中国科学院大学
University of Chinese Academy of Sciences

Can Computers Be Conscious?

Topic：Computer

Reporter：Team 5

2025.12.11

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CONTENTS

1 Author and Background

2 Article Structure

3 Vocabulary

4 Complex Sentences

5 Reading Skills

1 Author and Background

1.1 Author

Max Miller is Big Think's Assistant Managing Editor, in charge of setting daily content of the website and interviewing the illustrious experts that come through Big Think's studio. During his time at Big Think, he has had the pleasure to interview many of the world's thought leaders, including Malcolm Gladwell, Edward Norton, Garry Kasparov, Salman Rushdie, and Julian Schnabel. Before becoming a Big Thinker, Max lived in Hanoi for a year, where stuffed himself on *bun cha* and served as the Associate Executive Editor of Vietnam Financial Review, the only independent English-language financial magazine in Vietnam. Max graduated from Princeton University, where he received an A.B. in English.

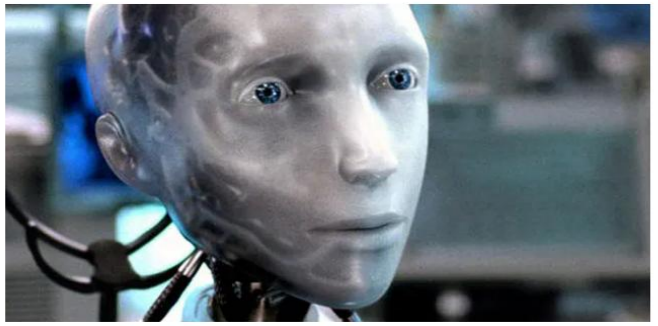
https://bigthink.com/people/maxmiller/

1.2 Article

SURPRISING SCIENCE — SEPTEMBER 28, 2010

Can Computers Be Conscious?

By studying the neural networks in the brain, scientists have constructed computer-based models that mirror the brain's complex biological networks.



https://bigthink.com/surprising-science/can-computers-be-conscious/

Max Miller

Computers have seem "mind-like" to people since they were invented in 1950s. In the early days they were widely called "electronic brains" for their ability to process information. But the similarity between computers and brains isn't just superficial: at their most fundamental levels, computers and brains process data in a similar binary fashion. Whereas computers use zeros and ones to store and manipulate data, the neurons in our brains transmit

1.3 Background

SURPRISING SCIENCE — SEPTEMBER 28, 2010

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Can Computers Be Conscious?

By studying the neural networks in the brain, scientists have constructed computer-based models that mirror the brain's complex biological networks.

A brain in a supercomputer

1,594,271 plays | Henry Markram | TEDGlobal 2009 • July 2009

https://www.ted.com/talks/henry_markram_a_brain_in_a_supercomputer

1.4 Takeaway

The field of artificial intelligence has made only modest gains in recent decades, but new reverse-engineering projects hope to recreate virtual models of the brain. These computer simulations might help cure mental disorders as well as shed light on cognition and consciousness. Henry Markram's Blue Brain Project has so far only recreated one neocortical column of a rat's brain, but Markram believes a full human brain could be simulated within 10 years.

