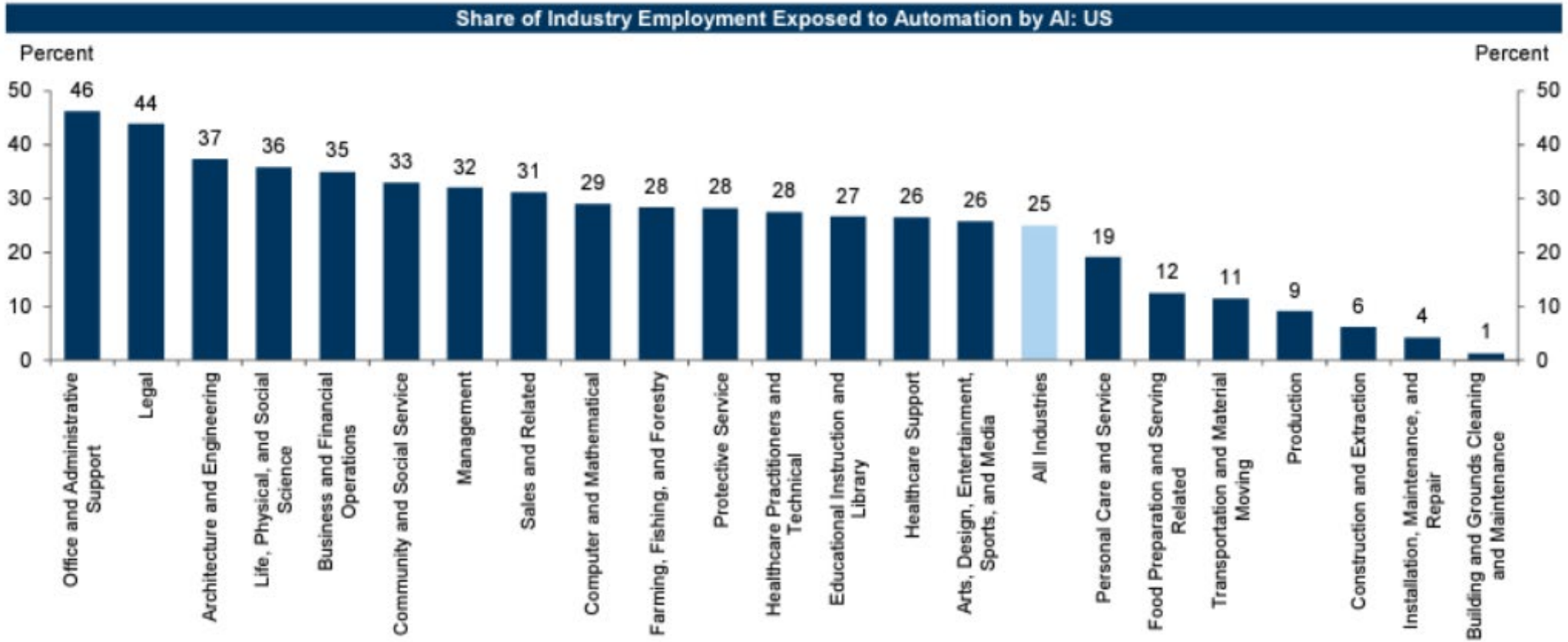
Knowledge Worker Productivity Boost

Goldman Sachs predict 300 million job loses

Exhibit 5: One-Fourth of Current Work Tasks Could Be Automated by AI in the US and Europe



Goldman Sachs, 2023

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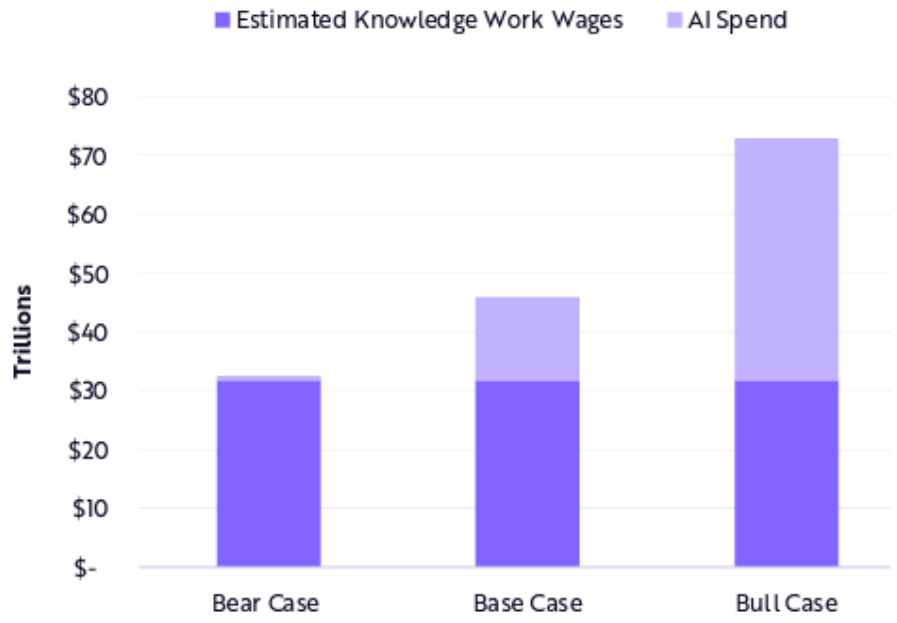
Knowledge Worker Productivity Boost

AI Should Increase Knowledge Worker Productivity Dramatically

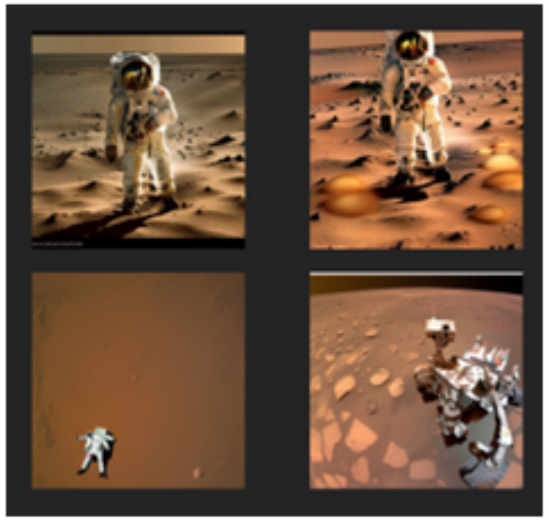
According to ARK's research, AI should increase the productivity of knowledge workers more than 4-fold by 2030. At 100% adoption, AI spend of ~$41 trillion could increase labor productivity ~$200 trillion, dwarfing the ~$32 trillion in knowledge v
10% of value created by their products, AI software could generate up to $

Estimated Human Knowledge Work Wages Relative To AI Spend In 2030



Generative Image Models

According to our research, AI can create a graphic design for just $0.08** in minutes — a *di minimis* cost compared to $150 for human labor.



