

# [SNU EE AI Seminar] The AI Landscape - Navigating Technology, Industry Shifts, and Future Trends

**Sunghee Yun**

Co-founder & CTO - AI Technology & Biz Dev @ [Erudio Bio, Inc.](#)

## About Speaker

- *Co-founder & CTO @ Erudio Bio, San Jose & Novato, CA, USA*
- Advisor & Evangelist @ CryptoLab, Inc., San Jose, CA, USA
- Chief Business Development Officer @ WeStory.ai, Cupertino, CA, USA
- Advisory Professor, Electrical Engineering and Computer Science @ DGIST, Korea
- Adjunct Professor, Electronic Engineering Department @ Sogang University, Korea
- Global Advisory Board Member @ Innovative Future Brain-Inspired Intelligence System Semiconductor of Sogang University, Korea
- *KFAS-Salzburg Global Leadership Initiative Fellow @ Salzburg Global Seminar*, Salzburg, Austria
- Technology Consultant @ Gerson Lehrman Group (GLG), NY, USA
- *Co-founder & CTO & Head of Global R&D & Chief Applied Scientist & Senior Fellow @ Gauss Labs, Inc., Palo Alto, CA, USA* 2020 – 2023

- Senior Applied Scientist @ Mobile Shopping Team, Amazon.com, Inc., Vancouver, BC, Canada – 2020
- Principal Engineer @ Software R&D Center of DS Division, Samsung, Korea – 2017
- Principal Engineer @ Strategic Marketing & Sales Team, Samsung, Korea – 2016
- Principal Engineer @ DT Team of DRAM Development Lab, Samsung, Korea – 2015
- Senior Engineer @ CAE Team - Samsung, Korea – 2012
- MS & PhD - Electrical Engineering @ Stanford University, CA, USA – 2004
- Development Engineer @ Vyan, Santa Clara, CA, USA – 2001
- BS - Electrical Engineering @ Seoul National University, Seoul, Korea – 1998

## Highlight of Career Journey

- BS in EE @ SNU, MS & PhD in EE @ Stanford University
  - *Convex Optimization - Theory, Algorithms & Software*
  - advised by *Prof. Stephen P. Boyd*
- Principal Engineer @ Samsung Semiconductor, Inc.
  - AI & Convex Optimization
  - collaboration with *DRAM/NAND Design/Manufacturing/Test Teams*
- Senior Applied Scientist @ Amazon.com, Inc.
  - e-Commerce AIs - time-series anomaly detection, deep reinforcement learning & recommender system
  - Jeff Bezos's project - increase sales by *\$200M* via Amazon Mobile Shopping App
- Co-founder & CTO & Head of Global R&D & Chief Applied Scientist & Senior Fellow @ Gauss Labs, Inc.
- Co-founder & CTO - AI Technology & Business Development @ Erudio Bio, Inc.

# Today

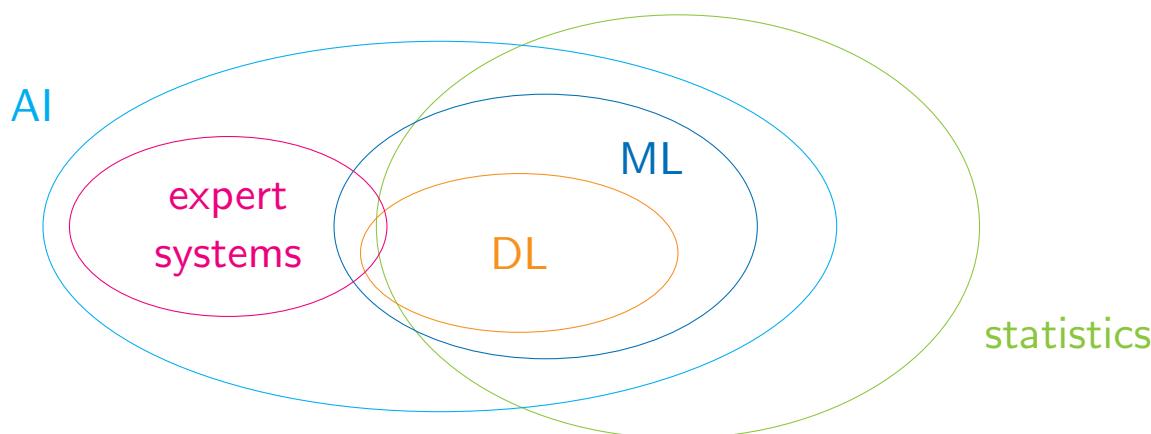
- Artificial Intelligence - 5
  - AI history & recent significant achievements
  - Industry & market indices, is AI hype?
- AI Agents - ??
  - Big Data → DL → LLM & genAI → Agentic AI
  - Future of society powered by AI agents
- Silicon Valley's Cultural Engine of Innovation and Disruption - ??
  - My journey from Samsung, Amazon & Gauss Labs to Erudio Bio
  - Innovation ecosystem & case study - Amazon
- References & Sources - ??