By Ed Yong 8th February 2013

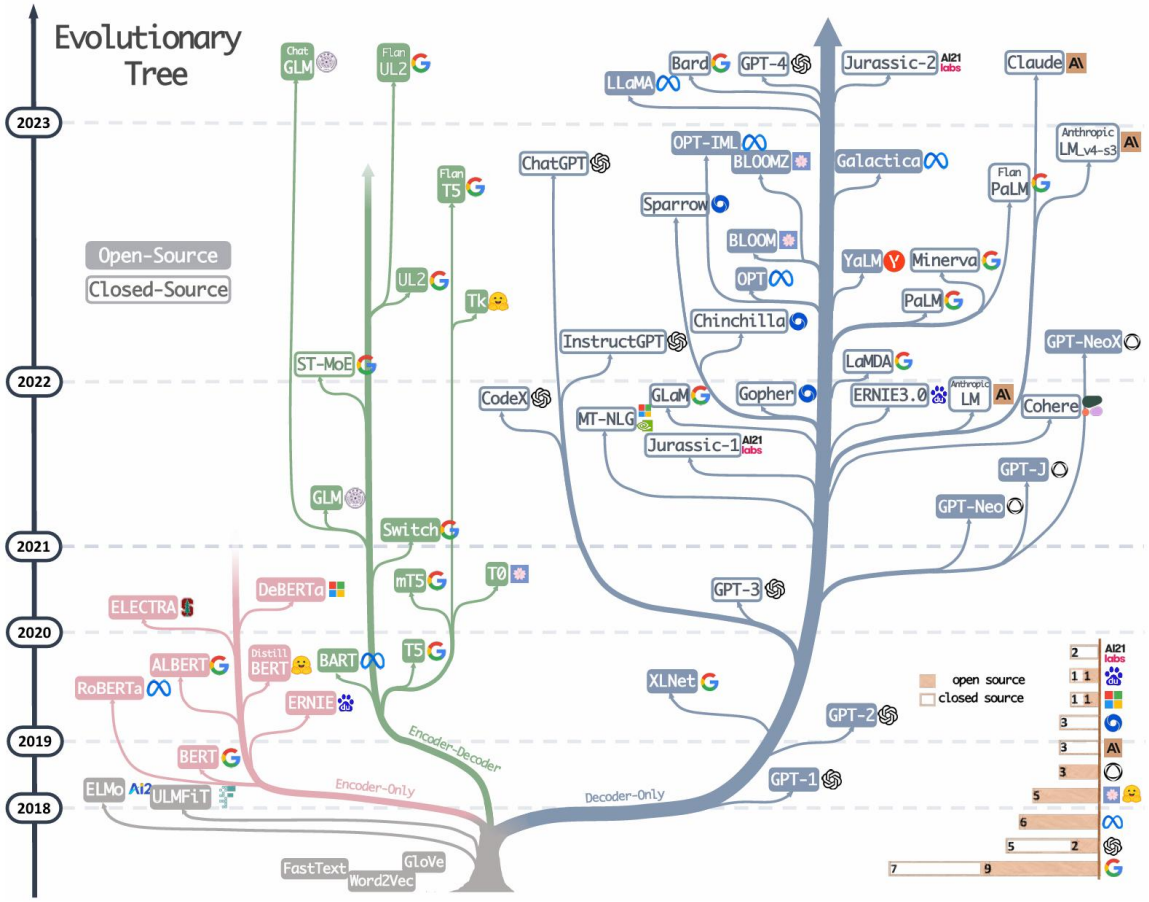
A billion dollar project claims it will recreate the most complex organ in the human body in just 10 years. But detractors say it is impossible. Who is right?

For years, Henry Markram has claimed that he can **simulate the human brain in a computer** within a decade. On 23 January 2013, the European Commission told him to prove it. His ambitious Human Brain Project (HBP) won one of two **ceiling-shattering grants from the EC** to the tune of a billion euros, ending a two-year contest against several other grandiose projects. Can he now deliver? Is it even possible to build a computer simulation of the most powerful computer in the world – the 1.4-kg (3 lb) cluster of 86 billion neurons that sits inside our skulls?