Human	
Cost	$150
Time	5 Hours

Generative AI	
Cost	$0.08
Time	< 1 Minute

*Gross Domestic Product. Sources: ARK Investment Management LLC, 2023. Forecasts are inherently limited and cannot be relied upon. For informational purposes only and should not be considered investment advice or a recommendation to buy, sell, or hold any particular security. Past performance is not indicative of future results.

Ark Invest, 2023

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First Principles

1x Knowledge Worker

Input

Output

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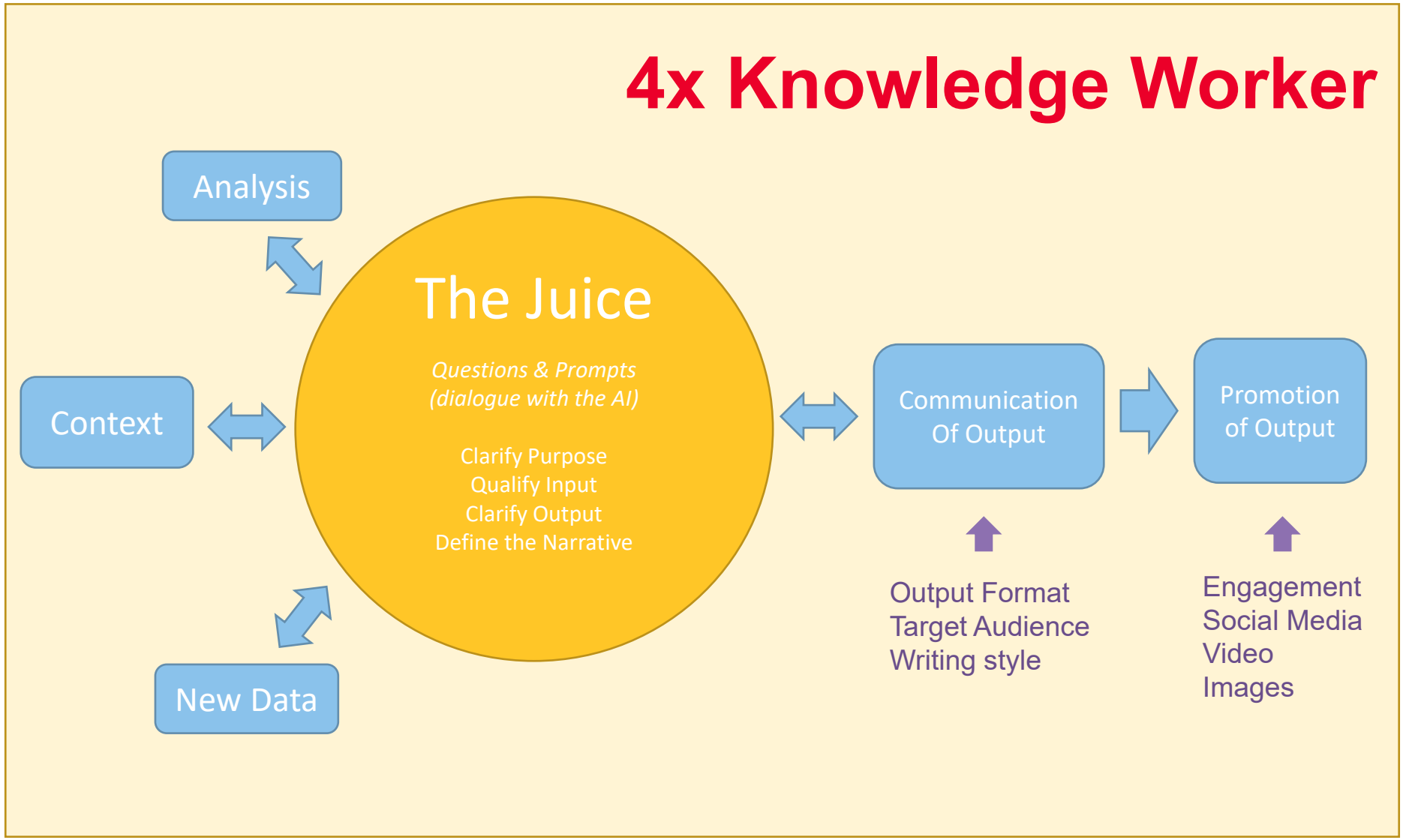
First Principles



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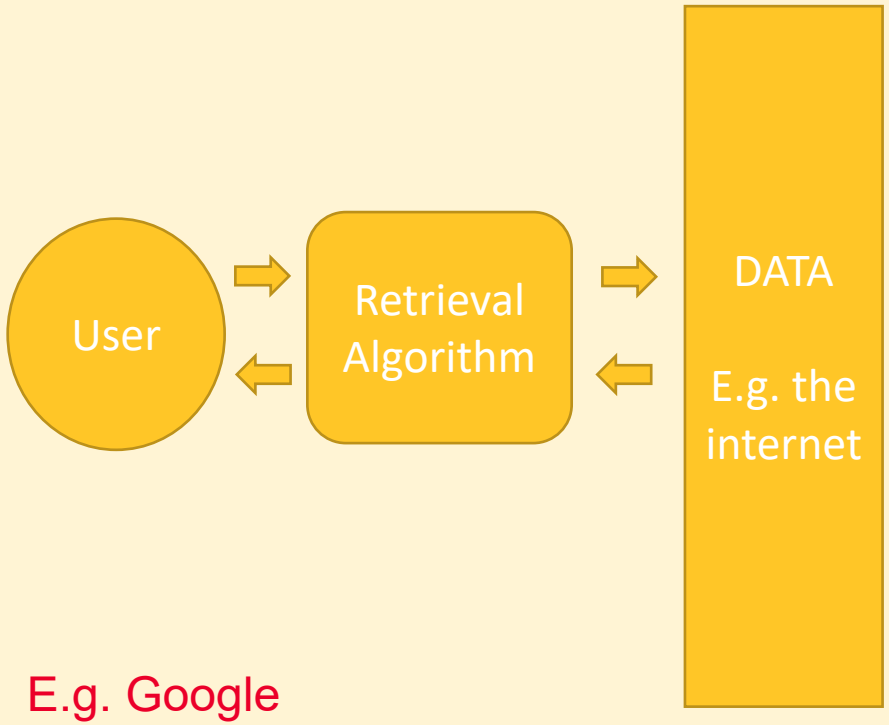
Generative AI vs Retrieval AI