# **Artificial Intelligence**

## **Definition and History**

## Definition & relation to other technologies

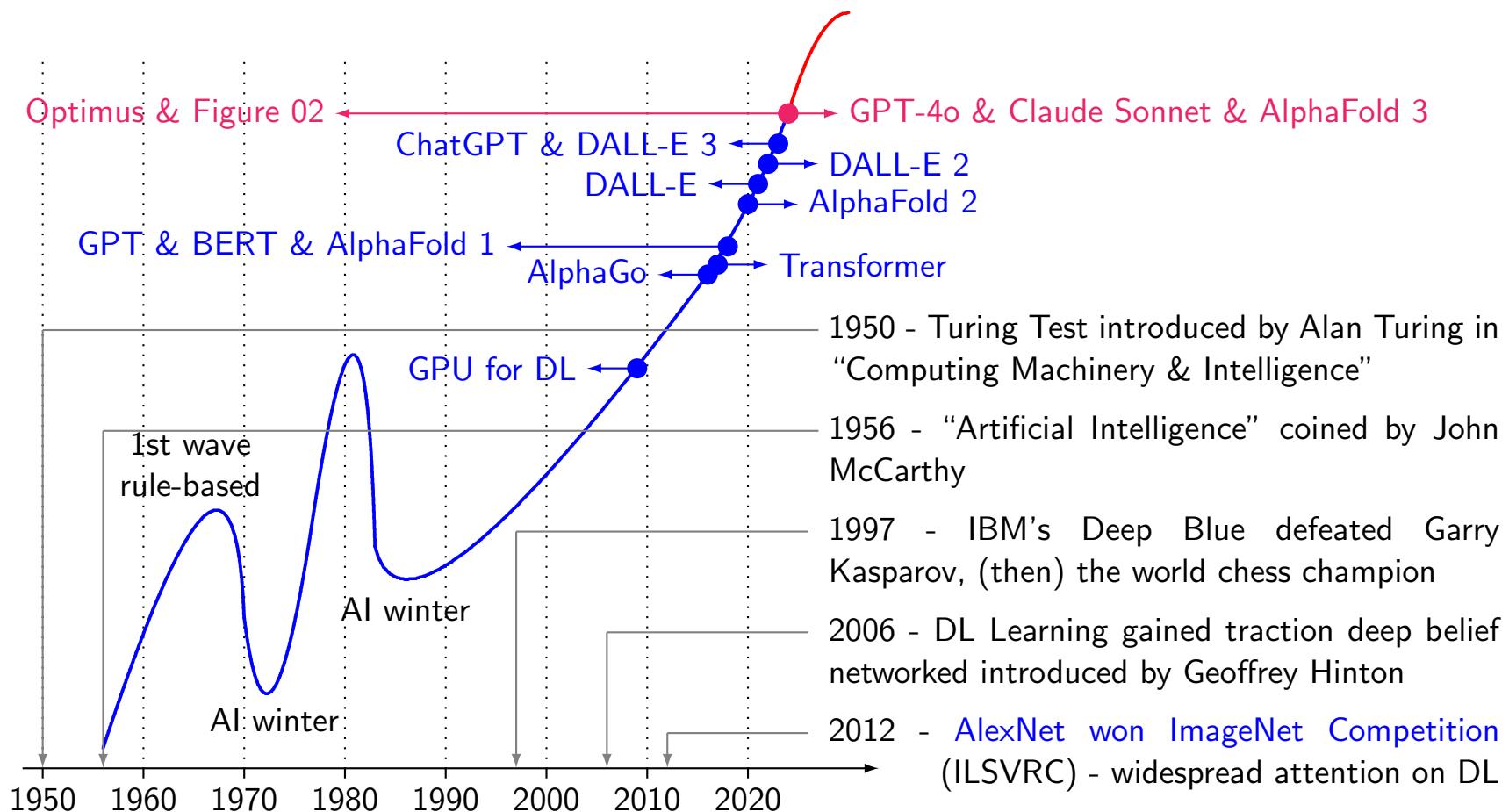
- AI
  - is technology doing tasks requiring human intelligence, such as learning, problem-solving, decision-making & language understanding
  - encompasses *range of technologies, methodologies, applications & products*
- AI, ML, DL, statistics & expert system<sup>1</sup> [HGH<sup>+</sup>22]



