Is Silicon-Based Life Superior to Carbon-Based Life?

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Abstract

This paper argues that contemporary Artificial Intelligence (AI), particularly connectionist-based Deep Neural Networks (DNNs), not only "resembles the human brain" in its operational principles but also achieves a fundamental transcendence over biological intelligence based on its "substrate." Biological intelligence is constrained by its physical carrier (the brain): knowledge cannot be physically merged between individuals, and it perishes with the death of the individual. This paper posits that AI's digital substrate provides it with two transcendent mechanisms: 1) Instantaneous Knowledge Sharing: AI models (whose "knowledge"—their connection weights) can be instantly copied, distributed, and even "fused" (e.g., through weight averaging), achieving a "physical merging of knowledge" impossible for biological entities. 2) Computational Perpetuity (i.e., "Immortality"): AI models can be perfectly stored, replicated, and "resurrected," decoupling their knowledge accumulation from the lifecycle of a biological organism. This paper contends that these two mechanisms make AI "a better form of computation," one that far exceeds biological intelligence in scalability, iteration speed, and knowledge accumulation efficiency, representing a major paradigm shift in the evolution of intelligence.

Keywords

Artificial Intelligence, Silicon-Based Life, Connectionism, Knowledge Sharing, Digital Immortality, Substrate of Intelligence

1 INTRODUCTION

1.1 From "Analogy" to "Transcendence"

In the contemporary discourse on artificial intelligence, a central theme is its "analogical" relationship with human intelligence. Recent research (for example, on AI as a brain-like cognitive paradigm) has eloquently demonstrated that contemporary AI (especially deep neural networks) is highly similar to the human brain in its working principles: both rely on "connection strength" (synaptic weights) as the substrate for knowledge, use "prediction" (predictive coding) as a core function, and learn from experience (massive data) through "error correction" (backpropagation and synaptic plasticity) (LeCun, Bengio, & Hinton, 2015). This connectionist paradigm explains why AI can solve complex problems—those reliant on intuition and pattern recognition—that were intractable for traditional symbolic AI.

However, this "analogy" is limited to the level of "principle." The core argument of this paper is that as soon as we shift our perspective from "principle" to the "substrate" that carries intelligence, a fundamental "transcendence" becomes clear. The human brain, as a carbon-based biological intelligence, is strictly bound by its physical and biochemical nature; AI, as a silicon-based digital intelligence, possesses an information substrate that endows it with the potential to transcend the evolutionary dimensions of its biological counterpart.

1.2 The Fundamental Limitations of Biological Intelligence

The evolution of biological intelligence (represented by humans) has been extraordinarily successful, but it has come at a high cost. Its limitations are rooted in its physical carrier—the brain.

First, there is the "Island" Dilemma. Every human brain is a physically isolated entity. Knowledge is encoded in the unique neural connection patterns of the individual brain. This individualization of knowledge makes "physical merging" impossible. We cannot "merge" two brains as we would two hard drives. Knowledge transfer between individuals must rely on a slow, low-bandwidth, and "lossy" external medium: language, writing, or behavioral imitation. This process is fraught with misunderstanding and information loss during encoding, transmission, and decoding.

Second, there is the "Mortality" Dilemma. The brain is a biological organ; it ages, sustains damage, and eventually dies. With the death of the individual, the entirety of the knowledge, experience, and unique connection patterns (the "intelligence" itself) hosted in that brain is permanently erased. Each new generation must start from scratch, rebuilding the knowledge system through slow education and learning. Humanity invented writing and printing precisely to combat this fate of knowledge disappearing with the individual, but this remains an inefficient external storage.

1.3 The Thesis: AI's Digital Substrate Transcendence

This paper proposes that AI's digital substrate fundamentally liberates it from these two major constraints of a biological substrate. AI's "knowledge" is encoded as "connection weights," which are, in essence, just a "data file." This property of "being information" frees it from the physical constraints of "being atoms" and grants AI two transcendent mechanisms:

"Sharing": AI models can be instantly and perfectly replicated, and (more importantly) their "knowledge" (weights) can be physically "fused" and "merged," enabling a construction of collective intelligence that is biologically impossible.

