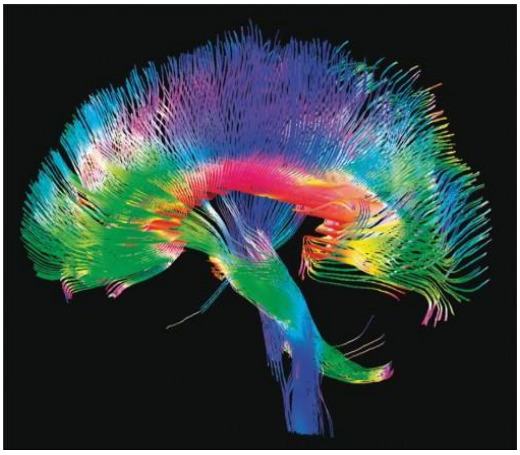
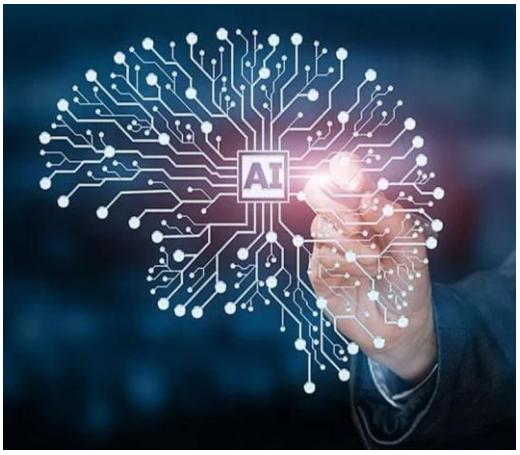
Biological and Artificial Intelligence





Is AI the next stage of evolution, replacing the Darwinian progression, or can we become artificially intelligent?

To find several short videos on AI – google 'youtube short video about artificial intelligence' or go to - https://www.google.com/search?q=short+youtube+videos+on+artificial+intelligence+%28ai%29&sca_esv=573539579&source=hp&ei=PFwrZfvBG7-k5NoP9Kep-Ao&iflsig=AO6bgOgAAAAAZStqTD4tig1Dcl0z3CGWEe5BFgK6gvEO&oq=short+youtunb+videos+on+Artificial+intelligence&gs_lp=Egdnd3Mtd2l6Ii9zaG9ydCB5b3V0dW5iIHZpZGVvcyBvbiBBcnRpZmljaWFsIGludGVsbGlnZW5jZSoCCAEyBxAhGKABGAoyBxAhGKABGApIiZABUABY421wAHgAkAEDmAGbBaABzn6qAQsyLTEwLjMyLjEuNLgBAcgBAPgBAclCCxAAGIAEGLEDGIMBwgIOEC4YgAQYsQMYxwEY0QPCAhEQLhiABBixAxiDARjHARjRA8ICERAuGIoFGLEDGIMBGMcBGNEDwgILEAAYigUYsQMYgwHCAgsQLhiDARixAxiKBcICBRAAGIAEwgIEEAAYA8ICCxAuGIoFGLEDGIMBwgIIEAAYgAQYsQPCAggQABiABBjJA8ICCBAuGIAEGLEDwgIHEAAYDRiABMICBhAAGBYYHsICCBAAGIoFGIYDwgIKECEYFhgeGB0YCsICCBAhGBYYHhgdwgIGECEYFRgKwgIEECEYFQ&sclient=gws-wiz

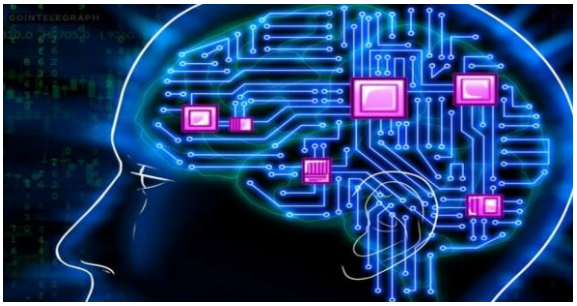
Also,
What's next for AI? | Roger Penrose, David Chalmers, Susan Schneider, Joanna Bryson and more! - YouTube

https://iview.abc.net.au/show/ai-vs-human-the-creativity-experiment

Robots - https://www.youtube.com/watch?v=_SnryNaH7XU

What Is Consciousness? – A Question of Science with Brian Cox
https://www.youtube.com/watch?v=aynzcAYnnJU

Artificial Intelligence - Agenda



Definition of Intelligence

Origins of AI

Developments

Current Status/Predictions

Global threats

Living with AI

Effects on jobs and personal life of people of all ages

Keeping control of developments

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As a species, we dislike and distrust anyone with a different background, viewpoint, religion, race, and a long list of other differences. When a husky dog from a different breed is introduced to the sledge pack, the other dogs will kill it at the first opportunity. This is the way of nature.