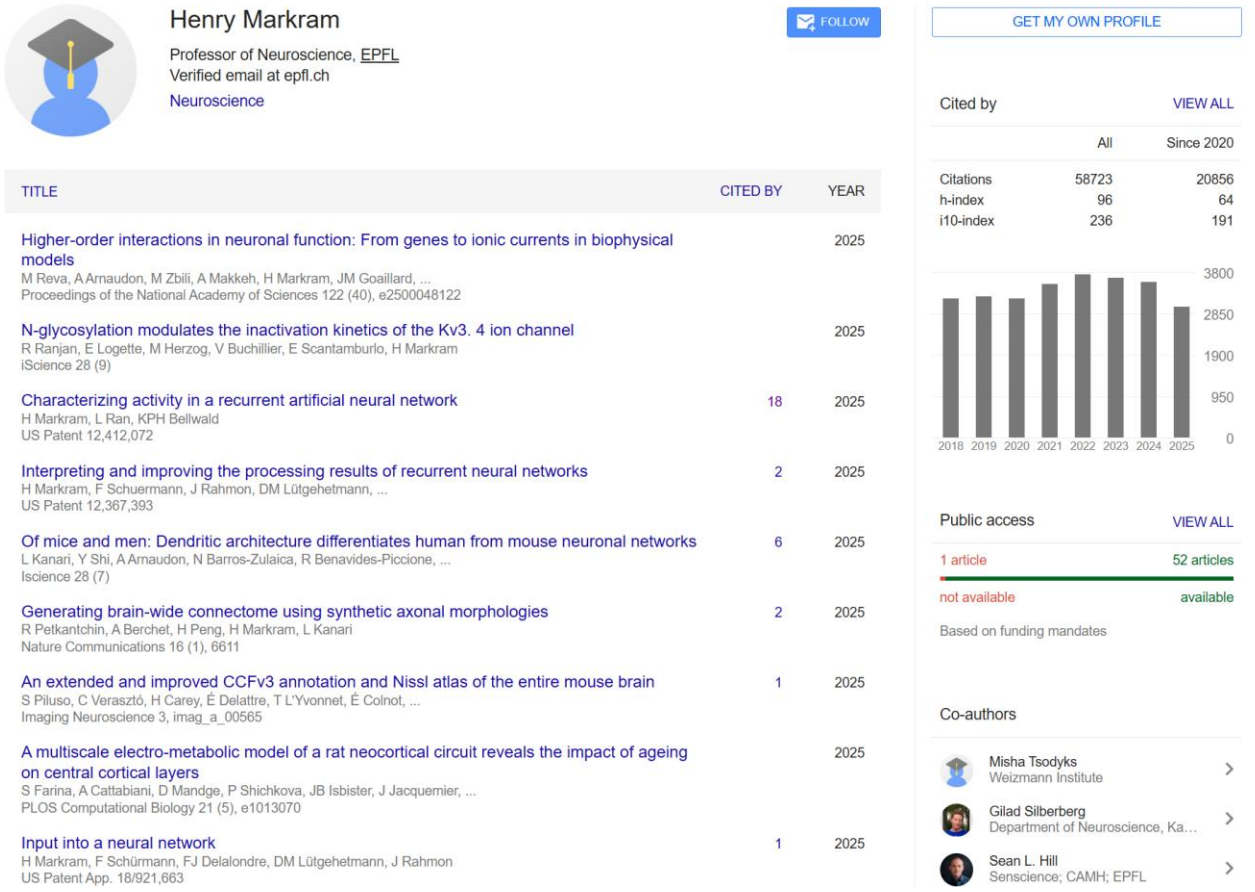
https://www.bbc.co.uk/future/article/20130207-will-we-ever-simulate-the-brain

1.4 Takeaway

Can Computers Be Conscious? It's hard to say.



https://arxiv.org/abs/2304.13712



Henry Markram

Professor of Neuroscience, EPFL
Verified email at epfl.ch
Neuroscience

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TITLE	CITED BY	YEAR
Higher-order interactions in neuronal function: From genes to ionic currents in biophysical models M Reva, A Arnaudon, M Zbili, A Makkeh, H Markram, JM Goaillard, ... Proceedings of the National Academy of Sciences 122 (40), e2500048122		2025
N-glycosylation modulates the inactivation kinetics of the Kv3. 4 ion channel R Ranjan, E Logette, M Herzog, V Buchillier, E Scantamburlo, H Markram iScience 28 (9)		2025
Characterizing activity in a recurrent artificial neural network H Markram, L Ran, KPH Bellwald US Patent 12,412,072	18	2025
Interpreting and improving the processing results of recurrent neural networks H Markram, F Schuermann, J Rahmon, DM Lütgehetmann, ... US Patent 12,367,393	2	2025
Of mice and men: Dendritic architecture differentiates human from mouse neuronal networks L Kanari, Y Shi, A Arnaudon, N Barros-Zulaica, R Benavides-Piccione, ... Iscience 28 (7)	6	2025
Generating brain-wide connectome using synthetic axonal morphologies R Petkantchin, A Berchet, H Peng, H Markram, L Kanari Nature Communications 16 (1), 6611	2	2025
An extended and improved CCFv3 annotation and Nissl atlas of the entire mouse brain S Piluso, C Verasztó, H Carey, É Delattre, T L'Yvonnet, É Colnot, ... Imaging Neuroscience 3, imag_a_00565	1	2025
A multiscale electro-metabolic model of a rat neocortical circuit reveals the impact of ageing on central cortical layers S Farina, A Cattabiani, D Mandge, P Shichkova, JB Isbister, J Jacquemier, ... PLOS Computational Biology 21 (5), e1013070		2025
Input into a neural network H Markram, F Schürmann, FJ Delalondre, DM Lütgehetmann, J Rahmon US Patent App. 18/921,663	1	2025