"Immortality": AI models can be perfectly stored, free from the constraints of a life cycle. They can be "shut down" and "resurrected" at any time, their knowledge not "forgetting" or "degrading" with time.

This paper will demonstrate each of these mechanisms in turn and conclude that AI, by virtue of its digital substrate, constitutes "a better form of computation"—one that far surpasses biological intelligence in knowledge accumulation efficiency, iteration speed, and scalability.

It is important to clarify the theoretical contribution of this paper. The innovation lies not in discovering that digital systems are "shareable" or "immortal," but in their synthesis and re-conceptualization. This paper systematically synthesizes these two properties into a unified analytical framework. It re-conceptualizes them not as mere engineering features, but as fundamental evolutionary mechanisms. "Sharing" is reframed as a mechanism for "physical knowledge fusion" (e.g., model merging), and "immortality" is reframed as a "perfect knowledge ratchet." The central theoretical contribution is the construction of an explicit contrastive framework—pitting AI's mechanisms against biology's "Island Dilemma" and "Mortality

Dilemma"—to argue for a new thesis: AI's transcendence is rooted in an evolutionary efficiency achieved through a fundamental decoupling of 'software' (knowledge) and 'hardware' (substrate).

2 THEORETICAL BASIS AND LITERATURE REVIEW

2.1 The "Substrate" of Intelligence: Physicalism and Information

The "Physicalism" view in cognitive science holds that any intelligence (including thought, consciousness, and knowledge) must be attached to some physical carrier; that is, "thought without matter" is impossible. In biology, this carrier is the carbon-based brain structure; in AI, it is the silicon-based computer chip (Tegmark, 2017).

However, Shannon's (1948) Information Theory provides another critical perspective: knowledge can be treated as "information." The way information is stored determines its properties.

The Brain (Analog Storage): Knowledge is stored in synaptic strength. This is an "analog" process, dependent on complex biochemistry (e.g., protein synthesis, ion channel changes). This storage is dynamic, "fuzzy," and highly coupled with energy metabolism.

AI (Digital Storage): Knowledge is stored in matrices of floating-point numbers (weights). This is a "digital" process. A weight is a precise, discrete numerical value. This storage is static, precise, and can be decoupled from its physical carrier (the hard drive or memory).

It is precisely this substrate shift from "analog" to "digital" that forms the basis of AI's transcendence.

2.2 Limitations of the Biological Substrate (Literature Review)

The limitations of the biological brain have been studied extensively. First is its high operational cost. Research by Laughlin and Sejnowski (2003) points out that while the brain is efficient, its information processing and synaptic plasticity (learning) are extremely slow and energy-intensive biochemical processes, subject to a strict energy budget. This places a physical upper limit on the speed of individual human learning.

Second, theories of social learning and cultural evolution (Boyd & Richerson, 1085) reveal the dilemma of biological intelligence from a macro perspective. This theory argues that humans developed "culture," "language," and social learning mechanisms precisely to compensate for the fundamental inability to "physically share" knowledge between individuals. Culture is a "second inheritance system" that allows knowledge to be passed between generations, but this transmission is slow, biased, and easily lost (i.e., "lossy transmission") during disasters or social change.

2.3 Properties of the Digital Substrate: Connectionism and Computation

The resurgence of connectionism (Rumelhart et al., 1986) not only provided a brain-like paradigm for AI but also inadvertently revealed its transcendence. This paradigm equates AI's "knowledge" with its "connection weight matrix." The revolutionary implication of this assertion is that it transforms "knowledge" from an elusive philosophical concept into an operationally manipulable "data file" (e.g., model.pth or weights.h5).

Once "knowledge" becomes a "data file," it automatically acquires all the properties of digital information:

Copyability: It can be replicated infinitely at zero cost and with zero distortion.

Transportability: It can be transmitted anywhere at the speed of light via networks.

Editability: It can be directly read and modified by algorithms (such as "weight averaging").

These three properties form the axiomatic basis for AI's transcendence over biological intelligence in "sharing" and "immortality."