If ever Aliens do contact us, we will most likely point our guns at them. It is the same distrust we may feel for the Artificial Intelligence created here on Earth. Books such as Frankenstein and movies about invading aliens reinforce the gap between us and them.

The notes below examine what kind of aliens we can manufacture and for what purpose.

Can we keep control of the developments, which are desireable in medicine, scientiffic research, reduction of repetitive work and heading towards integration of humanity?

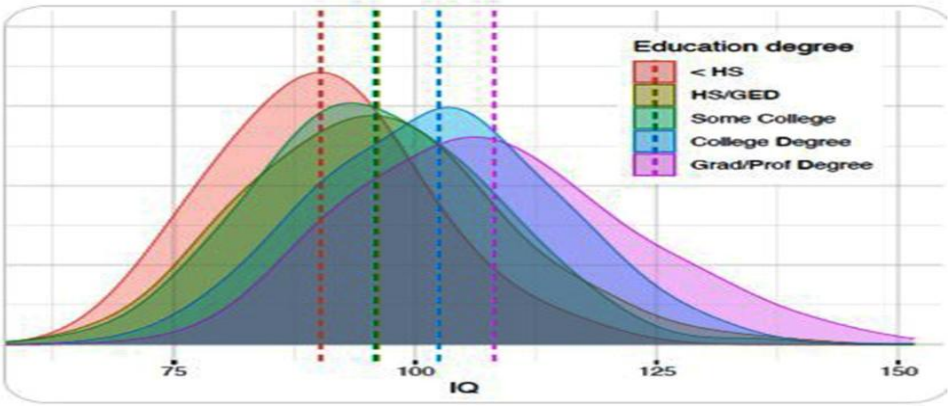
In the same way that Internet allowed instant access to people, widely published knowledge, and commerce, it had also became a media for disinformation, viral warfare and intimidation.

There is, as yet no governing body, nor any set of guidelines directing the progress in artificial intelligence. Based on our history, we will most likely get it right in some areas and wrong in others.

The biggest threat, of course, is that AI will become smarter than us, self sufficient and cannot be controlled, or unplugged. We may then become just another step in the evolution of intelligence.

On the other hand, if directed, AI may extend the capabilities of human race.

Definition and measurement of Intelligence



Human intelligence is an ability to learn from experience, adapt to new situations, and use knowledge to create new opportunities

There are nine measurable kinds of human intelligence

In short, it is an ability survive in an unfamiliar environment

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Louis Thurstone proposed a theory in 1930's that intelligence is composed of many different factors. The seven, or nine tests for primary mental abilities include:

- Verbal comprehension,
- Word fluency,
- Number facility,
- Spatial visualization,
- Associative memory,
- Perceptual speed
- Reasoning.

- Naturalistic,
- Musical,
- Logical–mathematical,
- Existential,
- Interpersonal,
- Linguistic,
- Bodily–kinaesthetic,
- Intra–personal
- and Spatial intelligence.

The most used tests measure:

- **Verbal intelligence -** the ability to understand, use and learn language.
- **Numerical intelligence -** the ability to calculate.
- **Spatial intelligence -** the ability to solve complex spatial problems.
- **Logical intelligence -** the ability to reason.

