

14th PAN ARAB
TRANSFUSION
MEDICINE
CONFERENCE
QATAR 2024



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دولة قطر - State of Qatar



30 November to 2 December 2024

Sheraton Grand Doha Resort & Convention Hotel,
Doha, Qatar

Pan Arab Conference Hamad Hospital Corporation

Large Language Models
(LLMs)

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Senior Consultant

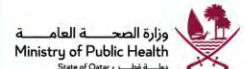
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- There is no plagiarism or copyright infringement.
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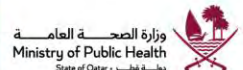
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Tulane Faculty Conference: March 2024

- Associate Dean from the president's office
 - March 2024: using chatGPT he has been following all the scientific research in the medical school for the last 4 months
- Professor: complained
 - Students were using chatGPT to write their essays
 - She wanted the medical school to invest in software to detect these essays.

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Pan Arab Conference

- IT solutions
- Data analysis
- Utilization

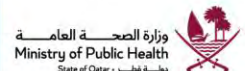
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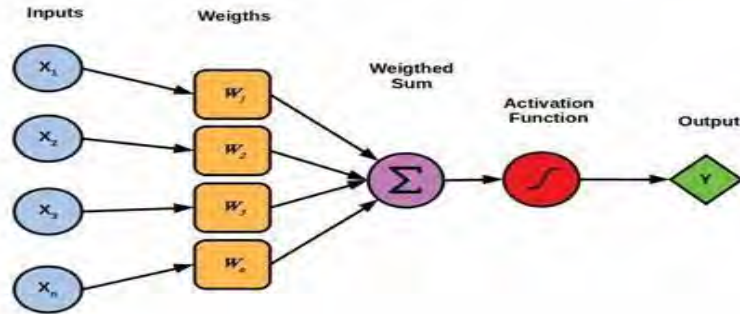


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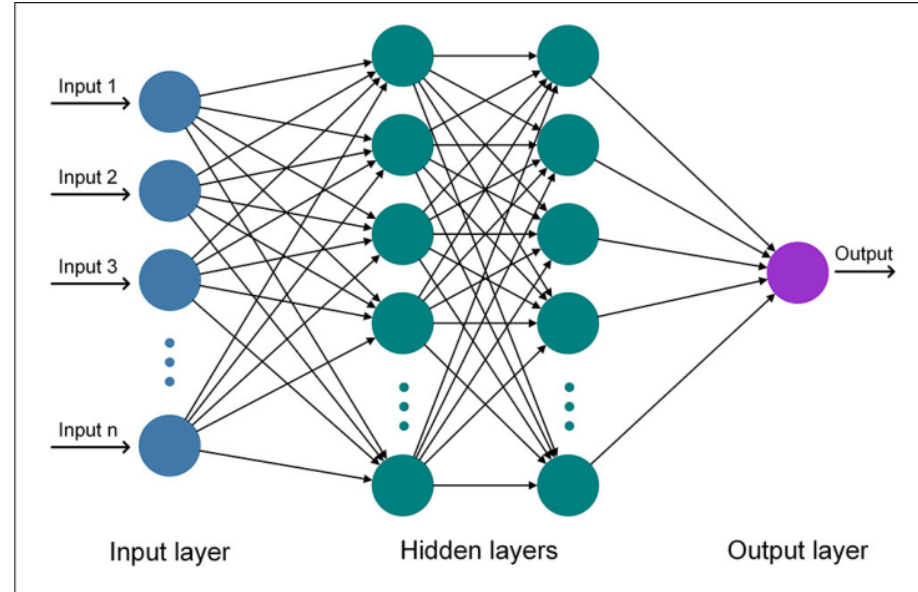
Perceptron

- **1943:** Warren McCulloch and Walter Pitts published a paper titled "A Logical Calculus of Ideas Immanent in Nervous Activity,"
- **1958:** Frank Rosenblatt developed the Perceptron



NeuroNets

- **1986:** The backpropagation algorithm, a key method for training neural networks, was popularized by David E. Rumelhart, Geoffrey E. Hinton, and Ronald J. Williams in their paper "Learning representations by back-propagating errors"



Bottlenecks in development of LLMs

- Limited computing power
 - Moore's the number of transistors in an integrated circuit(IC) doubles about every two years
- Limits to algorithmic progress.
 - Assembly programming
 - Object oriented programming languages
 - Fortran, C, C++, Python
 - Parallel processing