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Based on funding mandates

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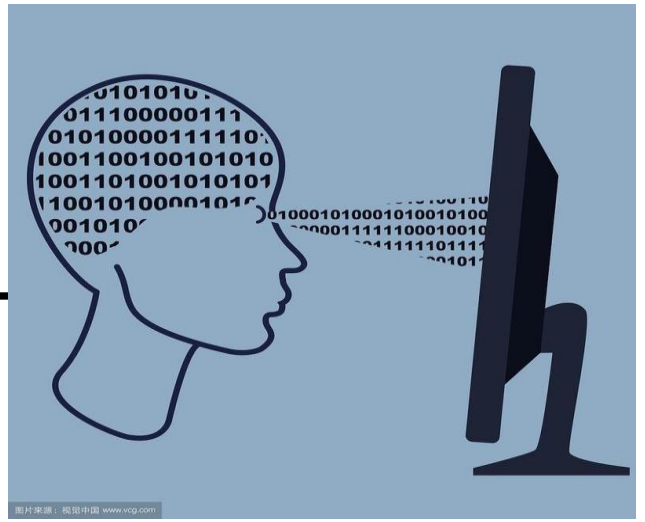
2 Article Structure

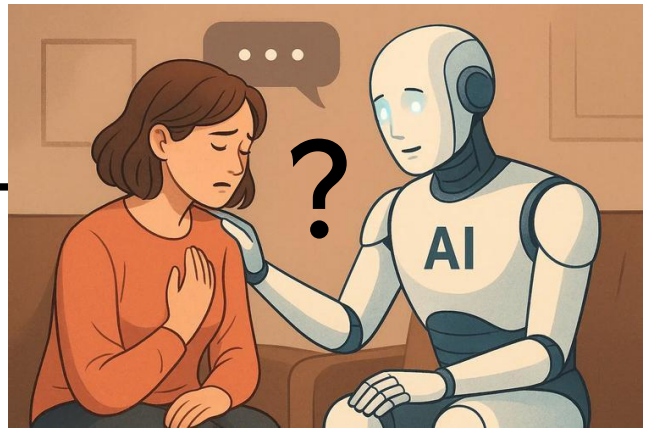
Section 1

Paras. 1 — Because of the application of binary pattern, the computer produces "mind-like" characteristics, which becomes the basis of computational neuroscience.