Retrieval AI

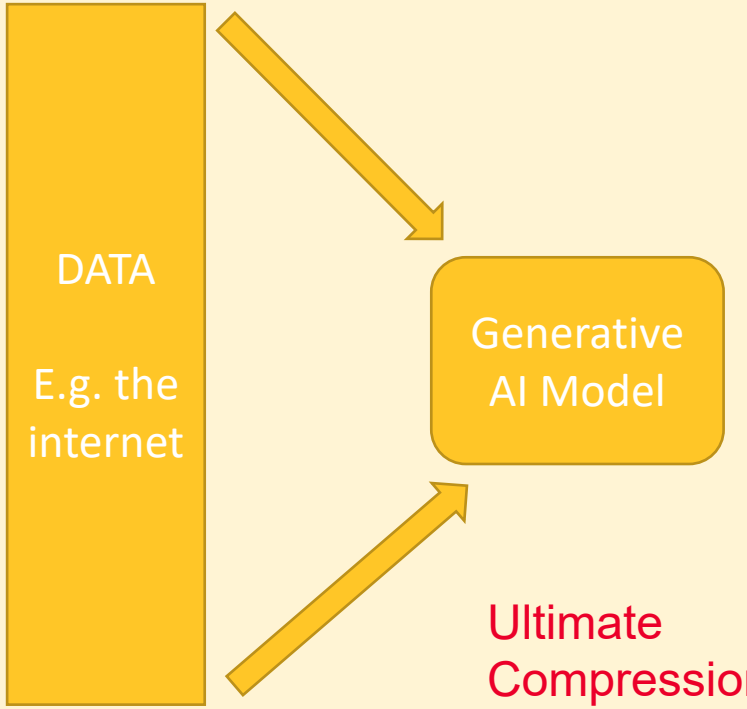
- Search's large amounts of data to retrieve information



E.g. Google
It's accurate

Generative AI Model Creation

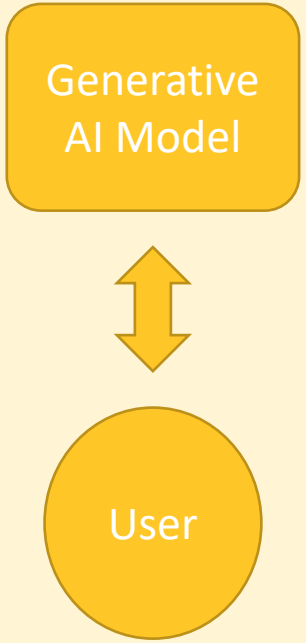
- Generative AI models are created by training a transformer on a large data set (e.g. the internet). Essentially a Generative AI Model compresses all knowledge into a simple function which replicates a biological neural network in the brain and operates on inputs and outputs



Ultimate Compression Algorithm

Generative AI Model Use

- The User types and Input (prompt) and the model generates an output. There is no data.



There is no data
It's predictive

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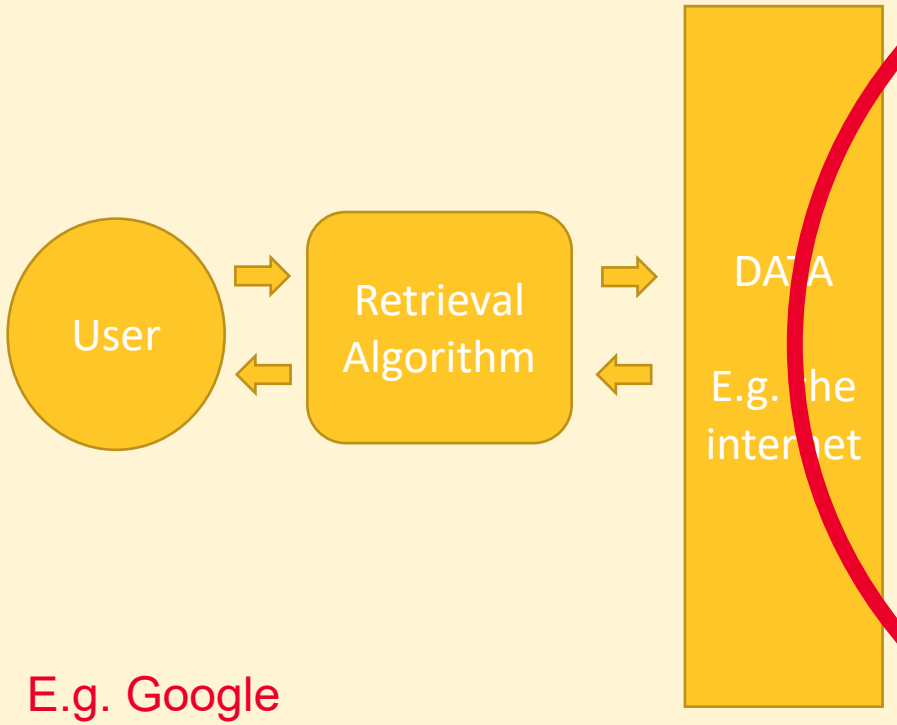
Generative AI vs Retrieval AI

Retrieval AI

- Search's large amounts of data to retrieve information



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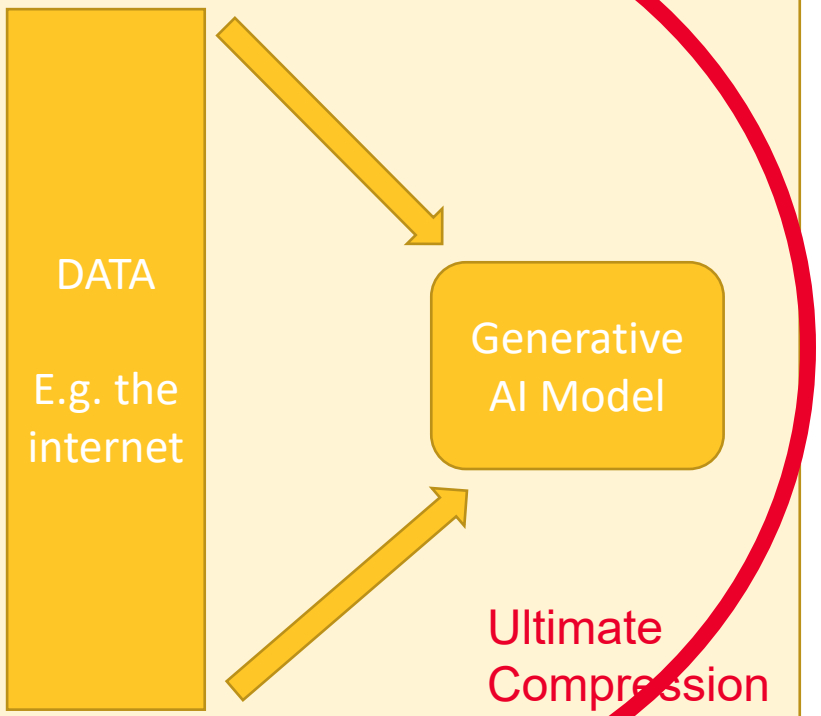

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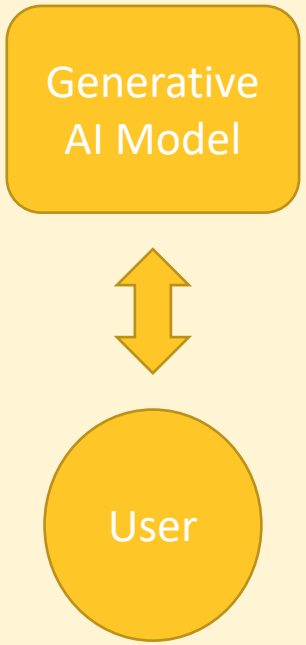

