Understanding the evolution of Artificial Intelligence

Background

How will AI evolve over the next few years / decades?
That's Not an easy question to answer - but nevertheless, we present a methodology below

Consider a gedankenexperiment / thought experiment like Einstein's famous beam of light

Image source Reddit

If AI were a child how would it learn an ideal set of skills and in turn - what would be the impact of those capabilities learnt by AI on us (our work)?

We can split this into components
   a) Horizontal skills - where could AI be applied
   b) Vertical skills - what techniques are needed to develop AI
   c) How would the 'mind of AI' i.e. a generative model learn
   d) How could we adopt working with AI emotionally
   e) How could AGI develop
   f) Process mining i.e. understanding the workflows behind a process and rethinking the process using AI and AGI ex
   g) How easily could we adopt the co-pilot model i.e. humans working with AI and which jobs would it impact and what does it mean for skills and automation

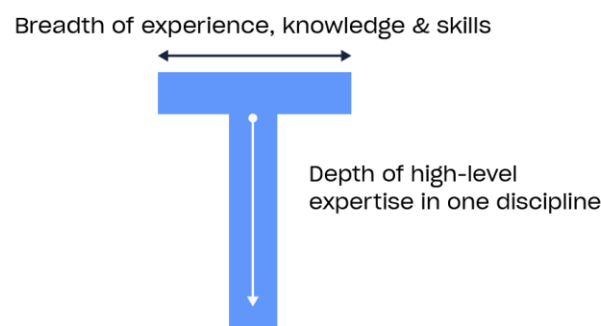We can think of skill acquisition as a T shaped skills format

T-Shaped Skills

Breadth of experience, knowledge & skills

Depth of high-level expertise in one discipline

Image source https://www.highspeedtraining.co.uk/hub/t-shaped-employee/

However, with generative AI, we have one more component
We have to think of AI in terms of incremental brain development

If we think of generative AI (like chatGPT) as a child, then as, as it is exposed to knowledge, it develops its capabilities

The T shaped framework

The horizontal axis (breadth)

A possible evolution of all technology is as per below - we expect they will all use AI in some shape or form

The World in 2030: Top 20 Future Technologies
1. Human-Like AI Will Likely Become A Reality
2. 8K Virtual Reality Headsets Will Become Mainstream
3. Brain-Interface Devices Will Become Mainstream

4. The First Quantum Computers With 1 Million Qubits Will Emerge
5. 3D-Printed Human Organs Will Begin Being Used
6. Artificial Brain Implants Will Restore Lost Memories
7. SpaceX's 1st Crewed Mars Mission Will Be Successful
8. The First Version Of The Quantum Internet Could Emerge
9. A Billion Human Genomes Will Be Sequenced
10. Human Brain Simulations Could Become Possible
11. Terabyte Internet Speeds Could Be Commonplace
12. "Smart Grid" Technology Will Become Widespread In The Developed World
13. Foldable Electronics Could Become Commonplace
14. Open-Source, 3D Printed Clothes Will Be At Near-Zero Cost
15. 100 Terabyte Hard Drives Will Become Mainstream
16. Hypersonic Missiles Will Be Commonly Used In Most Major Militaries
17. Carbon Sequestration Will Be Commonly Used In Many Nations
18. Small Modular Nuclear Reactors Could Gain Widespread Adoption
19. Several Extinct Species Could Be Resurrected
20. The Entire Ocean Floor Will Be Mapped

The World in 2040: Top 20 Future Technologies
1. The Metaverse Will Become Fundamental To Everyday Life
2. Brain-Computer Interfaces Could Become Mainstream
3. Life-Like Virtual Assistants Could Become Mainstream
4. Level 5 Autonomous Vehicles Could Emerge
5. Quantum Computing Could Become Mainstream
6. Artificial Intelligence Could Take Over The Education Industry
7. Service Robots Could Number A Billion Worldwide
8. The First Permanent Lunar Base Could Be Established
9. Hypersonic Airliners Could Enter Service
10. CRISPR And Gene Therapies Could Greatly Minimize Diseases
11. Moon And Asteroid Mining Could Become A Routine Practice
12. Carbon Nanotubes Could Begin Production
13. The First Zettascale Super Computer Could Be Operational
14. The Einstein Telescope Could Be Operational
15. Robots Could Dominate The Battlefield
16. Space-Based Solar Power Could Become Commercially Feasible
17. Deep Ocean Mining Operations Will Likely Become Commonplace
18. Fusion Power Could Become Commercially Available
19. The Very Large Hadron Collider Could Become Operational
20. The High-Definition Space Telescope (HDST) Could Be Operational