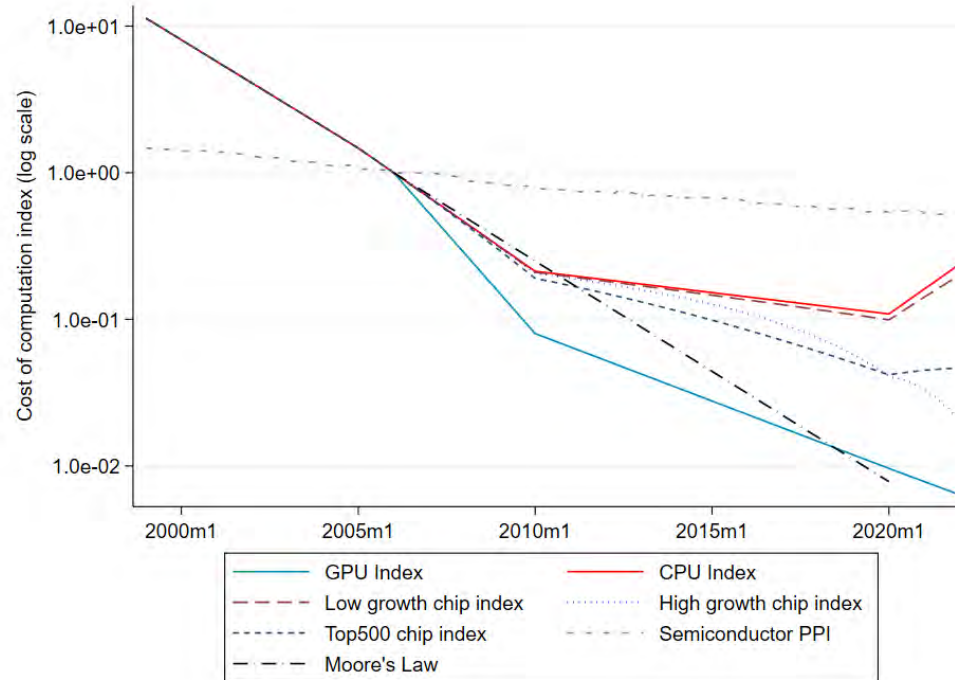


Nvidia

- Supercomputer
 - MTBF (mean time to failure)
 - 10,000 cpu: hours
 - 100,000 cpu: minutes
 - Energy consumption
 - \$100 M - \$ 1 B
- Blackwell (emulator)
 - Super chip x 2
 - 10 terabytes/sec link
 - Cost \$3 M



Cost of computing



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LLMs - 2017

- Increased efficiency of CPUs/GPUs
- Energy for supercomputer
 - 1000 gigawatt is now 3 gigawatt
 - Token generation (~words)
 - decreased by 45,000 times
 - 0.4 joules per token
- LLMs (Large Language Models)

