Cogitations of a Computational Pathologist

Artificial or Computational—Rethinking Intelligence in the Age of Algorithms

Giovanni M. Luján, MD

THE PROBLEM OF WORDS

The term *artificial intelligence* (AI) has become one of the most overused and misunderstood expressions in modern science. It evokes notions of autonomy, sentience, and creativity that distort both the public and professional understanding of what these systems do. The word *artificial* implies imitation, something pretending to think, while *intelligence* suggests consciousness and agency. Together, the phrase creates a mirage: a metaphor that has outgrown its usefulness.

What makes this issue especially pressing is the speed at which computational technologies are now integrated into daily life, clinical workflows, and public discourse. The gap between what AI systems truly are and what society believes them to be has widened dramatically. This divergence fuels unrealistic expectations, unwarranted fears, and misplaced trust.[1] As a result, clinicians, researchers, and patients are often left navigating a conceptual landscape shaped more by marketing and science fiction than by scientific accuracy.

In medicine, this misnomer has real consequences. Clinicians are asked to "trust" AI systems, while patients are led to believe that machines can "diagnose" or "think." In reality, these tools perform high-dimensional pattern recognition, probabilistic inference, and computational learning, remarkable feats, but still fundamentally algorithmic.

The more our clinical environments integrate these systems, the more evident the limitations of the existing terminology become. Words that once seemed futuristic now obscure rather than illuminate, and the medical community must confront whether it is wise—or responsible—to continue relying on metaphors that distort the essence of the technology.

The purpose of this essay is not to propose a formal or immediate replacement of the term *artificial intelligence*, or to dismiss the remarkable achievements achieved under its banner. Rather, this perspective is offered as a conceptual caution to clinicians and scientists increasingly asked to rely on these systems in practice. By interrogating the language we use, this article aims to encourage a more grounded understanding of what these tools are, how they function, and how they should be integrated responsibly into clinical decision-making. The goal is not linguistic enforcement, but conceptual clarity.

THE CASE FOR COMPUTATIONAL INTELLIGENCE

"Computational intelligence" (CI) more accurately describes the reality. It acknowledges that what we call AI is the culmination of decades of computational theory, statistical modeling, and algorithmic optimization. These systems are not artificial minds; they are computational processes operating on data.

By framing these technologies as computational rather than artificial, we anchor them in the disciplines that birthed them: mathematics, engineering, computer science, and information theory. This grounding helps protect the field from the hype cycles that too often inflate public expectations and distort regulatory, ethical, and scientific discourse. CI emphasizes what these tools do: compute, classify, detect, predict, and quantify. They are instruments of analysis, not entities of thought.[2]

The rebranding toward computational reframes intelligence not as a mystical human trait to be mimicked, but as a measurable capacity for information processing and decision support. This distinction matters because it grounds the discourse in science rather than fiction, in transparency rather than hype.

With a computational framing, the focus shifts toward reproducibility, accountability, and systematic validation—pillars that are essential for safe clinical deployment. Rather than debating whether machines can think, we recognize that they excel at tasks that benefit from scale, speed, and pattern mining far beyond human perception.

By shifting the lexicon, we encourage a culture of epistemic humility that values computational rigor, interpretability, and human oversight.

FURTHER REFINEMENT: COMPUTATIONAL CO-INTELLIGENCE

While *computational intelligence* corrects the scientific and linguistic inaccuracies of the term *artificial intelligence*, an even more accurate and forward-looking concept is computational co-intelligence (CCI). This terminology emphasizes that the value of these systems does not lie in replacing human cognition, but in collaborating with it. Intelligence

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From Clinical Informatics, Digital & Computational Pathology, The Ohio State University Wexner Medical Center, Columbus, Ohio.

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Corresponding author: Giovanni M. Luján, MD, Clinical Informatics and Computational Pathology, Department of Pathology, The Ohio State University Wexner Medical Center, 410 W 10th Avenue, Doan Hall N437C, Columbus, OH 43210 (email: Giovanni.lujan@osumc.edu).

in medicine emerges through interaction: the synthesis of human expertise, contextual reasoning, and ethical judgment with the scale, speed, and pattern-recognition capabilities of computational systems.

CCI represents an evolution in how we conceptualize the relationship between humans and computation. Rather than positioning human and machine as adversaries or rivals, it envisions a shared cognitive ecosystem. In clinical practice, this means that diagnostic and therapeutic decisions arise from the dynamic interplay between human insight and computational augmentation. This partnership model reflects reality far more faithfully than the outdated notion of machine autonomy.