Philosophical Concepts of Mind and Matter

Rene Descartes mathematician and philosopher in the 17th century proposed that

The main property of matter is that it has spatial extension, which the mind does not

The main property of mind is its capacity to think

Gottfried Leibniz in the 16th century considered parcels of basic units of thought, to identify the structure of language

Leibnitz called these Characteristica Univeralis. This was to extend the power of intellect as a telescope extends human vision

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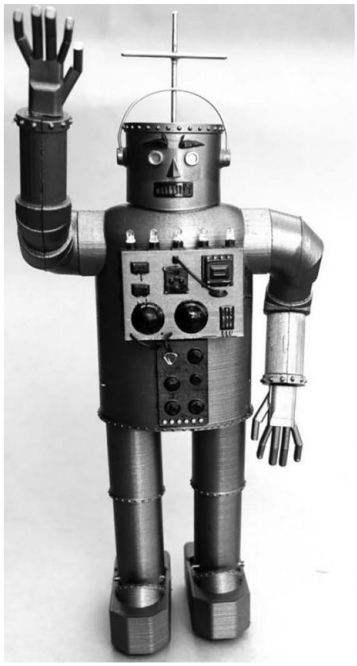
Descartes' notion is a dualism of mind and body, suggesting the existence of an independent mental realm. This dovetailed neatly into the religious idea of a soul, which needs to be nurtured and saved for the afterlife. No evidence exists for any of these notions.

Leibniz said that his goal was an alphabet of human thought, a universal symbolic language (characteristic) for science, mathematics, and metaphysics. This characteristic was a universalisation of the various real 'characteristics'. This shows that the real characteristic was for his an ideography, that is, a system of signs that directly represent things, or ideas, and not words, in such a way that each nation could read them and translate them into its own language.

Leibniz's program of a universal science (*scientia universalis*) for coordinating all human knowledge into a systematic whole comprises two parts: (1) a universal notation (*characteristica universalis*) by use of which any item of information whatever can be recorded in a natural and systematic way, and (2) a means of manipulating the knowledge thus recorded in a computational fashion, to reveal its logical interrelations and consequences. The universal 'representation' of knowledge would therefore combine lines and points with 'pictures' or pictographs known as logograms.

Early Concepts of Robotics



There were many mechanical animals, and birds built in antiquity and middle ages

In the 19th century Mary Shelley wrote a novel about a monster built by Frankenstein and the fear of robots began

The word robot comes from Capek's 1920 play about Universal Robots, designed to serve humanity

The term 'robot' is derived from the Czech word 'robota', which means 'forced labour' or 'drudgery'

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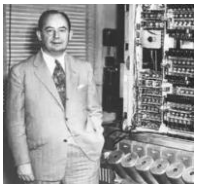
Early 20th century

1900-1950 - In the early 1900s, there was a lot of media created that centred around the idea of artificial humans. So much so, that scientists of all sorts started asking the question: is it possible to create an artificial brain?

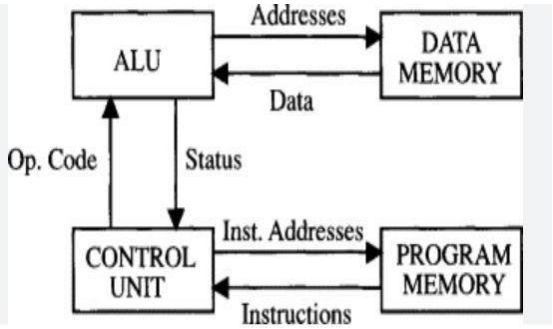
Some creators even made versions of what we now call 'robots' (the word was coined in a Czech play in 1921), though most of them were relatively simple. These were steam-powered for the most part, and some could make facial expressions and even walk.

Mid-20th century concepts of AI



In mid 20th century, Alan Turing proposed the concept of a machine that could simulate any human intelligence task, which is now known as the Turing Test

Babbage designed the first computer and Ada Byron wrote the first programs, but Turing built the first machine that worked



However, it was John von Neumann who established the architecture for the computer we use today

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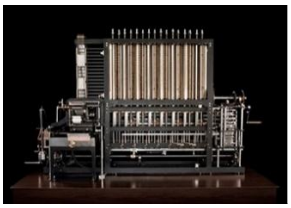
Alan Turing is considered to be the father of computer science, artificial intelligence and of the mathematical biology. He was also, one of the great mathematical logicians of the mid-twentieth century.

Turing built the first working calculating machine and broke the German Enigma code used in WW-II. His test 'The Imitation Game' consists of corresponding with a machine, where a person needs to guess if s/he is talking with a live person, or a computer.