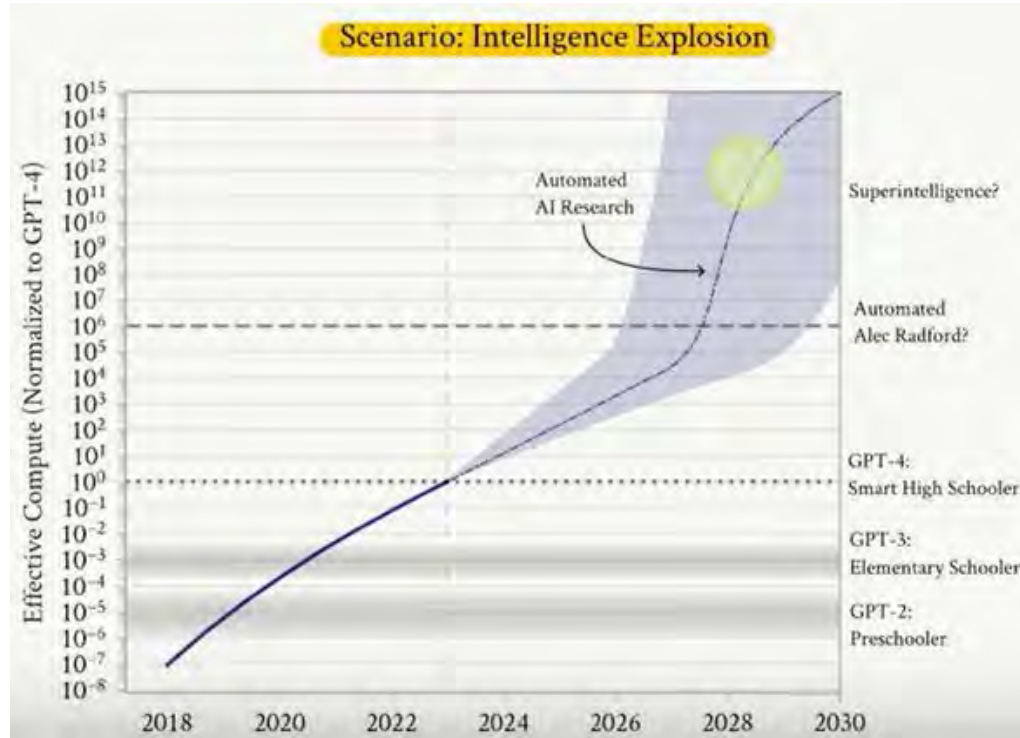


LLM (Large Language Models)

- Creating an LLM is a resource-intensive process that requires
 - Large datasets
 - Powerful computing infrastructure
 - Skilled human resources
 - Significant financial investment
 - Consideration of ethical issues
- Models that can perform complex language tasks.



Intelligence Explosion



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Large Language Models

- GPT-2
 - Preschooler could count to 5
- GPT-3
 - Could write simple paragraphs
 - Elementary school
- GPT-4
 - Could write code
 - Debug the code
 - Beat high schoolers
- AGI: Artificial General Intelligence

LLMs

- Large language models technology
 - Computer vision
 - Speech recognition
 - Natural language understanding
 - Generative AI
 - Text
 - Images
 - Songs
 - Videos, etc.



What is AGI

- Artificial General Intelligence (AGI) is a field of theoretical AI research that attempts to create software with human-like intelligence and the ability to self-teach.
 - The aim is for the software to be able to perform tasks that it is not necessarily trained or developed for.
 - Computers work alongside humans (PhD's)
- Super intelligence:
 - Computers write programs beyond our ability to understand
 - Next step in which we cannot control the computers



LLMs: utilization

- IT solutions
- Data analysis
- Utilization

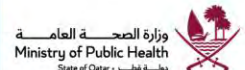
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Technology that I am using

- ChatGPT
 - Programming
 - Perplexity
- RAG
 - GraphRAG
 - DSPy
 - Kotaemon
- Agents
 - Crewai
 - AI Agents
 - Kubernernetes
- Research
 - Andy Stapleton (youtube.com)

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LLMs and Medicine

- Collection and organization of medical information
 - What will publications look like in the future?
- Diagnostic Medicine: personalized medicine
 - Diagnosis
 - Treatment
- Research
- Medical education
- Etc.



Running out of data

- LLMs (transformers)
 - Internet data
 - Scraped
 - Llama-3 trained on 15 trillion tokens
 - Synthetic data
- High quality data
 - Retrieval-Augmented-Generated data
 - Reinforced learning from human feedback (RLHF)
 - Chain of Thought (CoT)
 - Scaffolding CoT++ (paired agents)
 - Models in which the computer thinks/test the data
 - Reasoning chains
- Artificial general intelligence (AGI)