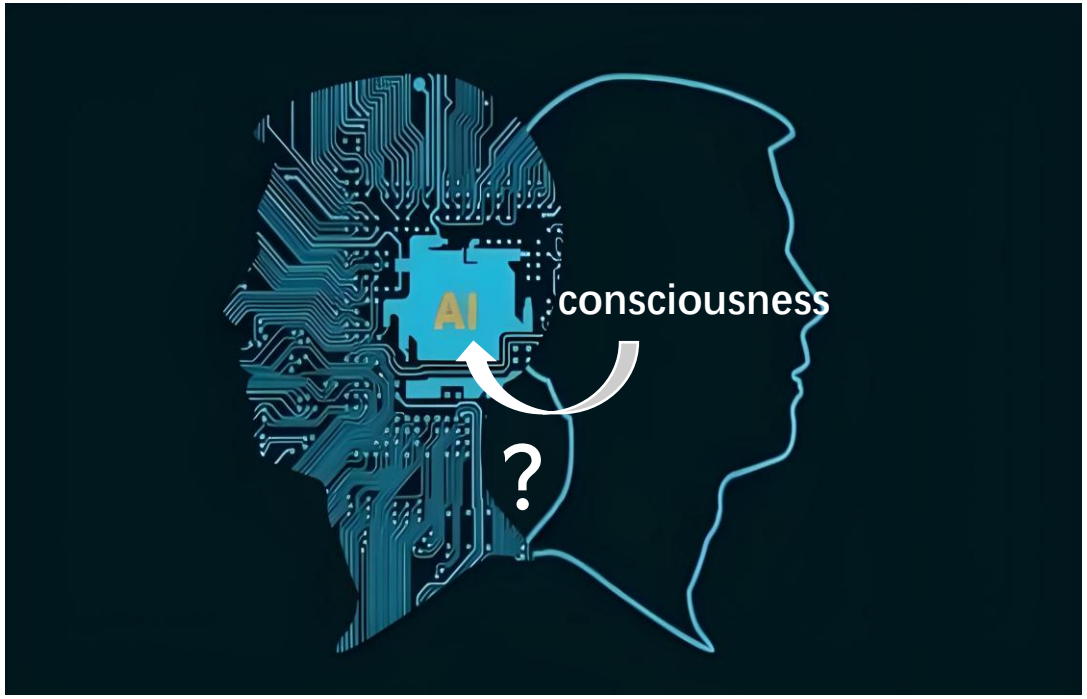


graph 1 Binary diagram（视觉中国）

Paras. 2 — But AI has been slow to make breakthroughs in core technologies, such as simulating human consciousness and creativity.



graph 2 AI and human（百度百科）



graph 3 Virtual brain（百度百科）

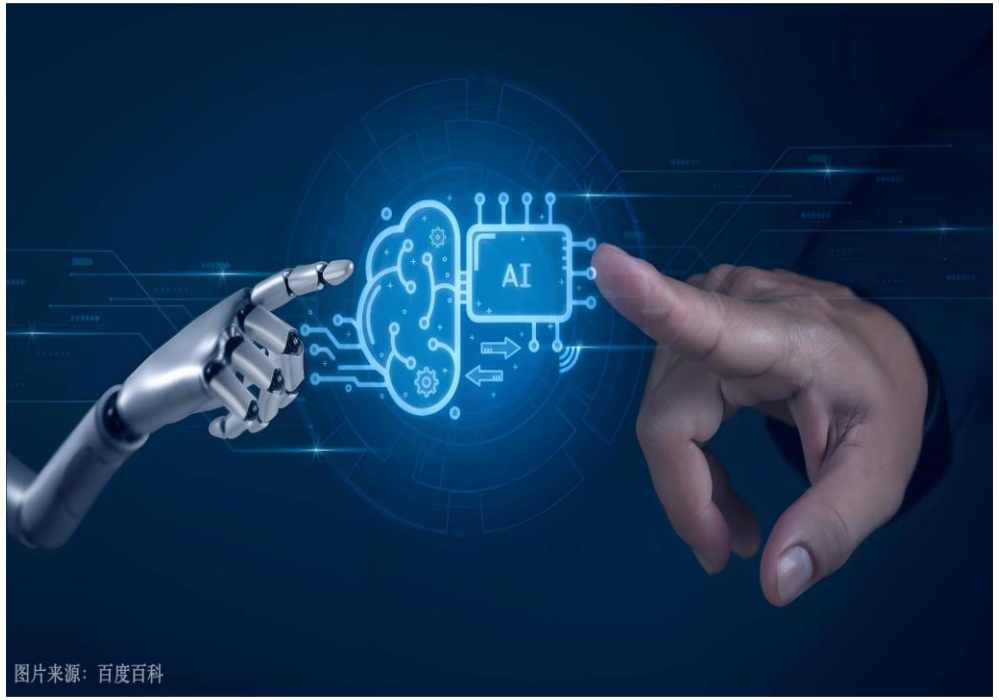
Section 2

Paras. 3-5

By introducing one major project which tries to make a computer model to replicate virtual brains,the author asks a question here: Will this modelbecome conscious itself ?