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<sup>1</sup>ML: machine learning & DL: deep learning

# History



# **Significant AI Achievements - 2014 – 2025**

## Deep learning revolution

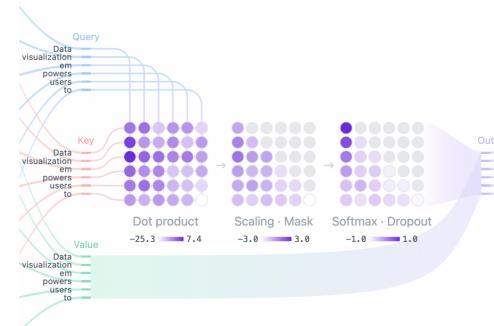
- 2012 – 2015 - DL revolution<sup>2</sup>
  - CNNs demonstrated exceptional performance in image recognition, e.g., *AlexNet's victory in ImageNet competition*
  - widespread adoption of DL learning in CV transforming industries
- 2016 - AlphaGo defeats human Go champion
  - DeepMind's AlphaGo defeated world champion in Go, extremely complex game *believed to be beyond AI's reach*
  - significant milestone in RL - AI's potential in solving complex & strategic problems



<sup>2</sup>CV: computer vision, NN: neural network, CNN: convolutional NN, RL: reinforcement learning

## Transformer changes everything

- 2017 – 2018 - Transformers & NLP breakthroughs<sup>3</sup>
  - *Transformer (e.g., BERT & GPT) revolutionized NLP*
  - major advancements in, *e.g.*, machine translation & chatbots
- 2020 - AI in healthcare – AlphaFold & beyond
  - DeepMind's *AlphaFold solves 50-year-old protein folding problem* predicting 3D protein structures with remarkable accuracy
  - accelerates drug discovery and personalized medicine - offering new insights into diseases and potential treatments



<sup>3</sup>NLP: natural language processing, GPT: generative pre-trained transformer

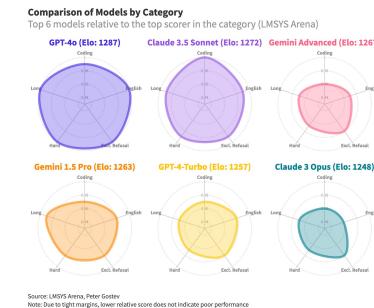
## Lots of breakthroughs in AI technology and applications in 2024

- proliferation of advanced AI models
  - GPT-4o, Claude Sonnet, Claude 3 series, Llama 3, Sora, Gemini
  - *transforming industries* such as content creation, customer service, education, etc.
- breakthroughs in specialized AI applications
  - Figure 02, Optimus, AlphaFold 3
  - driving unprecedented advancements in automation, drug discovery, scientific understanding - *profoundly affecting healthcare, manufacturing, scientific research*



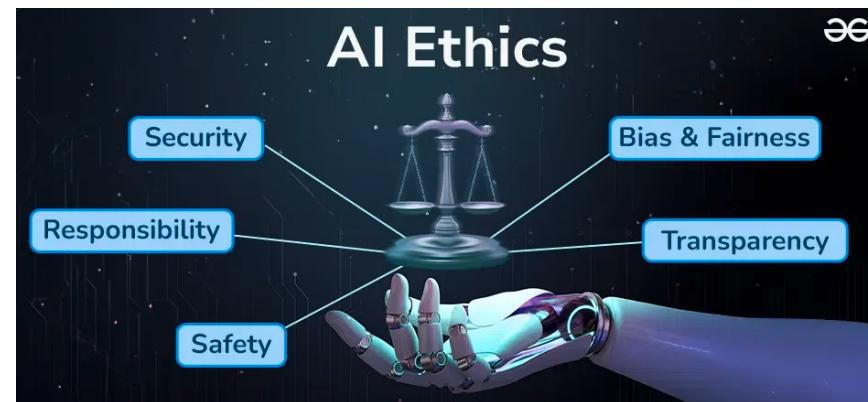
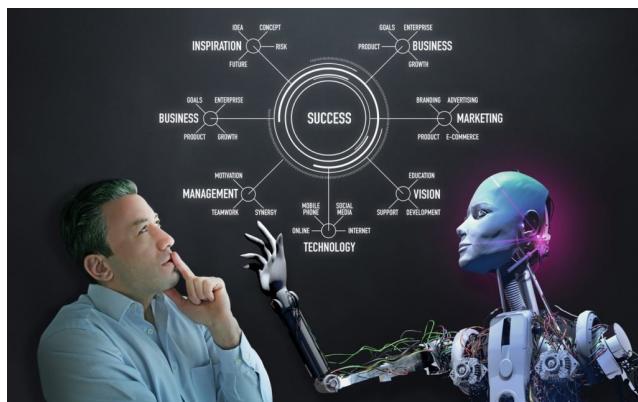
## Major AI Breakthroughs in 2025