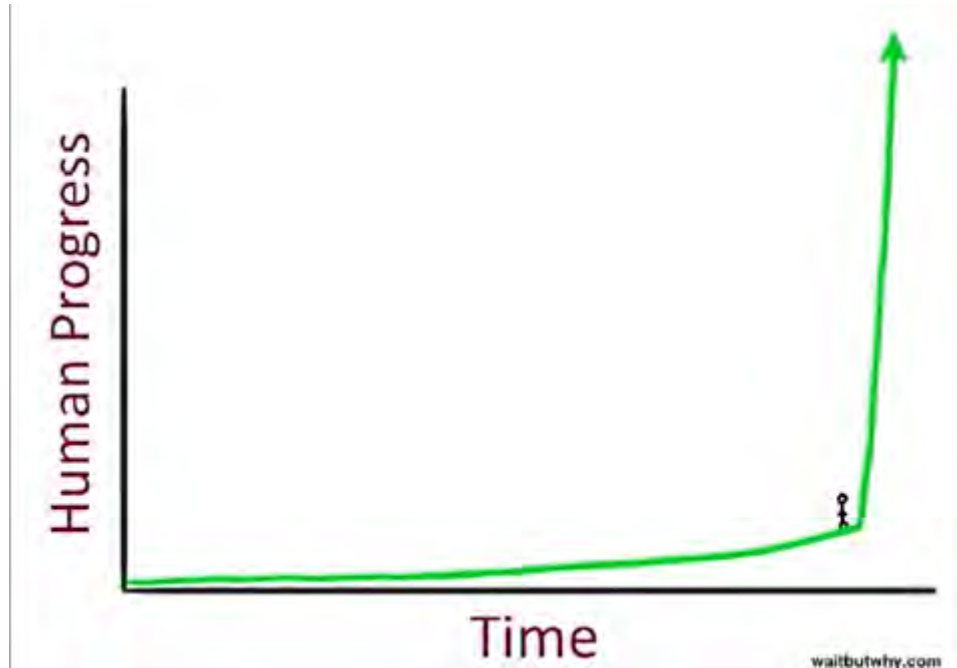


Aschenbrenner and Sutskever

- OpenAI
 - Security concerns
 - Super intelligence
 - Compute clusters: 10 Billion to 1 Trillion.
 - Every six months, another zero is added.
 - Compute clusters: server farms
 - By 2025-26 these machines will outpace college graduates
 - By the end of the decade. These machines will have achieved super intelligence.



Just Getting Started!



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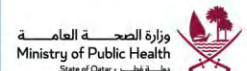
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Research publications

- Publishers of scientific works (\$\$\$)
 - Charging for publications
 - Scientific editors are not paid
 - What is the value of generated publications?
- Generating publications
 - Knowledge graphs
 - Research literature
 - References
 - Graphics
 - Writing the publication

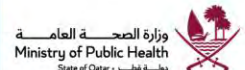
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Generative AI: new jobs

- Programming:
 - Classical programming is being phased out
 - Programmers are now directors of projects
- Text generation
 - Emails, memos, correspondence, reports, lectures, books, RAG
- Research
 - Literature
 - Writing papers for publication