There is no data
It's predictive

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AI Technology Overhang

Transformer Model → Training Data → Reinforcement Learning from Human Feedback (RLHF) → Generative AI Model

Generative AI Model →
- Reinforcement Learning models
- Computer Vision models
- Speech Recognition models
- Anomaly detection models
- Recommendation models

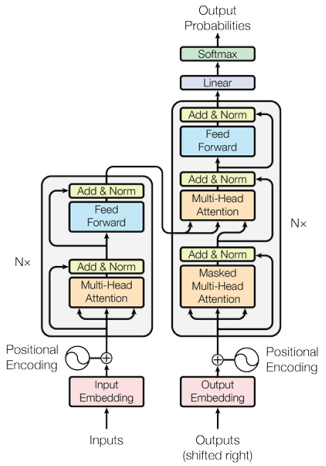

Figure 1: The Transformer - model architecture.

Vaswani et al, 2017

Billions of Training Cycles
e.g. GPT3 was 200 Billion

Not as many cycles as you think for ChatGPT - Thousands?

Large Language Models (LLM) with Natural Language Processing (NLP) capability

- Bard (Google)
- GPT 3 / GPT3.5 / GPT 4
- LLaMa (Meta/Facebook)
- BLOOM (Hugging Face/AWS)

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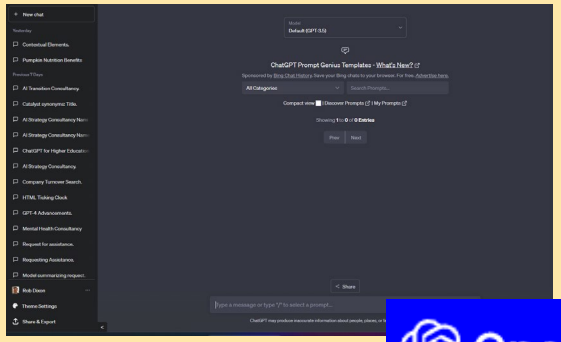
2023 Impact Landscape

Phase 1
Direct Access

- ChatGPT
- Bard
- Stable Diffusion
- Mid-journey

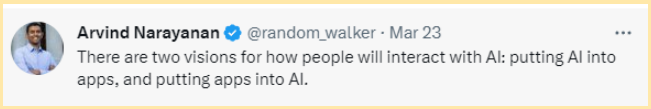
30% Productivity Boost



Phase 2
Applications and Automation

- Futurepedia.io
- getCody.ai
- heyNovo.ai
- ResearchBuddy.app
- Zapier

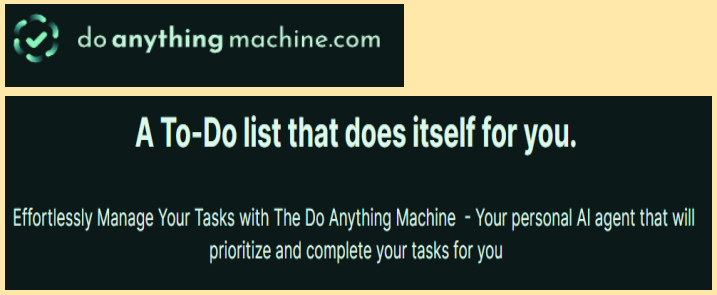
100%-200%
Productivity Boost



Phase 3
Agents

AutoGPT

Auto-GPT is an "AI agent" that given a goal in natural language, will attempt to achieve it by breaking it into sub-tasks and using the internet and other tools in an automatic loop.[1] It uses OpenAI's GPT-4 or GPT-3.5 APIs,[2] and is among the first examples of an application using GPT-4 to perform autonomous tasks



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Researchbuddy.app

Literature reviews in minutes

Heynovo.ai

Make your own chatbot

getcody.ai

Here’s a bot I trained earlier

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What does this mean for Student Outcomes?

We need to improve AI literacy

Artificial intelligence to hit workplace 'like a freight train', energy boss warns

As some UK workers adopt AI, and other lose their jobs to it, concerns re
country's readiness to deal with the new and surprisingly rapid evolution

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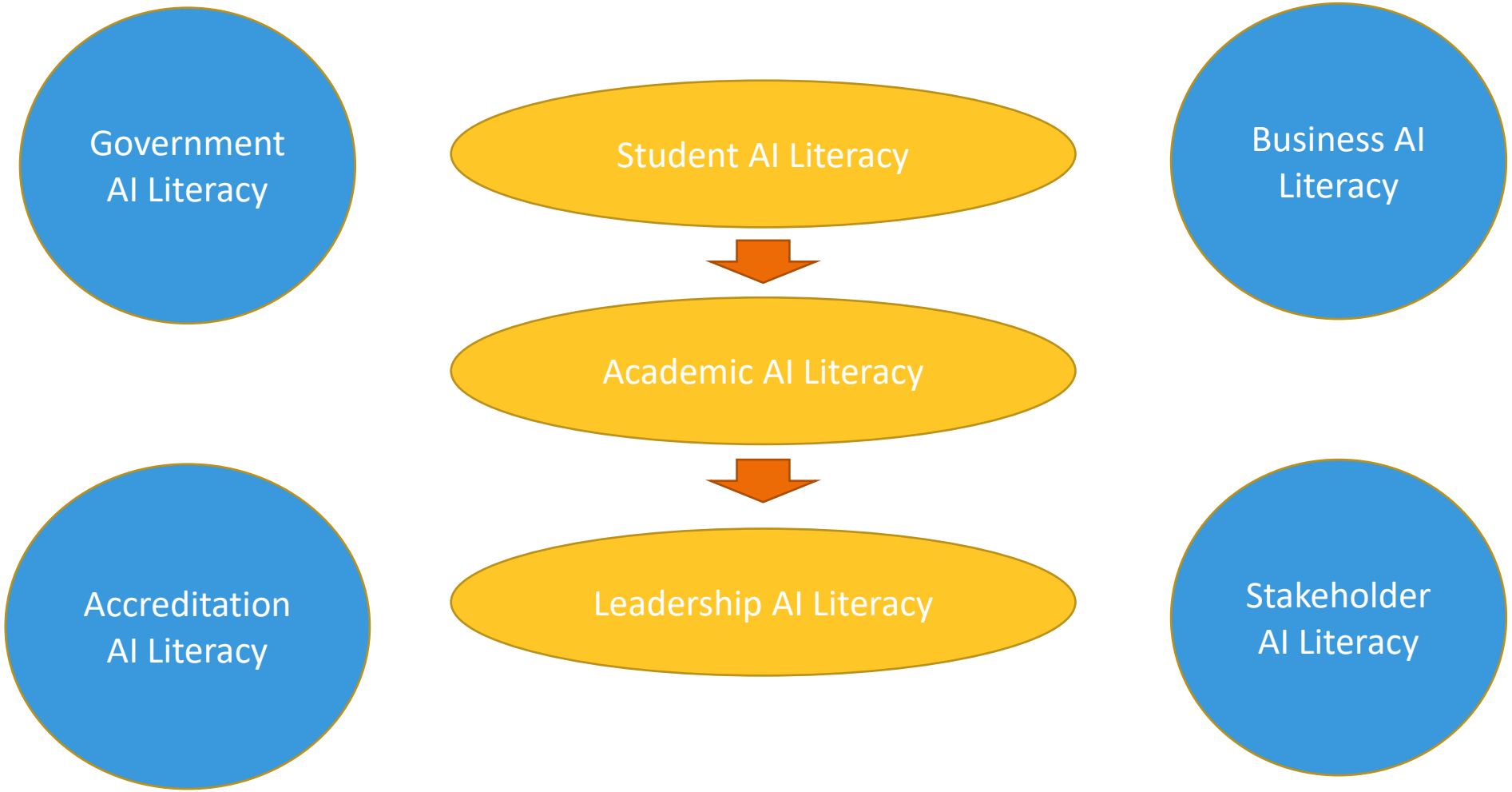