Section 3

Paras. 6-10



graph 4 Creative AI（百度百科）

Acquiring problem-solving and reasoning abilities cannot necessarily make a computer intelligent enough. Scientists realise how important it is to design a creative Al, a model that can invent new analogies and experience emotions the way humans do.And this is a long-term research direction in the future.

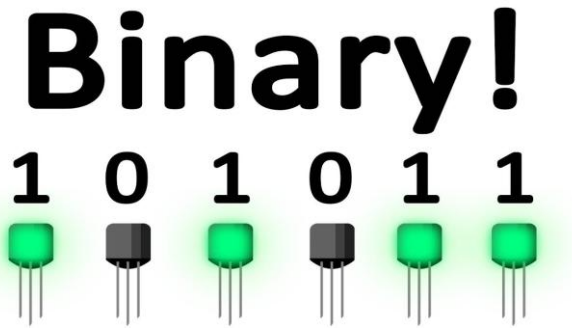
3

Vocabulary

binary /'bainəri/adj.the binary system:a systemof counting,used in computers,in which only thenumbers 0 and 1 are used.
eg:Every beat is a one, every rest is a zero. Binary code.

manipulate /mə'nrpjylert/vt.to work skilfully withinformation,systems,etc.to achieve the result that you want
eg:Friends don't manipulate friends. They help each other.

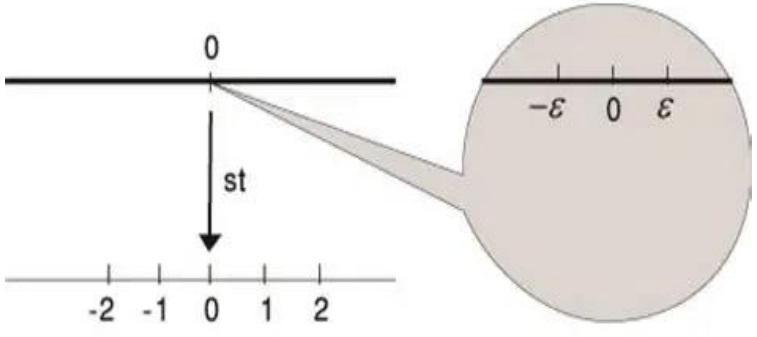
burgeoning /'b3:d3oniŋ/adj.growing,increasing,or developing very quickly
eg:It's a burgeoning market, you're gonna make a fortune.

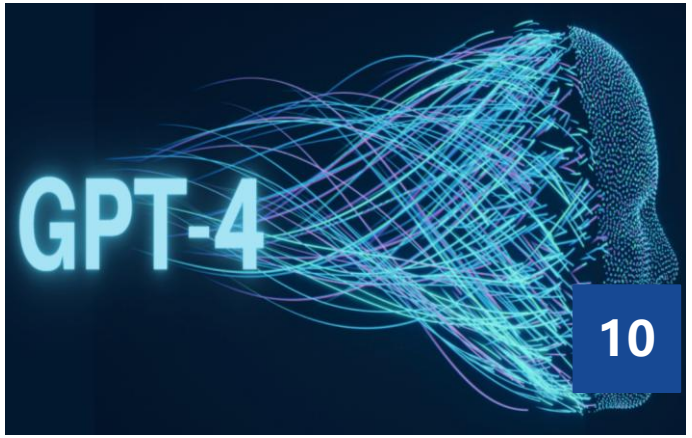


simulate /'simjylert/vt. to make or producesomething that is not real but has the appearanceor feeling of being real
eg: But I can simulate interest in your statements.

infinitesimal /infin'tesməl/adj.extremely small
eg:I told you, the odds of getting off this island are infinitesimal.

emergent /r'm3:d3ont/adj.(only before noun)in an early state of development
eg:But the fact of the matter is that what is going on is a kind of emergent complexity.