- next-generation foundation models
  - GPT-5 and Claude 4 demonstrate emergent reasoning abilities
  - open-source models achieving parity with leading commercial systems from 2024
- hardware innovations
  - NVIDIA's Blackwell successor architecture delivering 3-4x performance improvement
  - AMD's MI350 accelerators challenging NVIDIA's market dominance
- AI-human collaboration systems
  - seamless multimodal interfaces enabling natural human-AI collaboration
  - AI systems effectively explaining reasoning and recommendations
  - augmented reality interfaces providing real-time AI assistance in professional contexts



## Transformative impact of AI - reshaping industries, work & society

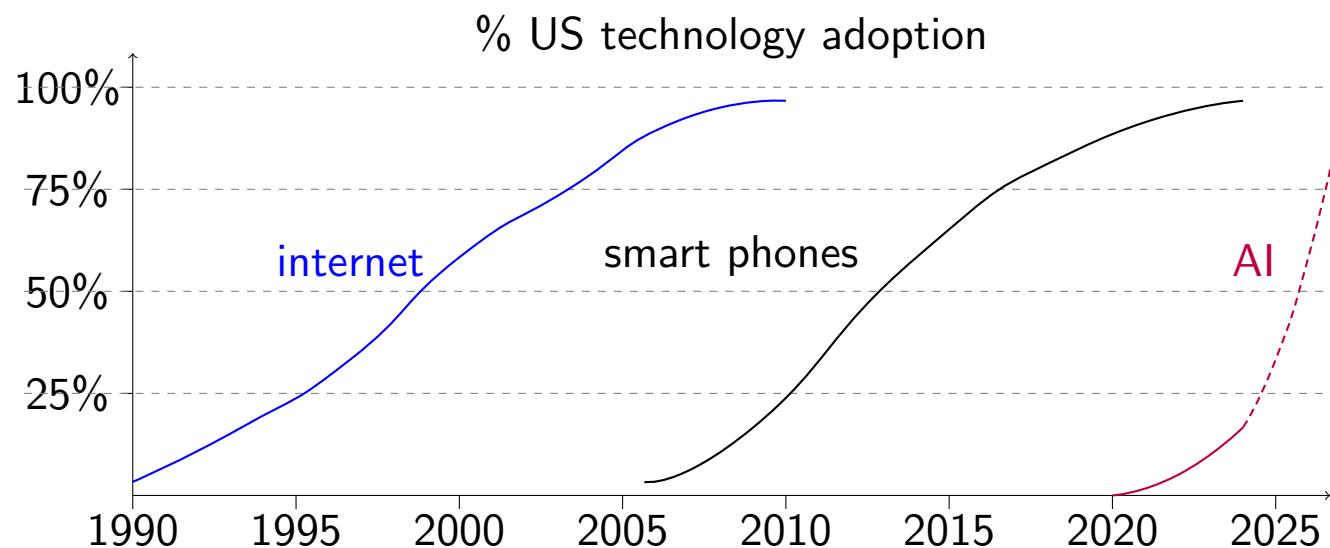
- accelerating human-AI collaboration
    - not only reshaping industries but *altering how humans interact with technology*
    - AI's role as collaborator and augmentor redefines productivity, creativity, the way we address global challenges, e.g., *sustainability & healthcare*
  - AI-driven automation *transforms workforce dynamics* - creating new opportunities while challenging traditional job roles
  - *ethical AI considerations* becoming central not only to business strategy, but to society as a whole - *influencing regulations, corporate responsibility & public trust*