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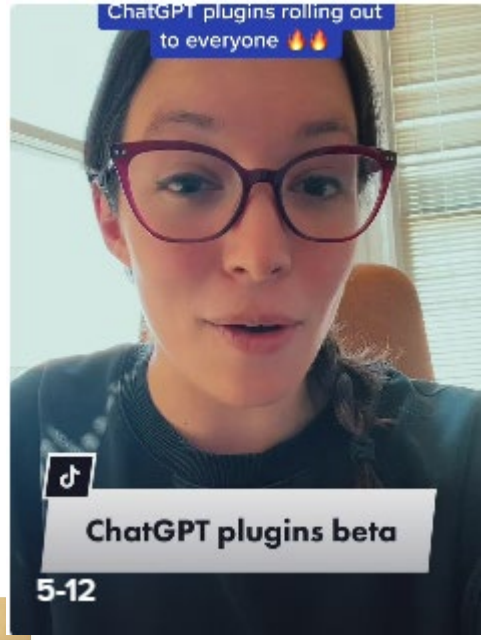
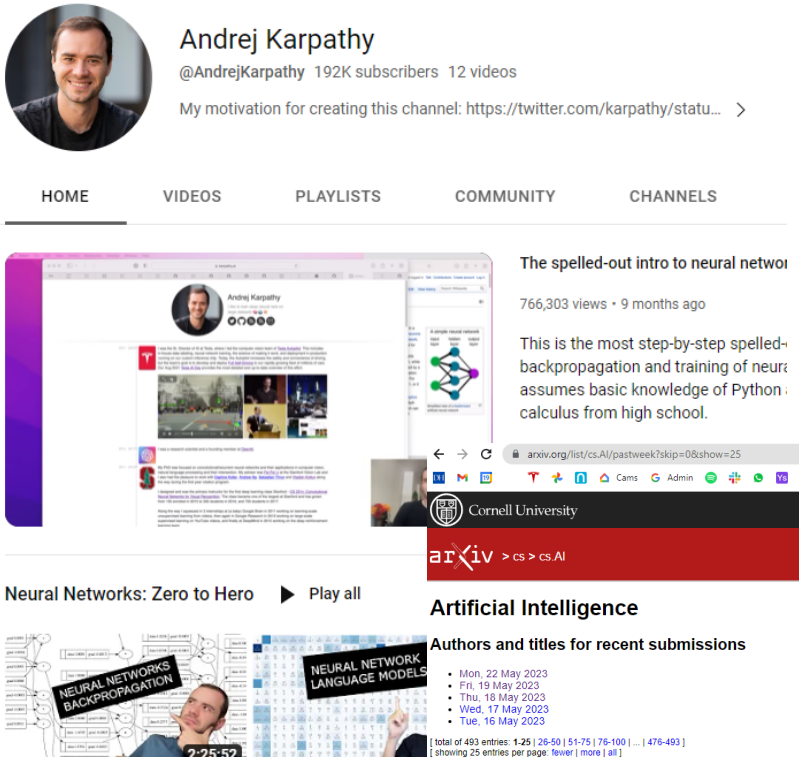
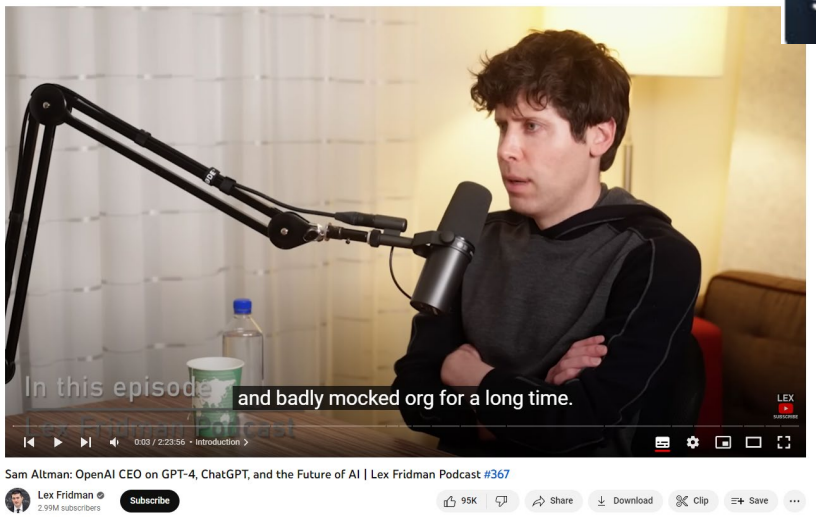
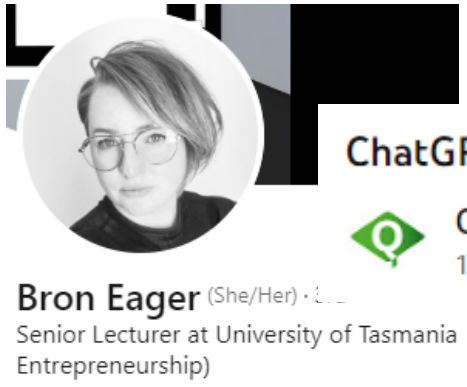
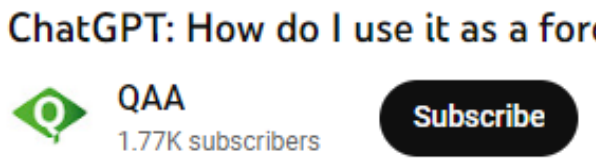
Where is the information?