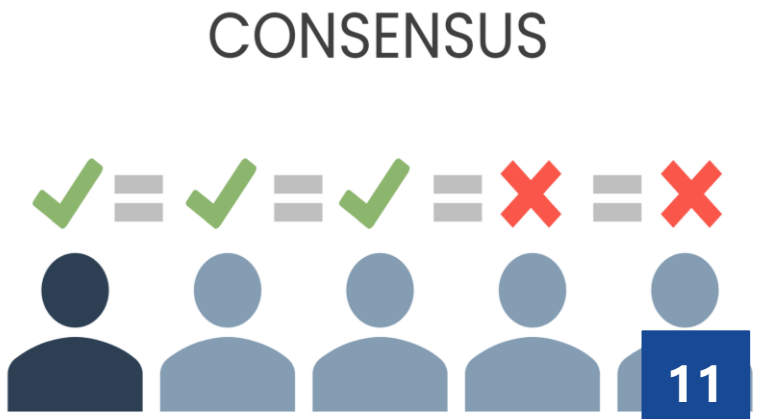




analogy /ə'nælədʒi/n.something that seemssimilar in two situations,processes,etc.
eg:Can you make an analogy that might help us understand?

haunt /hɔ:nt/vt.to cause problems for someoneover a long period of time
eg:I thought I would die here and haunt it ever after.

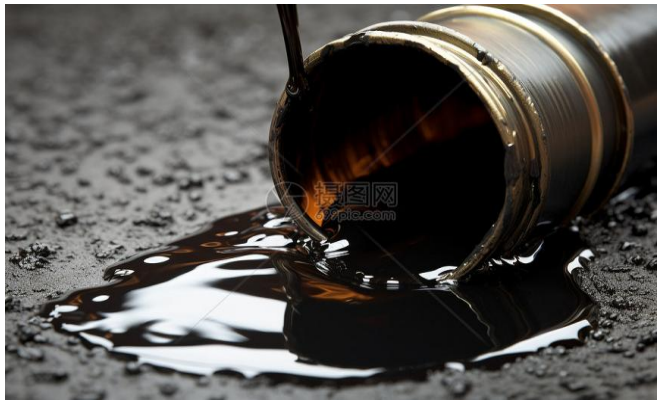
consensus /kən'sensəs/n.an opinion thateveryone in a group agrees with or accepts
eg:There's a town consensus about what kind of girl I am.

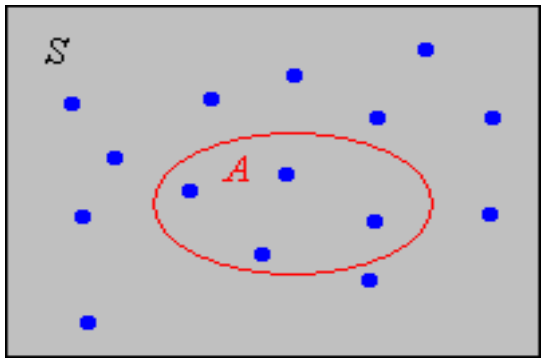


monopolise /mə'nppəlaiz/vt.to use a lot of someone's time or attention
eg:These are all world-class technology which used to be monopolised by Rolls-Royce.

subtle /'sʌtl/adj.not easy to notice or understand unless you pay careful attention
eg:The effect is so subtle, you'd never notice it.

discrete /dr'skri:t/adj.clearly separate
eg:This damage was not caused by a discrete event.





remnant /'remnənt/n.a small part of something that remains after the rest of it has been used,destroyed,or eaten
eg:I found these food remnants between the victim's teeth. See this?

nuanced /'nju:nst/adj.slightly different
eg:Since then the distinction between animals and humans has become increasingly nuanced.

resonance /'rezənəns/n.the special meaning or importance that something has for you because itrelates to your own experiences
eg:There must be some resonance between the elements I didn't know about.

4 Complex Sentences

Para.1 / Sentence 1

Whereas computers use zeros and ones to store and manipulate data, the neurons in our brains transmit information in binary, on/off spikes known as action potentials.

Para.1 / Sentence 2

This basic similarity is what underlies the burgeoning field of computational neuroscience, which hopes to understand how neuronal networks give rise to processes like memory and facial recognition.

Para.4 / Sentence 4

If they could accurately recreate the behaviours and structures of a biological brain, their computer simulation should shed light on both normal cognition and disorders.

1. Contrast Structure (Whereas)

Para.1 / Sentence 1

Whereas computers use zeros and ones to store and manipulate data, the neurons in our brains transmit information in binary, on/off spikes known as action potentials.