# **Recent Advances in AI**

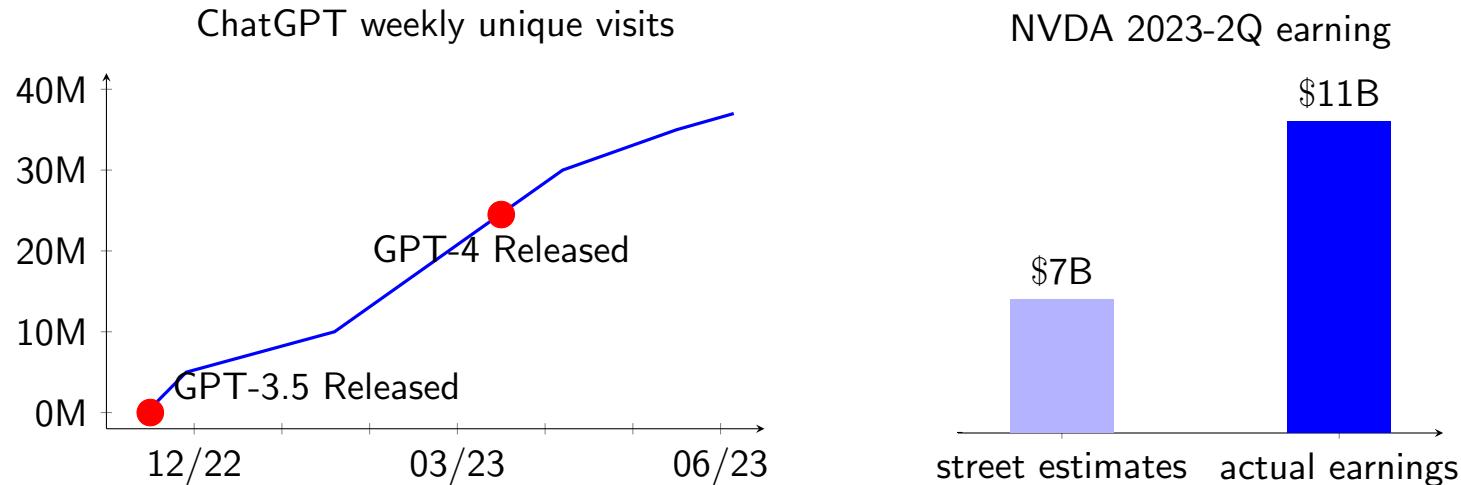
## Where are we in AI today?

- sunrise phase - currently experiencing dawn of AI era with significant advancements and increasing adoption across various industries
- early adoption - in early stages of AI lifecycle with widespread adoption and innovation across sectors marking significant shift in technology's role in society



## Explosion of AI ecosystems - ChatGPT & NVIDIA

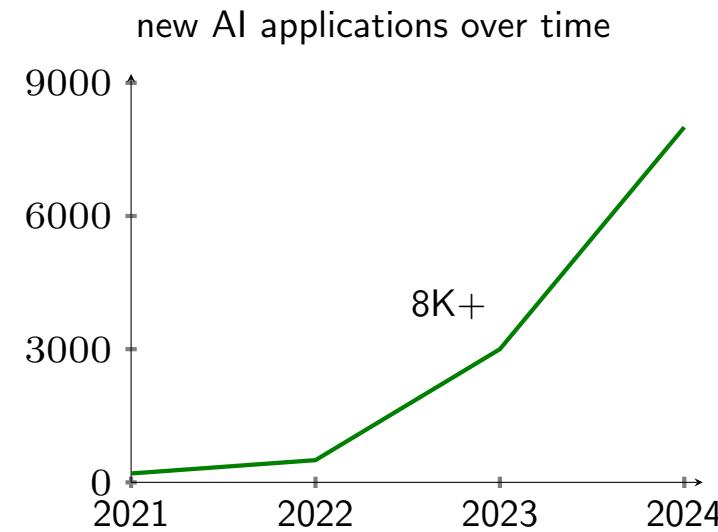
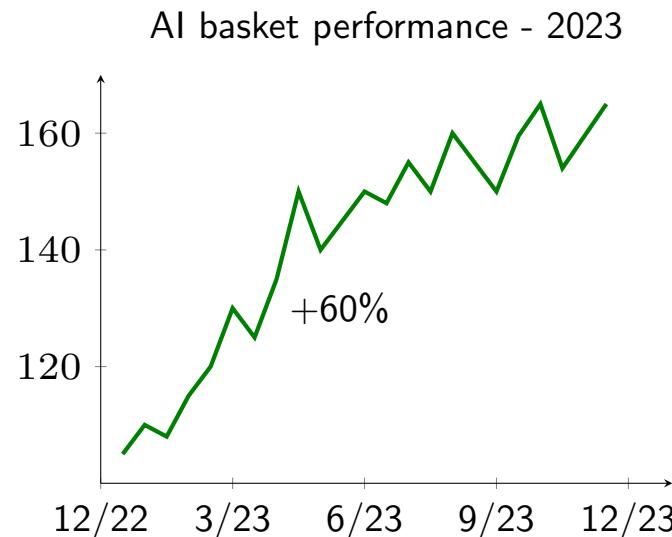
- took only *5 months for ChatGPT users to reach 35M*
- NVIDIA 2023 Q2 earning exceeds market expectation by big margin - \$7B vs \$13.5B
  - surprisingly, *101% year-to-year growth*
  - even more surprisingly *gross margin was 71.2%* - up from 43.5% in previous year<sup>4</sup>