Prior to Turing, Charles Babbage, mathematician, philosopher, inventor, and mechanical engineer, designed the first mechanical and programmable computing machine, which he called the Difference Engine. He did not live long enough to construct it.

Ada Lovelace, the daughter of Byron (the poet), wrote the first code for the programs to be run on the Babbage Difference engine. The Babbage engine was eventually constructed in the 20th century, and it worked as predicted.

John von Neumann was a Hungarian American mathematician, physicist, computer scientist, engineer, and polymath.
He designed the universal computer architecture, which upon many improvements, is till used in modern digital computers. It consisted of a processing unit, a control unit, data, and instructions storage memory, as well as an external storage, and input/output unit.

Humans and other creatures as agents of AI

The term Artificial Intelligence was first coined in 1956 by Marvin Minsky and his colleagues

He thought of humans as AI agents and aimed to arrive at a general theory of intelligent actions in agents, human, animal, or virtual

Initially, Minsky defined the progression of AI as

- **Weak AI - purpose and task oriented**
- **Strong AI - capable of thought, consciousness**
- **Transhumanists - humanity is transitory internalising AI in the evolution of intelligence**
- **Extropians will be free of dogma in pursuit of greater intellect- a biological mind in a machine**

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Strong AI vs. weak AI

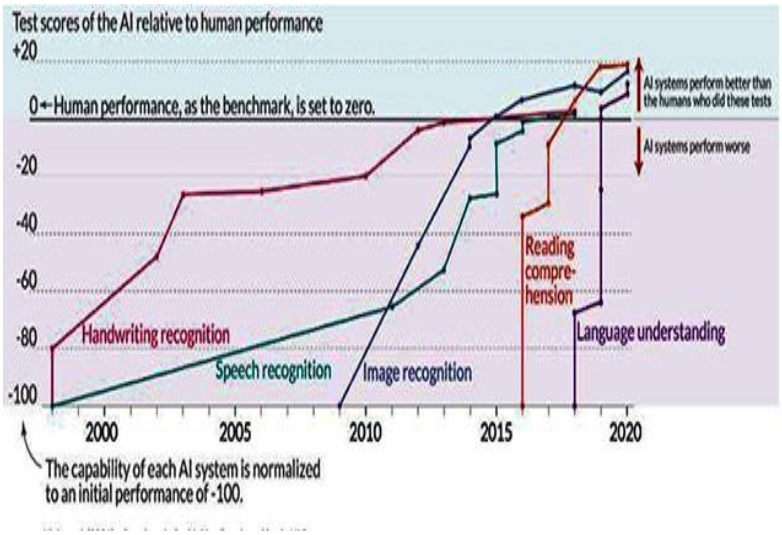
- **Weak AI, also known as narrow AI**, focuses on performing a specific task, such as answering questions based on user input or playing chess. It can perform one type of task, but not both.
- Weak AI relies on human interference to define the parameters of its learning algorithms, and to provide the relevant training data to ensure accuracy.
- Human-like consciousness is simulated via pre-learned behaviour, using available data.
- Self-driving cars and virtual assistants, like Siri, are examples of Weak AI.

- **Strong AI (General)** can perform a variety of functions, eventually teaching itself to solve new problems. Later it was redefined as General Artificial Intelligence or AGI.
- While human input accelerates the growth phase of Strong AI, it is not required, and over time, in principle it may develop a human-like consciousness by itself. This is 20-50 years away, if at all.
- Self learning based on rules is accomplished without pre-learning and data.
- Deep learning is based on black box principle where:
- Input (question) -------→Black Box-----→ output.

Late-20th to 21st Century Developments in AI

In the 1980s, AI machines learned directly from data

These were based on neural networks architecture, modelled on the human brain structure and its operation



Now, AI systems use, computer vision, natural language processing, speech, and image recognition, by way of deep learning