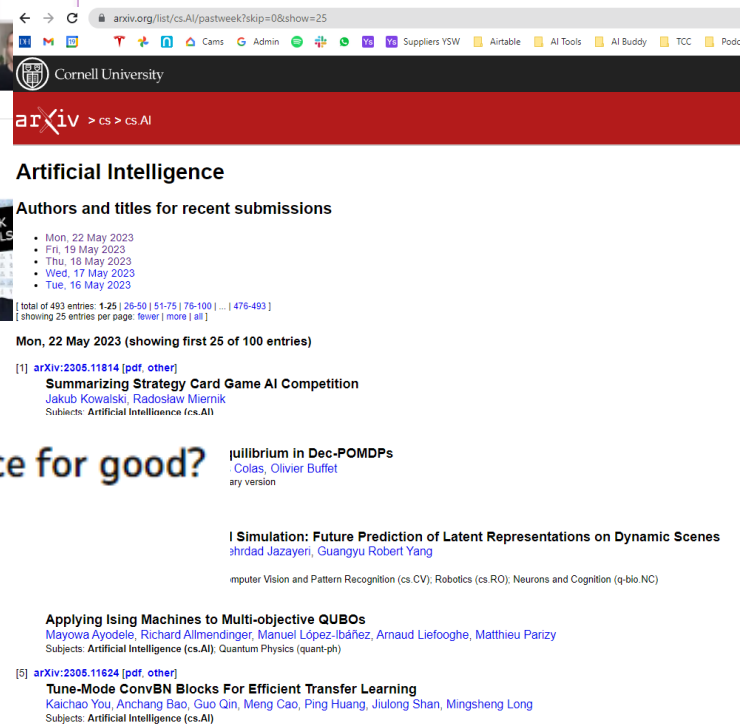












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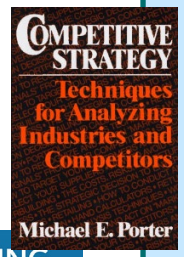
Strategic Management Ontology

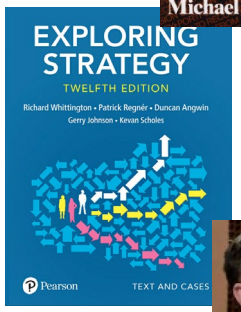
The ontology continuum

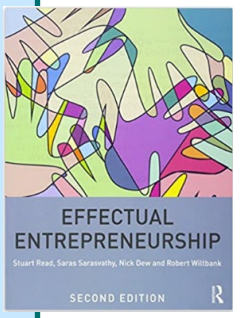
Positivist ⟵ ⟶ **Constructivist**

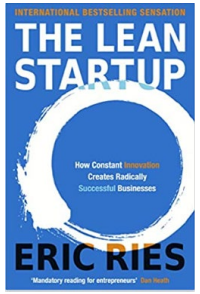
Through analysis we can discover the perfect strategy

Strategy is created by interactions between the organisation and the business environment

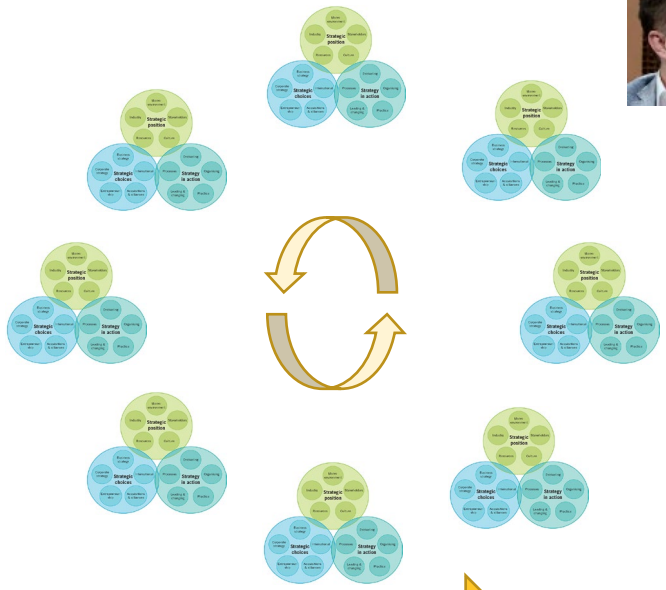


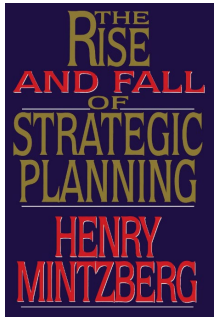






VS





Increasing Turbulence

Increasing Predictability

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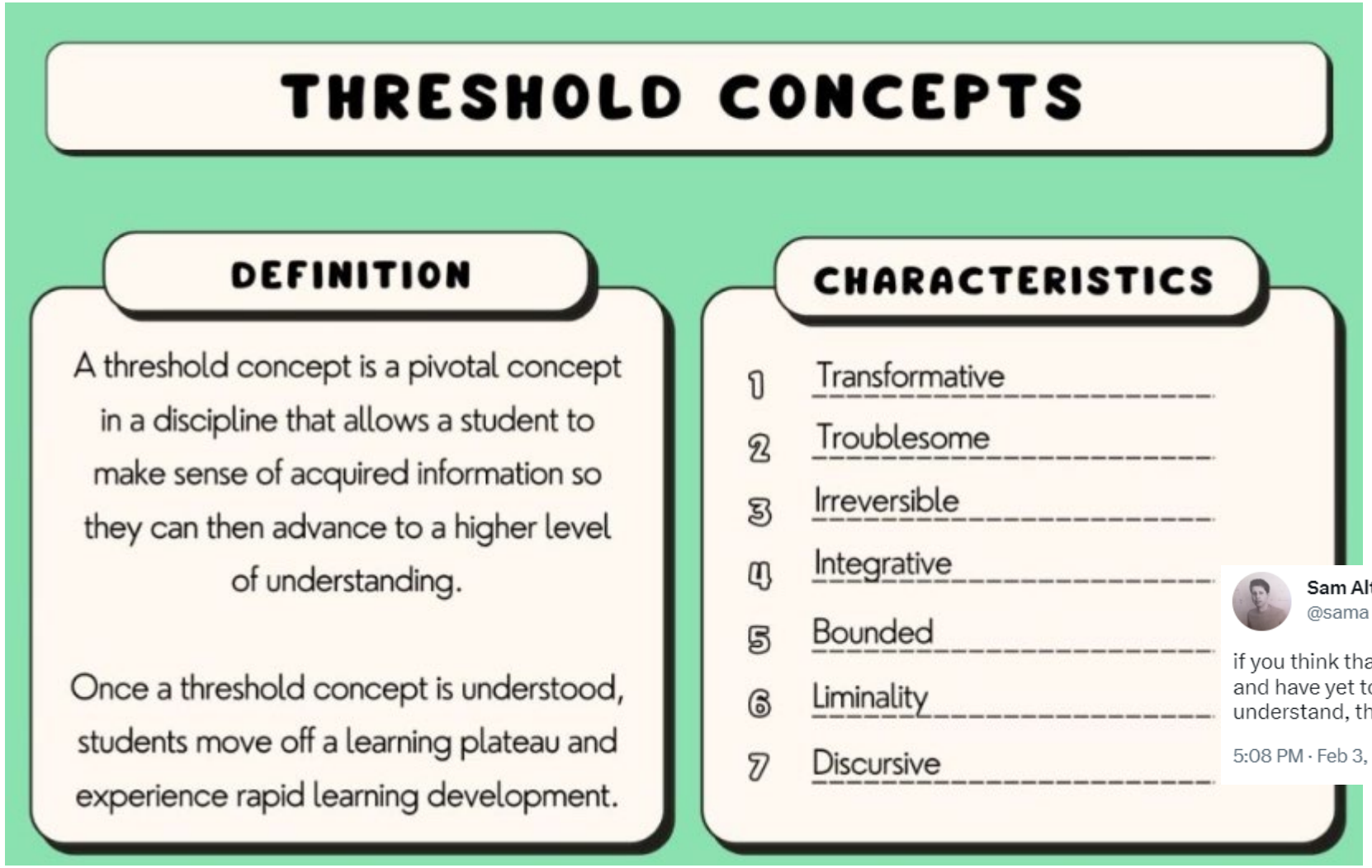
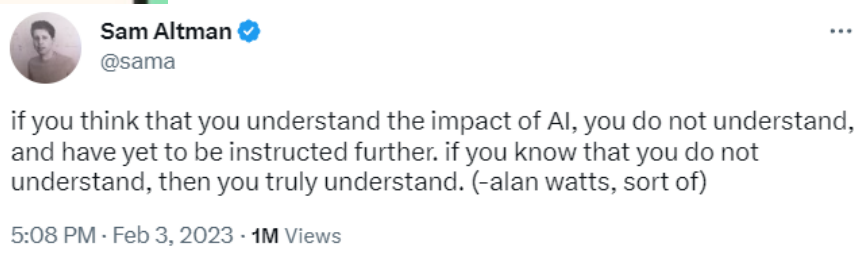
Generative AI: Threshold concept