<sup>4</sup>source - Bloomberg

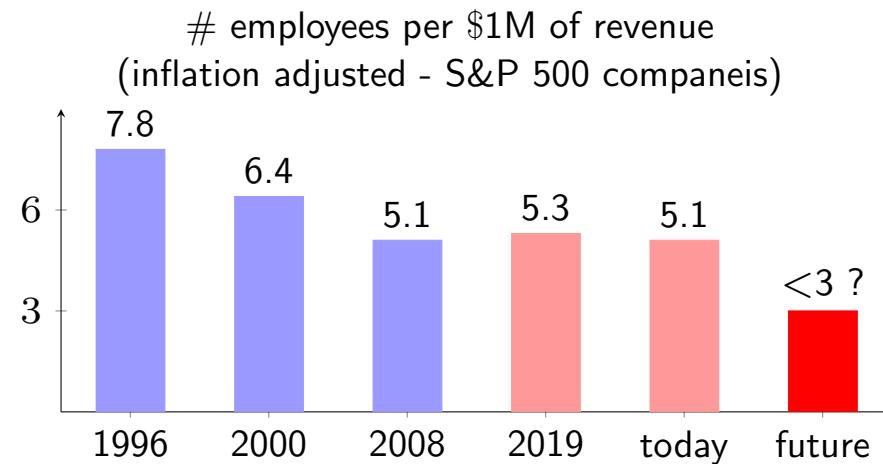
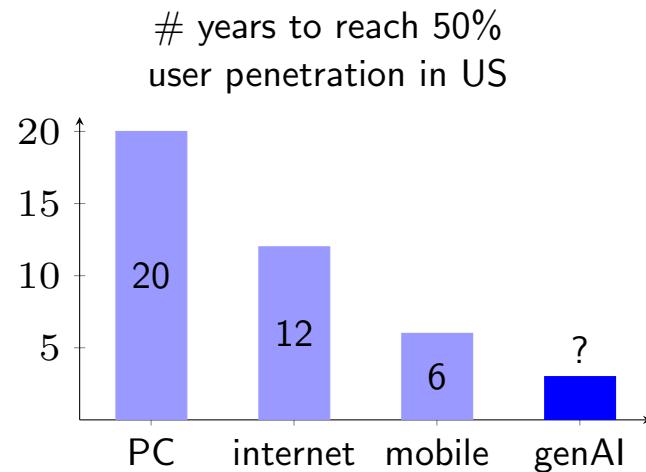
## Explosion of AI ecosystems - AI stock market

- *AI investment surge in 2023 - portfolio performance soars by 60%*
  - AI-focused stocks significantly outpaced traditional market indices
- *over 8,000 new AI applications* developed in last 3 years
  - applications span from healthcare and finance to manufacturing and entertainment



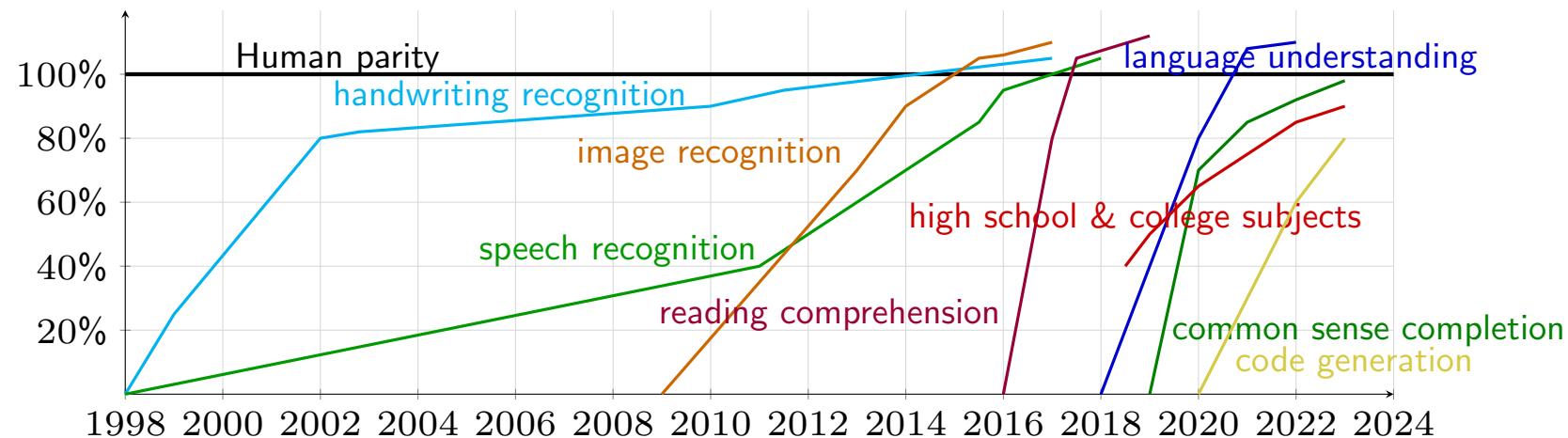
## AI's transformative impact - adoption speed & economic potential