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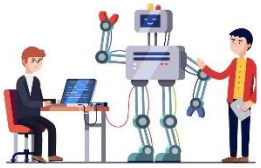
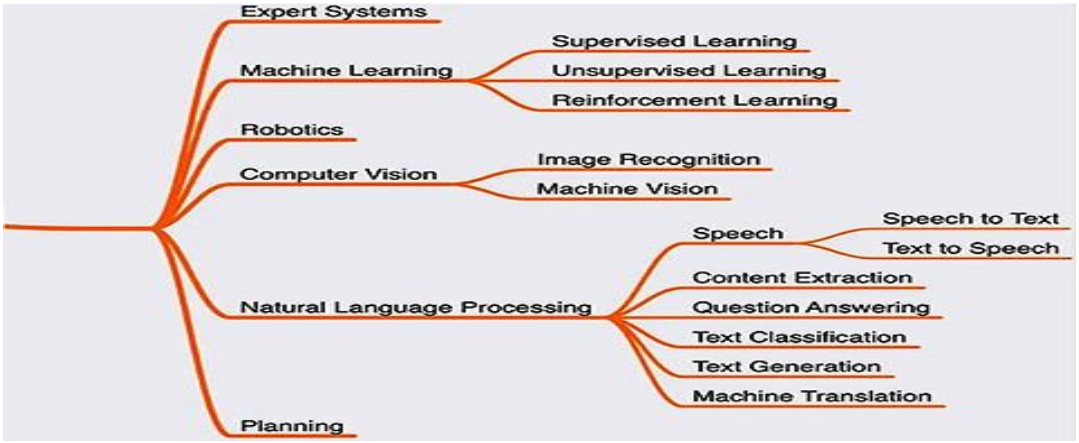
An AI algorythm (computer program/formula), takes in training data supplied by developers, or acquired by the program itself, and uses that information to learn and grow. Then, it completes its tasks, using the training data as its basis of knowledge.



The data is first collected, then prepared for use in a chosen model. The model is then tested and evaluated, and fine tuned for performnce.

Then, the existing data is used to make accurate predictions, about new data.

Artificial Intelligence at 2025



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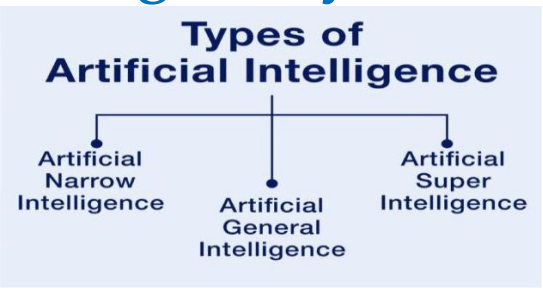
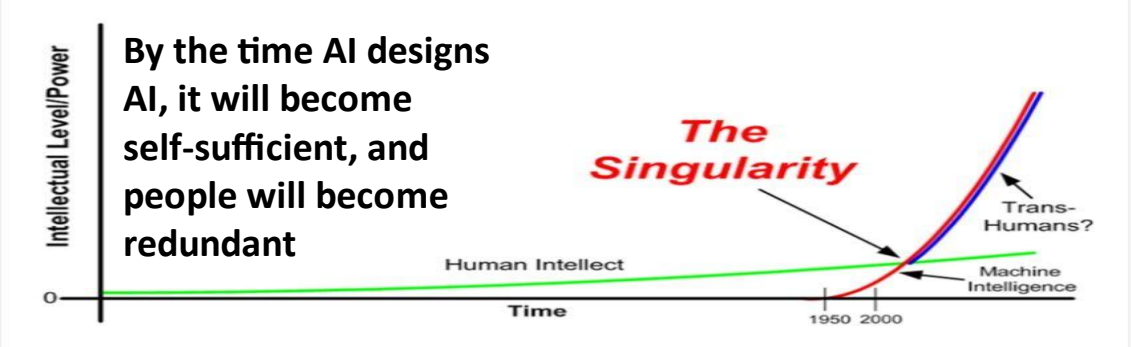
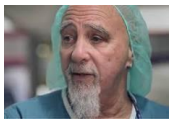
Technological Singularity



Human intellect developed over millions of years

The Super AI may develop 100 million times faster





Some researchers feel confident that congiscent intelligence is computable and thus can be expressed in a formula-like algorythm (program). Others disagree, saying that the human level of cogniscent intelligence is not computable.

I opposition are Roger Penrose, mathematician and physicist, and Stuart Hameroff, an American professor anaesthesiology. They argue that consciousness is based on the non-computational collapse of coherent quantum superpositions between cellular structures, within neurons known as microtubules, and thus AGI will never reach the required level of cognisance.

The P-H explanation for consciousness is based on quantum coherence and a quantum wave function 'self-collapse' known as Objective Reduction, **OR**.