Key Grammar Points:

- **Whereas = introduces contrast (like "while" or "although")**
- **Main clause vs. Subordinate clause**

(M) the neurons in our brains transmit information in binary

(S) Whereas computers use zeros and ones...

Computers vs. Neurons: Two Ways to Process Information

Computers	Neurons
Use 0s and 1s	Use on/off spikes
Store data digitally	Transmit via action potentials
Caption: “Whereas” highlights this difference!	

2. Noun Clause & Non-restrictive Relative Clause

Para.1 / Sentence 2

This basic similarity is what underlies the burgeoning field of computational neuroscience, which hopes to understand how neuronal networks give rise to processes like memory and facial recognition.

Key Grammar Points:

what underlies... = noun clause (= "the thing that underlies...") → acts as subject complement

which hopes to... = non-restrictive relative clause (adds extra info; refers to "field")

Examples to illustrate:

1. This is what I meant. → (= the thing that I meant)

2. She invented AI, which can recognize faces. → (extra info about AI)

Tip: Non-restrictive clauses are always set off by commas!

3. Hypothetical Conditional

Para.4 / Sentence 4

If they could accurately recreate the behaviours and structures of a biological brain, their computer simulation should shed light on both normal cognition and disorders like depression and schizophrenia.

Key Grammar Points:

If + could... → unreal/hypothetical condition (not real now)

should = formal way to say "would" (predicts result)

Structure: If + past subjunctive (could/were), ... would/should + base verb

5

Reading Skills

What are arguments ?

In the context of critical thinking,arguments mean the presentation of evidence to support a claim.Therefore,an argument consists of two parts;one part supposedly provides a reason for thinking that other part is true.

Evidence + Claim = Argument

How to support a claim with evidence ?

Presenting and explaining statistics

Statistics will be used to convey information in a numerical form (referred to as data). Statistics are convincing when they are used in combination with an explanation of why the numbers are significant.

Providing appropriate examples

Examples can support the writer's contention that a general statement is true and provide specifics and details in support of a claim.

Quoting expert opinions

Expert opinions are usually based on factual evidence to interpret other facts.

Determine which of the following passages contain arguments

Asked whether there will ever be computers as smart as people, the US mathematician and sci-fi author Vernor Vinge replied: “Yes, but only briefly.” He meant that once computers get to this level, there’s nothing to prevent them getting a lot further very rapidly.

No argument

Asked whether there will ever be computers as smart as people, the US mathematician and sci-fi author Vernor Vinge replied: “Yes, but only briefly.” He meant that once computers get to this level, there’s nothing to prevent them getting a lot further very rapidly.

Only have claim without evidence

Determine which of the following passages contain arguments

One by one, computers take over domains that were previously considered off-limits to anything but human intellect and intuition. We now have machines that have trumped human performance in such domains as chess, trivia games, flying, driving, financial trading, face, speech and handwriting recognition – the list goes on.

Argument

One by one, computers take over domains that were previously considered off-limits to anything but human intellect and intuition. We now have machines that have trumped human performance in such domains as chess, trivia games, flying, driving, financial trading, face, speech and handwriting recognition – the list goes on.

Determine which of the following passages contain arguments

By default, then, we seem to have no reason to think that intelligent machines would share our values. The good news is that we probably have no reason to think they would be hostile, as such: Hostility, too, is an animal emotion.

Argument

By default, then, we seem to have no reason to think that intelligent machines would share our values. The good news is that we probably have no reason to think they would be hostile, as such: Hostility, too, is an animal emotion.

Determine which of the following passages contain arguments

There are real dangers from AI but they tend to be economic and social in nature. Clever AI will create tremendous wealth for society, but will leave many people without jobs. Unlike the industrial revolution, there may not be jobs for segments of society as machines may be better at every possible job.

Argument

There are real dangers from AI but they tend to be economic and social in nature. Clever AI will create tremendous wealth for society, but will leave many people without jobs. Unlike the industrial revolution, there may not be jobs for segments of society as machines may be better at every possible job.

This concludes the report.
Thank you for watching.

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