The World in 2050: Top 20 Future Technologies
1. The World's First Artificial General Intelligence Is Close To Becoming A Reality
2. Human-Like Robots Are Emerging
3. Smart Cities Are Emerging In Some Regions
4. Brain-Computer Interfaces Have Improved By Orders Of Magnitude
5. Bionic Eyes Are Perfected
6. Two Space Elevators Have Been Built
7. VR Glasses Are Replacing Smartphones

8. Mars Has A Permanent Human Presence
9. Augmented And Mixed Reality Is Everywhere
10. Hyperloop Tunnels Are Enabling Faster International Travel
11. Video Games Are Becoming Hyper Realistic
12. AI Can Outperform Humans In Most Occupations
13. Virtual Assistants Have Largely Replaced Search Engines
14. The Average Person Has Access To Quantum Computing Technology
15. CRISPR And Gene Therapies Are Minimizing Severe Diseases
16. AI-Enabled Warfare Is Now Possible
17. Light-Based Computer Chips Are Mainstream
18. The Cost Of Energy Is Incredibly Cheap
19. Decentralized Autonomous Organizations Are Disrupting The Entertainment Industry
20. Most Digital Transactions Use Blockchain Technology

The World in 2060: Top 9 Future Technologies
1. Artificial General Intelligence Has Arrived
2. Nanobots Can Connect Our Brains To The Internet
3. Photo-Realistic Virtual Worlds Are Now Planet-Sized
4. Radical Life Extension Is Becoming Possible
5. Space Hotels Are Now Affordable For Most People
6. Designer Babies Are Becoming Common For The Upper Class
7. Smart Clothing Is A Trillion-Dollar Industry
8. Tablet-Sized MRI Scanners Are Commonplace
9. Entire Movies Can Be Auto-Generated By AI

The World in 2070: Top 9 Future Technologies
1. Artificial Super Intelligence Is Now A Reality
2. Conscious Virtual Beings Are Now Available In Metaverse And Virtual Environments
3. Programmable Matter Is Becoming Mainstream
4. Advanced Humanoid Robots Look And Act 100% Human
5. Replicator Machines Are Now Mainstream
6. The First Generation Of Antimatter-Powered Spacecraft Is Emerging
7. Houses Are Becoming Fully Automated
8. Buildings Are Able To Assemble Themselves Using Nanotechnology
9. Underground Living Facilities Are Commonplace

The World in 2080: Top 7 Future Technologies
1. Transhumanism Is Now Mainstream
2. Advanced Nanotech Clothing Is Becoming Mainstream
3. Most Of The Solar System Is Being Explored
4. Viruses Are Being Simulated At The Quantum Level
5. Picotechnology Is Becoming Practical
6. A Tunnel Connecting The United States And Europe Is Being Built
7. Virtually All Of The World's Electricity Is Now Carbon-Free

The World in 2090: Top 9 Future Technologies
1. Super Intelligent Virtual Beings Are Now Available In The Metaverse
2. Conscious Virtual Beings Far Outnumber Biological Humans

3. The Terraforming Of Mars Is Underway
4. Uploading Memories And Dreams To Computers Is Now Possible
5. Androids Are Widespread In Law Enforcement
6. Photosynthetic Humans Are Becoming More Common
7. Genetic Enhancement Is Widespread In Professional Sports
8. Conventional Meat Is Becoming Obsolete
9. Nomadic Floating Cities Are Roaming The Oceans

The World in 2100: Top 10 Future Technologies
1. Humans Are Able To Merge With Artificial Super Intelligence
2. The Hive Mind And Telepathy Are Becoming Mainstream
3. Hyper-Personalized Virtual Realities Are Being Built Using Brain Data
4. Skills And Knowledge Can Be Downloaded To Peoples' Brains
5. Floating Cars And Room-Temperature Superconductors Are Mainstream
6. Memory, Thought, And Emotion Editing Is Becoming Mainstream
7. Force Fields Are Becoming Mainstream
8. Femtoengineering Is Now Possible
9. Personal Health Pods Are Commonplace For The Upper-Class
10. Large-Scale Arcologies Are Emerging As An Alternative To Traditional Cities