First Computers



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Alan Turning

1939-1945



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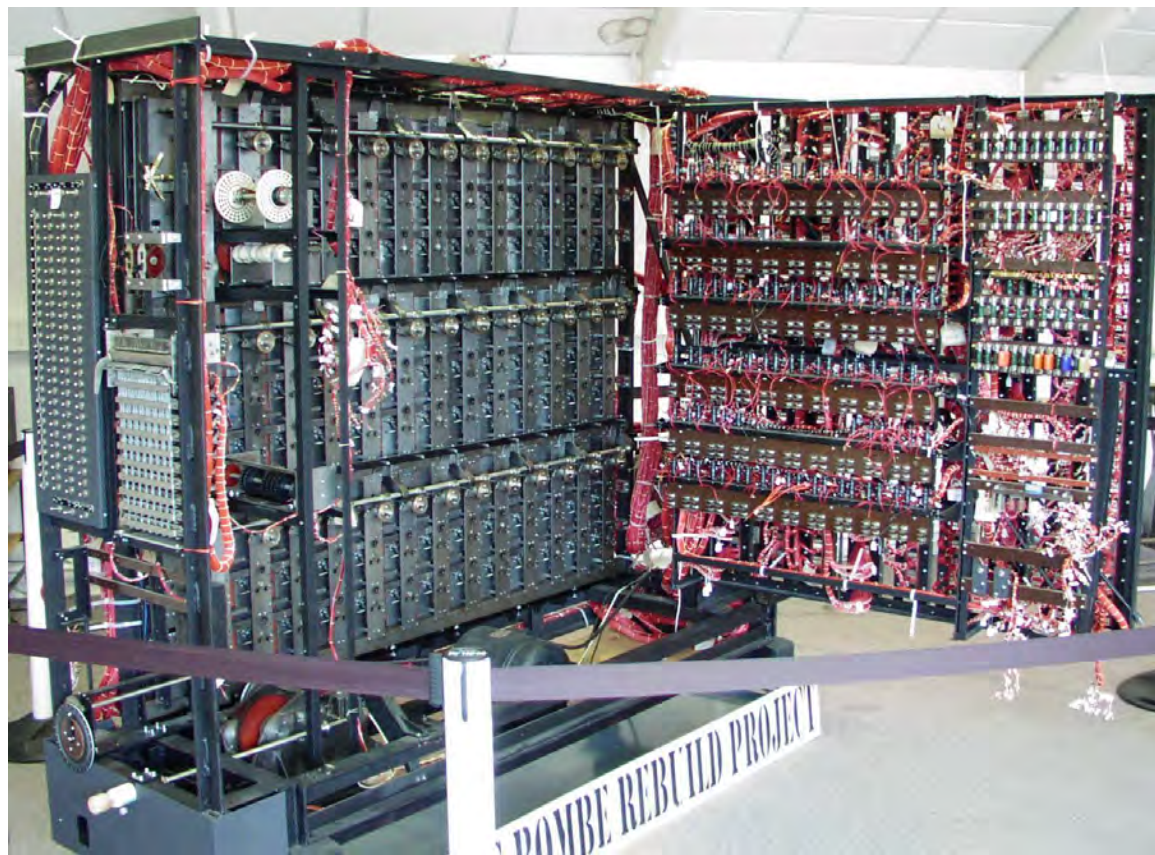
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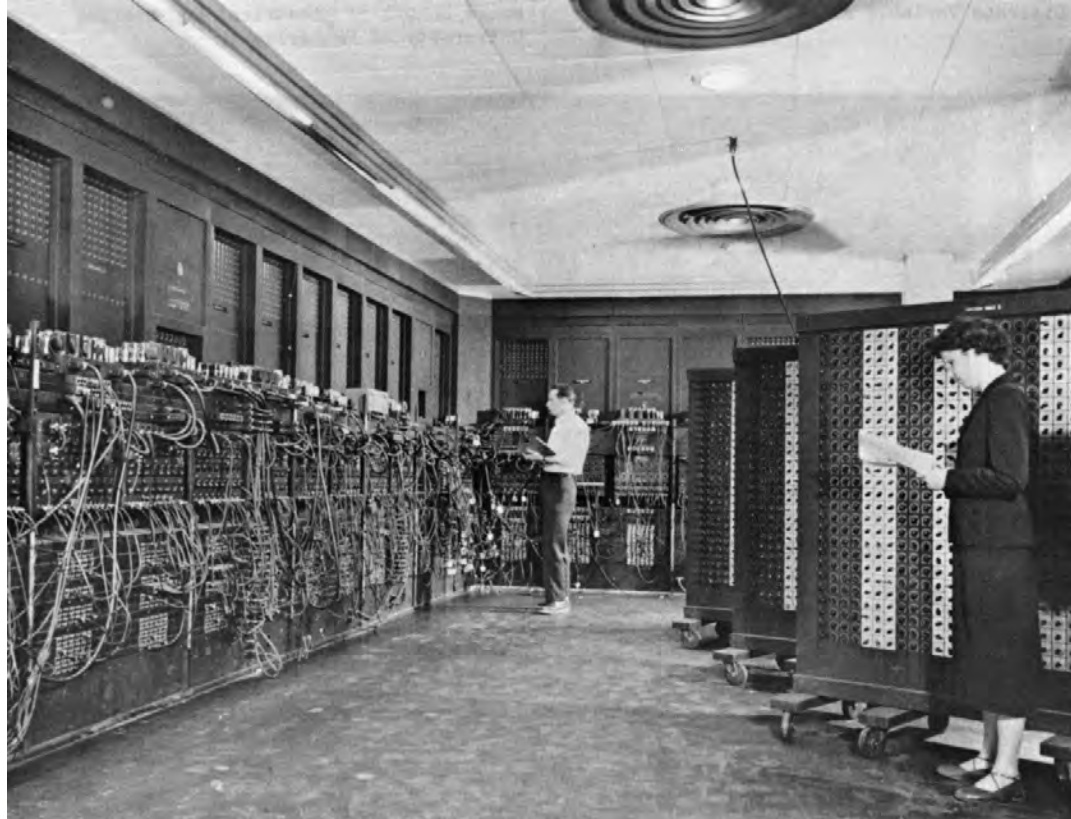
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Computer bug!

9/9

0800 Antan started
1000 stopped - antan ✓

1300 0320 MP-MC { 1.2700 9.037 847 025
2.130476415 (2) 9.037 846 795 convd
033 PRO 2 2.130476415
convd 2.130676415

Relays 6-2 in 033 failed spiral speed test
in relay 11.000 test.

1100 Relays changed
Started Cosine Tape (Sine check)
1525 Started Multy Adder Test.

1545  Relay #70 Panel F
(moth) in relay.

First actual case of bug being found.

1630 Antan started.
1700 closed down.