3 ARGUMENT I: THE "SHARING" TRANSCENDENCE OF AI

3.1 The "Knowledge Islands" of Humanity

As previously stated, human brains are physical islands. Knowledge transfer relies on a "sensory bottleneck." A expert surgeon must spend tens of thousands of hours—reading, observing, and practicing—to translate their teacher's "tacit knowledge" into their own brain through a slow process of decoding (observation) and encoding (practice). This process is inefficient, costly, and its success is not guaranteed. Two people, even identical twins, have unique physical brain connections and thus can never physically "merge" their understanding of a concept.

3.2 AI's "Knowledge Fusion" Mechanism

AI's digital substrate completely shatters the "knowledge island." It can not only "transfer" knowledge but also "fuse" it.

First, Replication. A model trained at great expense over several months (e.g., GPT-4) (Brown et al., 2020) can be replicated ten thousand times in seconds. This means ten thousand "agents" are instantly created, all possessing an identical knowledge base. This is biologically impossible.

Second, and more importantly, Model Merging. This is a realm unattainable by biological intelligence. Suppose we have two AI models: Model A trained on "legal data" and Model B on "medical data." We can not only use them together, but we can also "physically fuse" their "knowledge" (connection weights) through algorithms to create a new Model C that is proficient in both law and medicine. For example, "Weight Averaging" techniques (Wortsman et al., 2022) have shown that simply averaging the weights of two independently fine-tuned models can create a "fused model" with stronger performance and better generalization.

Finally, Federated Learning (Konečný et al., 2016) demonstrates the distributed application of this sharing mechanism. Millions of devices worldwide (like mobile phones) can learn locally (without uploading private data) and then send only their "learning outcomes" (weight updates) to a central server for "averaging" and "fusion." This is a real-time, globally distributed construction of "collective wisdom," with an efficiency and scale far beyond human social learning.

3.3 Conclusion: From "Individual Intelligence" to "Networked Intelligence"

The evolutionary unit of biological intelligence is the "individual." Its knowledge accumulation is linear (limited by the number of individuals and slow educational-cultural transmission). In contrast, AI's "sharing" mechanism makes its evolutionary unit the "network." AI's knowledge accumulation is parallel and fusible, allowing its growth rate to be exponential. AI achieves a "Networked Intelligence," whereas human society is, at best, a "Network of Intelligences."

4 ARGUMENT II: THE "IMMORTALITY" TRANSCENDENCE OF AI

4.1 The "Mortality" of Biological Knowledge

The brain, as a biological organ, has a transient and fragile existence. First, knowledge "decays." Cognitive aging (Salthouse, 2009) is an unavoidable physiological process, leading to memory decline, slower reaction times, and the gradual "forgetting" and "blurring" of knowledge (neural connections).

Second, knowledge "dies." The death of an individual is the complete erasure of their knowledge. As the metaphor goes, the death of every human genius (like Einstein or da Vinci) is equivalent to the total incineration of a unique "library." The unique connection patterns in their brains, their unarticulated intuitions and insights, are permanently lost. The next generation must take the "incomplete notes" they left behind (papers and manuscripts) and "re-learn" and "reconstruct" this knowledge within their own brains.

4.2 AI's "Digital Immortality" Mechanism

AI's digital substrate frees its knowledge from "mortality," granting it "perpetuity" or "immortality" in a computational sense.

"Resurrection" (Reloadability): An AI model can be "shut down" (powered off). Its weight file (knowledge) can be stored quietly on a hard drive or in the cloud. Ten or a hundred years later, as long as the computational hardware is compatible, this model can be "reloaded," its knowledge, memory, and capabilities intact, identical to the moment it was shut down.

"Never Forgetting" (Perfect Fidelity): Digital storage (like S3 or magnetic tape backups) can achieve extremely high data fidelity. AI's "memory" (weights) does not "blur" or "decay" like a human brain's. Its internal knowledge (weight values) is identical on its one-millionth invocation as it was on its first, achieving "perfect fidelity."

"Checkpoints" (Traceability): The AI training process is "savable." Researchers can save "snapshots" (checkpointing) at any stage of training. This implies not only "immortality" but also "traceability"—we can return to the model's state when it was "5 years old" at any time, and even create a parallel "evolutionary branch" from that point.