The World in 2200: Top 10 Future Technologies
1. Mind Uploading Has Become Mainstream
2. Synthetic Human Bodies And Brains Are Now A Reality
3. Virtual Simulations Now Have Quantum-Level Of Detail
4. Invisibility Suits Are Now Possible
5. Artificial Gravity Is Now Possible
6. Hi-Tech, Automated Cities Are Being Built
7. Holodeck Cities Are Now A Reality
8. Uploaded Minds Are Being Transmitted To Other Planets
9. Probes Are Reaching Neighboring Star Systems
10. Large-Scale Civilian Settlements On The Moon Are Now A Reality

The World in 2300: Top 9 Future Technologies
1. Superhuman Powers Are Now Possible
2. Humanity Is A Type 1 Civilization On The Kardashev Scale
3. Teleportation Is Now Available To The Mainstream Public
4. Life Has Been Found On Another Planet
5. Humans Now Live In Other Star Systems
6. Earth Is Able To Be Protected From Asteroids
7. The Entire Solar System Is Being Inhabited By Humans
8. Moore's Law Is Reaching Its Physical Limit
9. Earth's Ecosystems Are Being Repaired

The World in 3000: Top 7 Future Technologies
1. Humanity Is Becoming A Type 2 Civilization On The Kardashev Scale
2. Over 100,000 Earth-Like Worlds Have Been Occupied
3. Some Humans Are Living For Hundreds Of Years
4. An Entire Galaxy Has Been Simulated

5. Biological Organisms Can Be Created In Minutes
6. Mars Has Been Terraformed
7. Venus Has Been Terraformed

The World in 10,000 A.D.: Top 7 Future Technologies
1. 30% Of The Milky Way Has Been Inhabited By Humans
2. Ring Cities Are Now Orbiting Some Planets
3. Many Alien Species Have Been Discovered
4. Humans Are Living For Thousands Of Years
5. The Milky Way Galaxy Is Being Infused With Intelligence
6. Traditional Computer Science Is Reaching Its Ultimate Potential
7. The Grand Unification Theory Has Been Proven

The World in a Million Years: Top 7 Future Technologies
1. Most Humans Have Abandoned Their Physical Bodies
2. Multiple Wormholes Have Been Created
3. Spaceships Can Travel Faster Than The Speed Of Light
4. Humanity Is A Type 3 Civilization On The Kardashev Scale
5. Full Control Of Gravitational Waves Is Becoming Possible
6. Planet-Sized Computers Are Starting To Dominate Our Galaxy
7. The Universe Is Being Infused With Computronium

Source
https://www.futurebusinesstech.com/site/about

The vertical axis - depth

This represents a set of building blocks for AI (technologies)

Advanced materials and manufacturing
1. Nanoscale materials and manufacturing
2. Coatings
3. Smart materials
4. Advanced composite materials
5. Novel metamaterials
6. High-specification machining processes
7. Advanced explosives and energetic materials
8. Critical minerals extraction and processing
9. Advanced magnets and superconductors
10. Advanced protection
11. Continuous flow chemical synthesis
12. Additive manufacturing (incl. 3D printing)

Artificial intelligence, computing and communications

13. Advanced radiofrequency communications (incl. 5G and 6G)
14. Advanced optical communications
15. Artificial intelligence (AI) algorithms and hardware accelerators
16. Distributed ledgers
17. Advanced data analytics
18. Machine learning (incl. neural networks and deep learning)
19. Protective cybersecurity technologies
20. High performance computing
21. Advanced integrated circuit design and fabrication
22. Natural language processing (incl. speech and text recognition and analysis)

Energy and environment
23. Hydrogen and ammonia for power
24. Supercapacitors
25. Electric batteries
26. Photovoltaics
27. Nuclear waste management and recycling
28. Directed energy technologies
29. Biofuels
30. Nuclear energy

Quantum
31. Quantum computing
32. Post-quantum cryptography
33. Quantum communications (incl. quantum key distribution)
34. Quantum sensors

Biotechnology, gene technology and vaccines
35. Synthetic biology
36. Biological manufacturing
37. Vaccines and medical countermeasures
Sensing, timing and navigation
38. Photonic sensors

Defence, space, robotics and transportation
39. Advanced aircraft engines (incl. hypersonics)
40. Drones, swarming and collaborative robots
41. Small satellites
42. Autonomous systems operation technology
43. Advanced robotics
44. Space launch systems

Emergence of AGI

AGI is now nearer

The goal of openAI is to work on AGI
This has an impact especially the emergence of AGI is now seen as 20 to 50 years ie in our lifetime

"Until quite recently, I thought it was going to be like 20 to 50 years before we have general purpose AI," Hinton said. "And now I think it may be 20 years or less." AGI is the term that describes a potential AI that could exhibit human or superhuman levels of intelligence. Rather than being overtly specialised, an AGI would be capable of learning and thinking on its own to solve a vast array of problems.