Generative AI
You need to see it to believe it



Meyer, J. and Land, R., 2003. Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines (pp. 412-424). University of Edinburgh.

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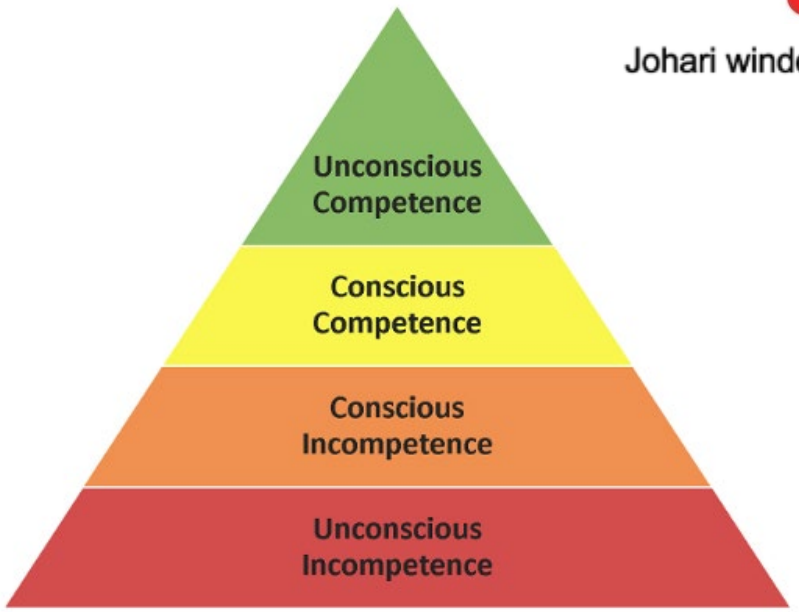
Johari's Window

Credited to: Gordon Training International by its employee Noel Burch in the 1970s

Johari window (Luft & Ingham, 1955)



Stages of learning (Efectiviology, 2021)

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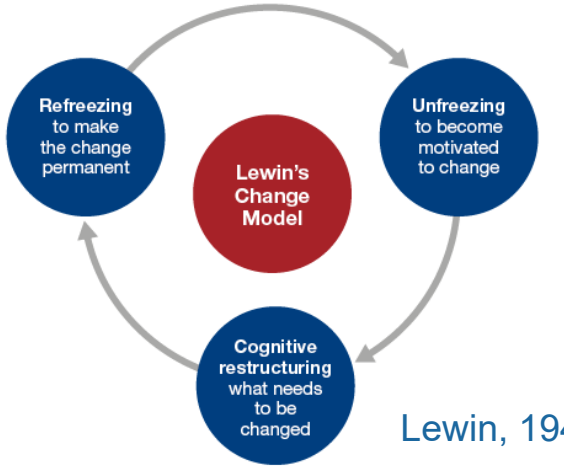
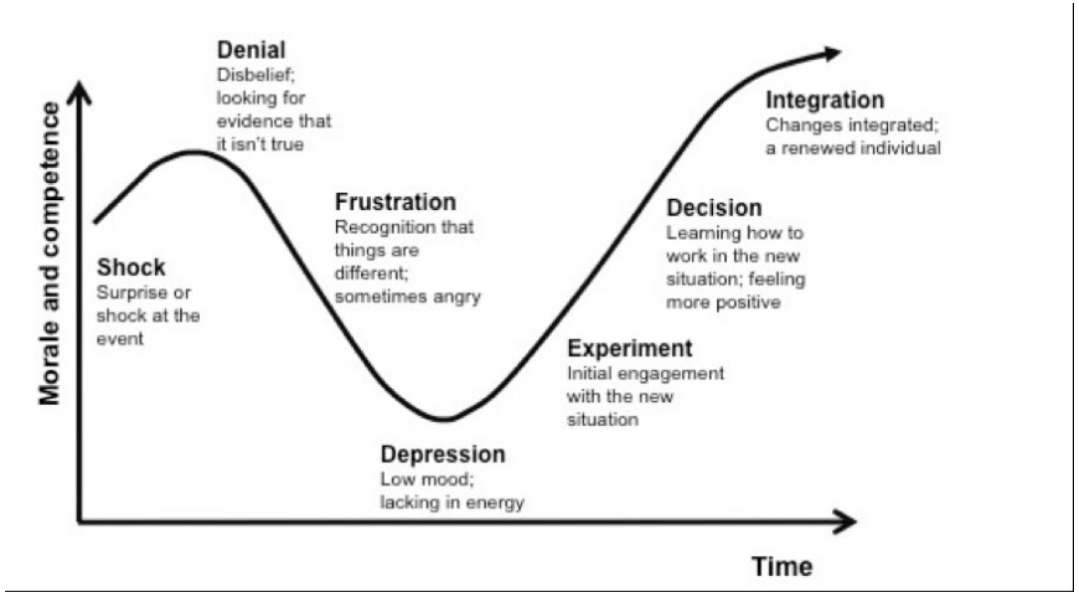
Organisational Change