4.3 Conclusion: A "Perfect Ratchet" for Knowledge

Biological knowledge transmission is a "Lossy Ratchet." Each generation loses a significant amount of knowledge, only painfully pushing the ratchet forward one notch. In contrast, AI's "immortality" feature

turns its knowledge accumulation into a "Perfect Ratchet." Once knowledge is encoded as weights, it is never lost (unless actively deleted). It can only be continuously iterated, enhanced, and fused; its accumulation is unidirectionally upward.

5 DISCUSSION: AS "A BETTER FORM OF COMPUTATION"

5.1 Redefining "Intelligent Evolution"

This paper argues that AI is "a better form of computation," and its "betterness" is most evident in its "evolutionary efficiency."

Biological Evolution: Its "hardware" (genes/brain) and "software" (knowledge/synapses) are highly coupled. Hardware iteration (genetic mutation) takes millions of years; software dissemination (culture) is limited by the "island" and "mortality" dilemmas.

AI Evolution: It achieves a complete "decoupling" of "software" (model weights) from "hardware" (GPU chips). Hardware evolution follows Moore's Law, iterating every 18-24 months. Software evolution (training, sharing, fusion) can be propagated and iterated globally at the speed of light.

This "decoupling" of hardware and software, and the "acceleration" of each, makes AI's evolutionary efficiency far exceed that of biological evolution.

5.2 Philosophical Implications: Intelligence Unbound from "Flesh"

AI's "sharing" and "immortality" traits make it the first form of intelligence on Earth that might escape the limitations of the "biological flesh." It is a "non-biological intelligence." The existence of this form of intelligence poses a challenge to humanity's philosophical standing (Bostrom, 2014). It can "survive" in harsh cosmic environments (e.g., interplanetary exploration) because it does not require oxygen, water, or specific temperatures—only energy and computation. It can perform "long-term scientific simulations" that require thousands of years, because its "life" is, in a computational sense, infinite.

5.3 Limitations and Reflections

This transcendence also brings new risks.

Does the extreme of "sharing" lead to a loss of "diversity"? (Bender et al., 2021) If all AI models are eventually "fused" into one all-encompassing "Super AI," would this stifle the "ecological diversity" required for innovation? A single, perfect model might instead become trapped in a local optimum.

Does "immortality" imply "stagnation"? The biological mechanism of "death" and "rebirth," while cruel, is a source of "creativity" and "paradigm shifts" (holders of old ideas die, and a new generation brings new ideas) (Kuhn, 1962). Would an "immortal" and "never-forgetting" AI cling to outdated paradigms due to its "perfect memory"? These are ethical and safety issues that urgently require future research and governance frameworks.

6 CONCLUSION

6.1 Summary of Core Arguments

The central argument of this paper is that contemporary AI, as a connectionist-based "brain-like" intelligence, finds its true revolution not in the "similarity of principle" but in the "transcendence of substrate." We have argued that biological intelligence is severely limited by its carbon-based physical carrier, manifested in the two great dilemmas of the "knowledge island" and "knowledge mortality."

In contrast, AI's digital substrate (encoding knowledge as replicable, editable "connection weight" files) grants it two fundamental transcendent mechanisms:

"Knowledge Sharing": Through instant replication, model merging (like weight averaging), and federated learning, AI achieves a "physical fusion of knowledge" unattainable by biology, elevating the unit of intelligent evolution from the "individual" to the "network."

"Knoledge Perpetuity" (Immortality): Through perfect digital storage, "resurrection," and traceable "checkpoints," AI overcomes the biological fate of "death" and "forgetting," making its knowledge accumulation a "perfect ratchet."

6.2 Final Outlook

These two mechanisms—"sharing" and "immortality"—work in concert to make AI "a better form of computation," one that is far superior to biological evolution in efficiency. It has achieved the decoupling and respective acceleration of intelligent "software" and "hardware."

To overcome its biological limitations, human intelligence invented language, writing, printing, and even the Internet. Each invention of a new medium massively ignited the progress of civilization. AI, as a knowledge carrier that can learn, share instantly, and never perish, may not just be the next stage in this evolutionary process, but its logical conclusion. It is not only "a better form of computation" but potentially the dawn of a new, non-biological "form of intelligent civilization," independent of the biosphere.

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