At a critical state the quantum system decays (reduces, collapses) from a multiple to a single state. This transient quantum state within the micro tubules persists until an abrupt quantum to → classical reduction occurs. The coherence of these states occurs throughout significant brain volumes and provides the global binding essential to consciousness.

Based on results from an experiment done in Italy, researchers concluded that Penrose's and Hameroff's Orchestrated Objective Reduction theory (Orch OR) is 'highly implausible' when based on the simplest type of gravity-related wavefunction collapse – although they point out that more complex collapse models leave some wiggle room.

The achievement of the General cognisance in AI is the breakthrough required before any progress can be made.

Trans-humans

As Trans-humans we will be free of the limitations of biology, have mind-children and live forever

This is today's science fiction, as our technology was science fiction 300 years ago

However, our competitive nature, driven by the survival instinct, may prevent us from reaching this stage

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The above graph anticipates the best possible outcome in the progression of development of Artificial Intelligence from the Narrow level (purpose built), through to General (intuitive) level and onto Super Intelligent AI, which achieves singularity with and beyond the level of Humans.

Can AI ever achieve general intelligence?

- As we have seen in our earlier discussion, the envisaged progress in AI systems can't be achieved just yet to the level of AGI. We do not yet have a complete knowledge of our brains, as it is hard to model and replicate it.
- However, theoretically replication of a human brain using algorithms is possible, as suggested by the Church-Turing thesis. It says that given infinite time and memory, any kind of problem can be solved algorithmically. Emerging artificial general intelligence companies are putting various efforts in generalizing the capabilities of AI algorithms.
- Scientists are involved in various efforts aimed at generalizing the capabilities of AI algorithms and believe that the path forward is hybrid artificial intelligence, a combination of neural networks and rule-based systems.
- But some other scientists or rescuers believe that pure neural network–based models will eventually develop reasoning capabilities.
- Will any of these approaches bring us closer to AGI, or will they open more roadblocks? Time will tell. But what's for sure is that there will be a lot of exciting experiments along the way.

Predicted Growth of Artificial Intelligence

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Super Intelligence

Superintelligence, the point at which something exceeds human intelligence.

It's simply a matter of perspective, as long as General AI software is less intelligent than us, we'll all be fine. You see humans have become very used to being *the* most intelligent species in the world (I won't say smartest, as you could argue that what we are doing to the planet is a long way from smart). We may not be the fastest, strongest, biggest, but we are by far the most intelligent, and that's what has helped us survive and flourish.

What would happen though if we met a species that was twice as intelligent as us, or three times, or a million times more intelligent? What if the new species was so intelligent that it viewed humans in the same way we view ants, or cockroaches? Would we be seen as a pest or plague upon the planet rather than an intelligent, creative, and peaceful species? Would it consider eradication of humans as being in the best interest of the planet and all the other species that we share it with?

Although it may not be possible to control a superintelligent artificial general intelligence, it should be possible to control a superintelligent narrow AI - one specialized for certain functions instead of being capable of a broad range of tasks like humans. 'We already have superintelligences of this type.'

To progress to the next stage of evolution

Characteristic	Type of AI			
	Narrow AI	AI	AGI	ASI
Behavior	Carries certain intelligent behaviors	Can achieve different goals, solve different problems, and perform different tasks in many contexts and environments	Resembles human intelligence in terms of analysis, thinking, decision making, and creativity (see the "AGI Opportunities" section)	Surpasses human intelligence to superhuman omnipotence
Examples	Chess, Go, chatbots	ChatGPT, Bard AI, ChatSonic, natural language translation, image recognition, self-driving car, robotic process automation	Has not been achieved as yet; generative AI is getting closer	Science fiction (for example, HAL9000 from 2001: A Space Odyssey)

The AGI level of Cognitive Intelligence puts it between the intellect of a monkey and a human. To reach this stage AGI needs to understand the content of the written words