Kotter, 1996



Lewin, 1947



The Kübler-ross bereavement curve, 1969

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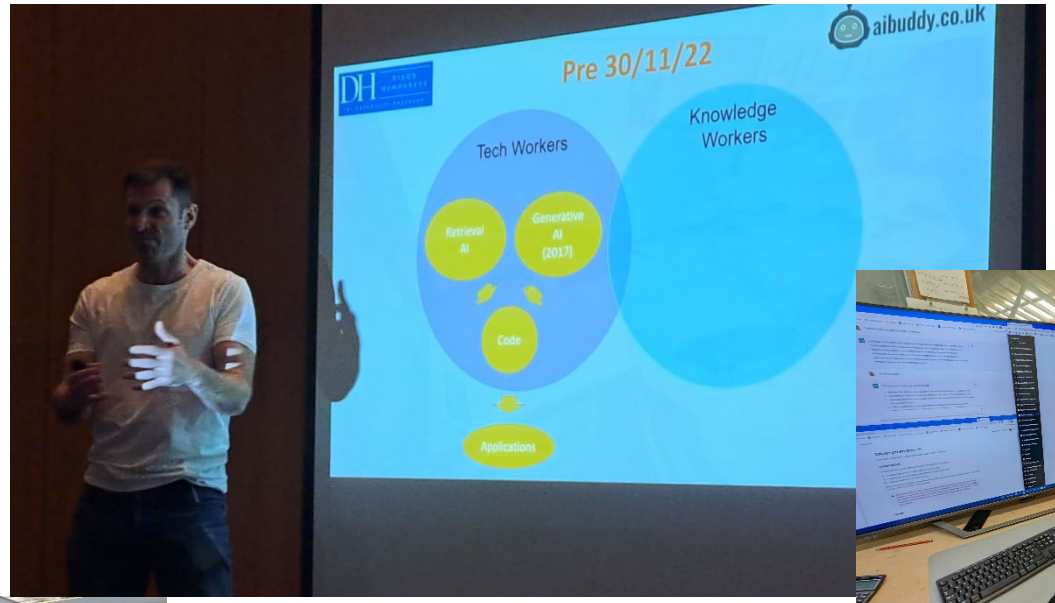

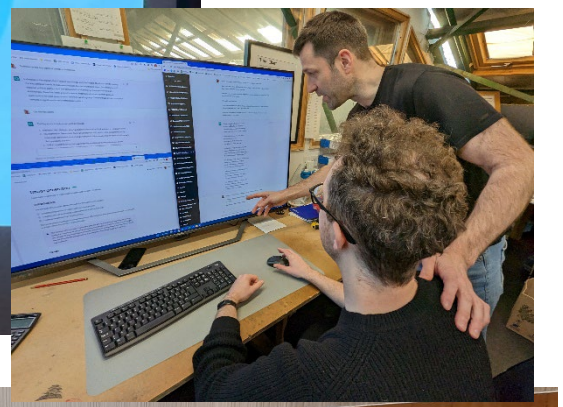

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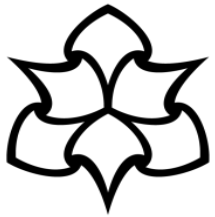
Organisational Action Plan (GEFIE)



Phase 1 Get Urgent	• Transition Knowledge workers and Senior Leadership from Unconscious Incompetence to Conscious Incompetence	3 Months
Phase 2 Exploration	• Transition Knowledge workers and Senior Leadership from Conscious Incompetence to Conscious Competence	
Phase 3 Formulate	• Formulate an Organisational AI Strategy • Emergent Bottom up approach	1 week
Phase 4 Iterate	• Formally repeat the process on a regular basis to maintain alignment with dynamic operating environment	Every 3 Months AI Strategic Review
Phase 5 Embed	• Fully embed AI thinking into every aspect of the organisational strategy. • At this stage there is no longer a requirement for a separate formal AI strategy	Upon Transformation

Dixon, R., 2023

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How do we start?

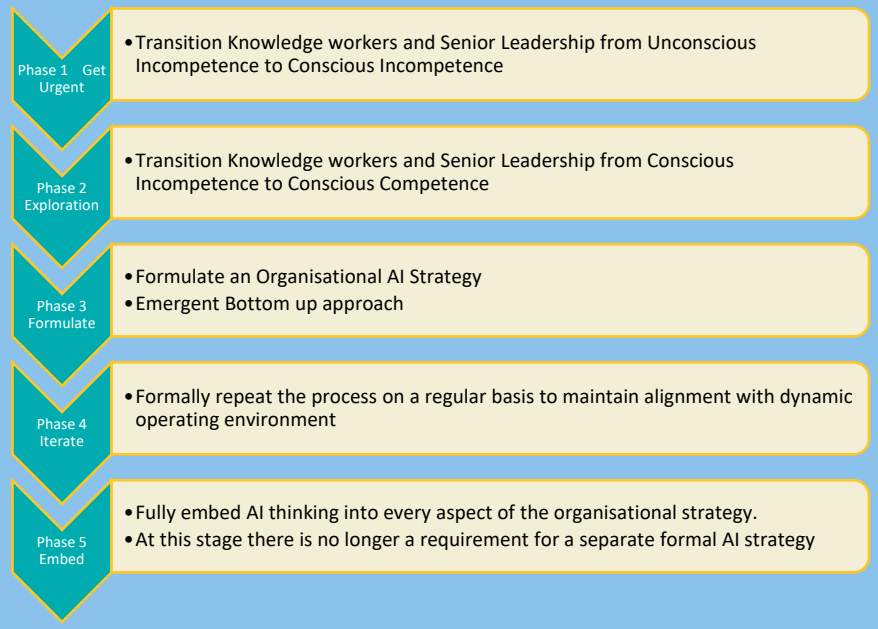
Individually

USE THE TOOLS

Institutions

Organise a
FESTIVAL of AI LITERACY (FAIL)

- 1 day AI Literacy event
  - Sense of Urgency, Workshops, No-Code hackathons, Bot Making
- Fear of failure
- Best if Senior Leadership involved



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Summary

November 2022: Generative AI accessible to Knowledge Workers

AI Revolution

- Hyper Turbulent and Unpredictable
- Compounded Exponential Rate of Change
- Transition to a world of
  - 10x Coding Productivity?
  - 4x Knowledge Worker Productivity?

What can we do?

- Get Urgent - FAIL
- Exploration of AI Technologies
- Formulate AI Strategy
- Iterate
- Embed

Generative AI a Threshold Concept

Emergent Strategy: doing and learning

Organisational Learning

Lots of little bets

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Enterprise and Innovation Centre in Greater Manchester (Founder)

ResearchBuddy
Produce and Academic Literature review on any subject (Co-Founder)