- adoption - has been twice as fast with platform shifts suggesting
  - increasing demand and readiness for new technology improved user experience & accessibility
- AI's potential to drive economy for years to come
  - 35% improvement in productivity driven by introduction of PCs and internet
  - greater gains expected with AI proliferation



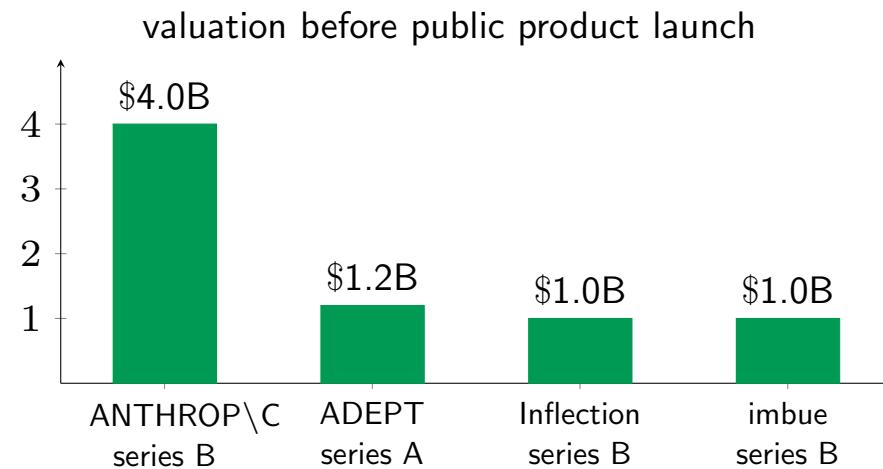
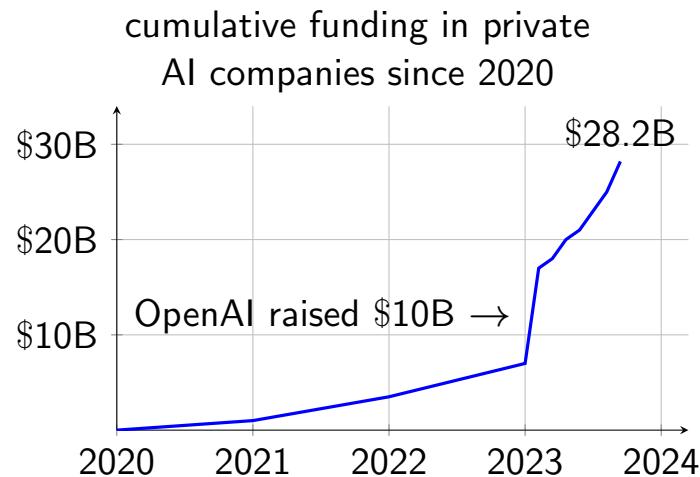
## AI getting more & more faster

- steep upward slopes of AI capabilities highlight accelerating pace of AI development
  - period of exponential growth with AI potentially mastering new skills and surpassing human capabilities at ever-increasing rate
- closing gap to human parity - some capabilities approaching or arguably reached human parity, while others having still way to go
  - achieving truly human-like capabilities in broad range remains a challenge