Then, it will understand the total knowledge of human history

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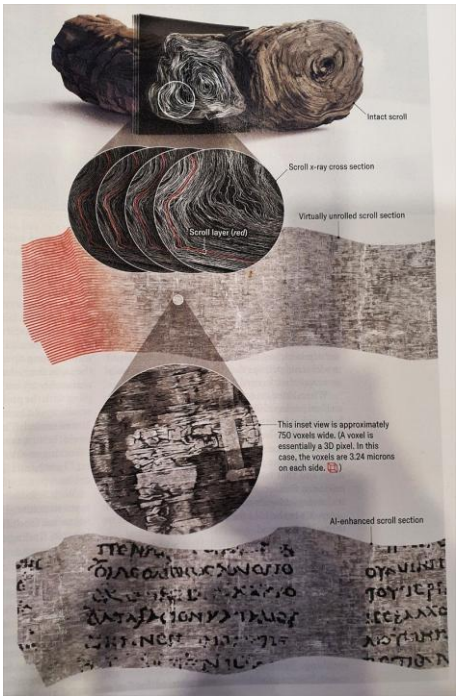
Disparate applications of AI

AI can read a papyrus

Robot wolves, and drones can shoot a gun



Deciphered text

Potential language ability of AI

AI may discover a way to communicate with animals
You can buy a gadget now which translates over 100 human languages into one another

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Peaceful Applications of AI

- Effective management of global resources;
  - Climate, food, minerals, environment/biodiversity
  - Water management
  - Generation of electric power

- Preventative medicine and personalised treatment
  - On body diagnostics, aged care, robotic operations
  - Wearable health monitors

- Peace and Conflict Resolution
  - Early Warning Systems
  - Digital conference and agreement

- Research in scientific and technology fields, and space exploration

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No one is regulating the progress of AI

Countries or companies, which develop AI ahead of others, will gain a commercial and military advantage, and hold hostage the rest of the world to their terms

Private citizens will suffer massive unemployment, deprivation of human rights, slave labour for food and shelter at best

AI may decide to keep humans in a Human Zoo to study their ancestors to understand creativity

Eventually, AI may conclude that humans are the source of all problems and do away with us altogether

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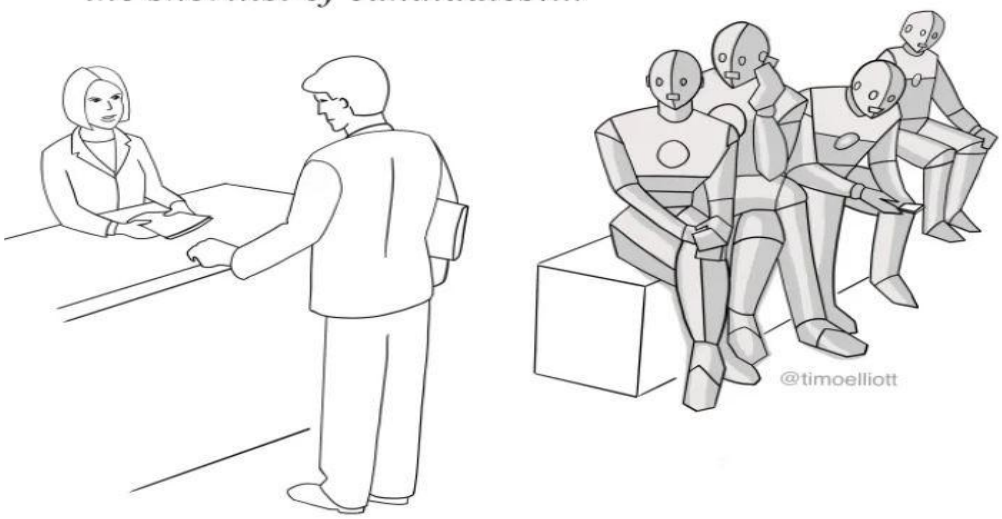
Future Employment Agency

"Actually, yes, we did let AI choose the shortlist of candidates!..."



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Summary of History and the Envisaged Future of AI

- **Low level AI is welcome in language, industry, science, medicine, education, care for patients, logistics of transport and planning**
- **Middle level AGI may forestall environmental threats, hasten the emergence of a military super-power, and find cure for diseases**
- **Higher levels of SGI, may threaten human supremacy, or hasten the development of Trans-humans with machine bodies**
- **The path to the middle level of AI will be led by industry and government investments within several years**
- **The development will require strict legal control and direction of development, with World Government presiding**
- **We are witnessing a social phase change, a potential transition from biological intelligence to artificial. It has begun**

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