Luckily, by Hinton's outlook, humanity still has a little bit of breathing room before things get completely out of hand, since current publicly available models are mercifully stupid. "We're at this transition point now where ChatGPT is this kind of idiot savant, and it also doesn't really understand about truth, " Hinton told CBS, because it's trying to reconcile the differing and opposing opinions in its training data. "It's very different from a person who tries to have a consistent worldview."

But Hinton predicts that "we're going to move towards systems that can understand different world views" — which is spooky, because it inevitably means whoever is wielding the AI could use it push a worldview of their own.

Major risk that AI may eliminate humanity

Source: https://futurism.com/the-byte/godfather-ai-risk-eliminate-humanity

Full interview is here
https://www.cbsnews.com/news/godfather-of-artificial-intelligence-weighs-in-on-the-past-and-potential-of-artificial-intelligence/

The full significance of OpenAI is that they intentionally set out to create AGIat scale (and no one else had) and they seem to have set all of humanity in that direction

Thats a big impact
See Sam altman (ceo of openai) interview with Lex Friendman
https://www.youtube.com/watch?v=L_Guz73e6fw

Possible Long term impact of AGI

- The emergence of Artificial Super Intelligence in 30 years
- Humans merging with AI in 40 years
- robots with human-level consciousness in 50 years
- AI generated content which is indistinguishable from humans - sound, language, video
- Quantum technologies and AI
- Level 5 Autonomous Vehicles
- Very high number of simulations of a range of scenarios
- Robots outnumber humans
- AI is non human form
- AI is distributed and connected
- Lifelike AI assistants]
- AIs are replacing teachers and professors
- Emergence of superintelligence (ref Nick Bostrum)
- The technological singularity has officially begun. The technological singularity is a point in time when technological growth becomes uncontrollable and irreversible.
- AIs can outperform humans in most occupations.
- AI-enabled warfare is commonplace in most major militaries.

This will be fostered by the evolution of chatGPT and other existing LLMS

Predicting the long term behaviour of large language models like chatGPT

Predicting the long term behaviour of large language models is hard. However, there are two noticeable trends already

  a) The capability of networks to learn exponentially by scale alone ref https://www.linkedin.com/pulse/artificial-intelligence-42-can-emerge-its-own-we-do-nothing-jaokar/ and https://computing.mit.edu/news/solving-a-machine-learning-mystery/ and
  b) The possibility of emergence - i.e. In the case of generative AI, we are also [probably already seeing emergent behaviour](#)

In addition, we could consider

The ability of AI to write code(and hence assist in software development in general)
https://www.arafattehsin.com/unlock-the-power-of-openai-gpt-with-no-code-ai-builder/

The impact of AGI on automation and jobs - as per OpenAI Research Paper: The Future of Work: How 80% of Jobs Could Be Impacted by Artificial Intelligence
https://arxiv.org/pdf/2303.10130.pdf

Impact on skills (source openAI)

<u>Basic Skills</u>
Developed capacities that facilitate learning or the more rapid acquisition of knowledge.

<u>Content</u>
Background structures needed to work with and acquire more specific skills in a variety of different domains.
• Reading Comprehension — Understanding written sentences and paragraphs in work-related documents.
• Active Listening — Giving full attention to what other people are saying, taking time to understand
the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
• Writing — Communicating effectively in writing as appropriate for the needs of the audience.
• Speaking — Talking to others to convey information effectively.
• Mathematics — Using mathematics to solve problems.
• Science — Using scientific rules and methods to solve problems.

<u>Process</u>
Procedures that contribute to the more rapid acquisition of knowledge and skill across a variety of domains
• Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative
solutions, conclusions or approaches to problems.
• Active Learning — Understanding the implications of new information for both current and future
problem-solving and decision-making.
• Learning Strategies — Selecting and using training/instructional methods and procedures appropriate
for the situation when learning or teaching new things.
• Monitoring — Monitoring/Assessing performance of yourself, other individuals, or organizations to
make improvements or take corrective action.

<u>Cross-Functional Skills</u>
Note: We selected only Programming from the list of cross-functional skills because of our prior knowledge
about the models' ability to code.
• Programming - Writing computer programs for various purposes.

Impact of Copilot
https://www.pcworld.com/article/1674223/microsoft-enlists-security-copilot-ai-to-fight-hackers.html

Emotional appeal of chatGPT
https://www.linkedin.com/pulse/emotional-appeal-chatgpt-why-matters-ajit-jaokar/