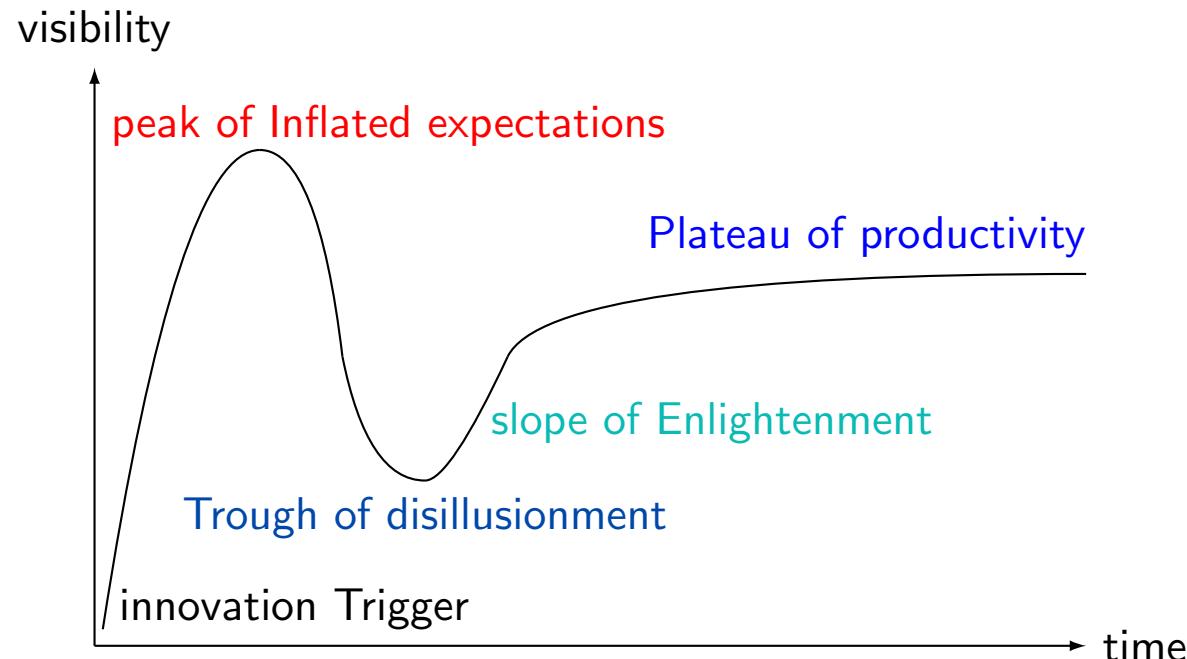
## Massive investment in AI

- *explosive growth* - cumulative funding skyrocketed reaching staggering \$28.2B
- OpenAI - significant fundraising (= \$10B) fueled rapid growth
- *valuation surge* - substantial valuations even before public products for stellar companies
- *fierce competition for capital* among AI startups driving innovation & accelerating development
- massive investment indicates *strong belief in & optimistic outlook for potential of AI* to revolutionize industries & drive economic growth



**Is AI hype?**

## Technology hype cycle



- innovation trigger - technology breakthrough kicks things off
- peak of inflated expectations - early publicity induces many successes followed by even more
- trough of disillusionment - expectations wane as technology producers shake out or fail
- slope of enlightenment - benefit enterprise, technology better understood, more enterprises fund pilots

## Fiber vs cloud infrastructure

- fiber infrastructure - 1990s
  - Telco Co's raised \$1.6T of equity & \$600B of debt
  - bandwidth costs decreased 90% within 4 years
  - companies - Covage, NothStart, Telligent, Electric Lightwave, 360 networks, Nextlink, Broadwind, UUNET, NFS Communications, Global Crossing, Level 3 Communications
  - became *public good*
- cloud infrastructure - 2010s
  - entirely new computing paradigm
  - mostly public companies with data centers
  - *big 4 hyperscalers generate \$150B + annual revenue*



## Yes & No

characteristics of hype cycles	speaker's views
value accrual misaligned with investment	<ul style="list-style-type: none"><li>• OpenAI still operating at a loss; business model <i>still</i> not clear</li><li>• gradual value creation across broad range of industries and technologies (<i>e.g.</i>, CV, LLMs, RL) unlike fiber optic bubble in 1990s</li></ul>
overestimating timeline & capabilities of technology	<ul style="list-style-type: none"><li>• self-driving cars delayed for over 15 years, with limited hope for achieving level 5 autonomy</li><li>• AI, however, has proven useful within a shorter 5-year span, with enterprises eagerly adopting</li></ul>
lack of widespread utility due to technology maturity	<ul style="list-style-type: none"><li>• AI already providing significant utility across various domains</li><li>• vs quantum computing remains promising in theory but lacks widespread practical utility</li></ul>

## References

- [HGH<sup>+</sup>22] Sue Ellen Haupt, David John Gagne, William W. Hsieh, Vladimir Krasnopolksky, Amy McGovern, Caren Marzban, William Moninger, Valliappa Lakshmanan, Philippe Tissot, and John K. Williams. The history and practice of AI in the environmental sciences. *Bulletin of the American Meteorological Society*, 103(5):E1351 – E1370, 2022.

**Thank You**