Within this framework, computational systems extend and amplify human reasoning rather than imitate or supplant it. Diagnostic and therapeutic accuracy is greatest when human judgment and computational strengths are integrated rather than contrasted. Importantly, the locus of agency and responsibility remains with the clinician, not the machine. In this model, the future of medical technology is cooperative rather than competitive, emphasizing collaboration over replacement. In this framing, machines are not artificial substitutes for intelligence but partners in a shared cognitive process. CCI therefore captures the relational and collaborative nature of clinical decision-making far more faithfully than terminology that implies autonomy or independent cognition.

This shift also supports a more realistic and ethically aligned vision of technologic progress. Co-intelligence communicates that humans guide the process, interpret the results, and remain ultimately accountable for clinical decisions. It resists the allure of technologic determinism and reaffirms that medicine is fundamentally a human endeavor enhanced, yes, but never replaced by computation (Figure).

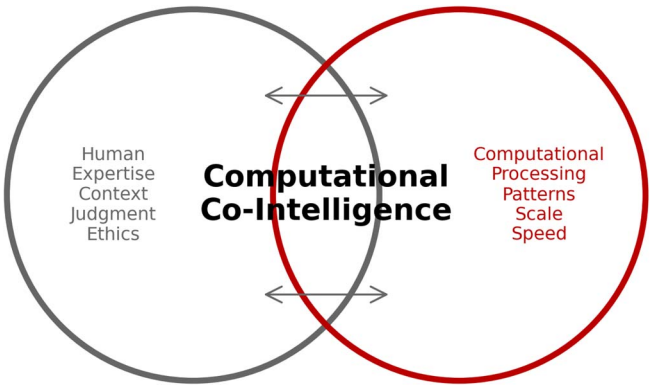
WHY LANGUAGE MATTERS IN MEDICINE AND SCIENCE

Scientific terminology is not neutral. It shapes funding priorities, regulatory policies, and ethical debates. When we call an algorithm "intelligent," we implicitly grant it agency; when we call it "computational," we reassert human responsibility.

In practice, the words we choose influence public perceptions of safety, risk, and trustworthiness. A poorly chosen term can generate fear, optimism, or confusion. For example, labeling a system "autonomous" may mislead users into believing it can function without human supervision, even when the underlying technology lacks the robustness, transparency, or reliability to justify such independence.

In pathology and radiology, where these tools are already influencing diagnoses, this linguistic precision is more than semantics, it is ethical clarity. A computational diagnosis is a process guided by human-defined rules and validated performance metrics, not a replacement for judgment.[3] Reframing the field would help institutions communicate with the public and regulators with greater honesty and trust.

Moreover, clearer terminology facilitates more rational policy development. Regulators can better assess risk and establish guidelines when the language accurately reflects technical function rather than aspirational metaphor. This benefits clinicians, patients, and industry stakeholders navigating an evolving technologic landscape.



Computational co-intelligence. Intelligence in medicine is neither artificial nor autonomous; it emerges in the space where human thought and computational capability meet.

HISTORICAL CONTEXT AND FUTURE DIRECTIONS

The phrase "artificial intelligence" was coined in 1956 at the Dartmouth Conference, a time when the ambition was to simulate human thought.[4] That vision, though inspiring, diverged from what actually emerged: a field driven by computation, data, and statistical learning. Today's systems, whether deep neural networks or transformer models, are the children of mathematics, not metaphysics.

As computational capability expanded, the practical applications of these methods shifted away from the philosophical goal of simulating human cognition and toward measurable performance in tasks like classification, prediction, and optimization. Yet the original metaphor persisted, creating a linguistic artifact disconnected from the modern reality.

Perhaps it is time to retire the metaphor and adopt a language aligned with our scientific maturity. CCI reflects where the field truly stands, as an interdisciplinary domain linking computer science, statistics, and cognitive modeling.

The future of medical technology will hinge not on the pursuit of artificial minds but on the refinement of human-machine collaboration. Investing in interpretability, safety, transparency, and human-centered design will matter far more than striving for autonomy. Clear terminology can guide research priorities accordingly.

CONCLUSIONS: A CALL FOR CONCEPTUAL HONESTY

In renaming the field, we do not diminish its promise; we dignify it. Words matter because they define the frame through which society perceives technologic progress. For medicine, where trust, transparency, and accountability are sacred, clarity of language is a moral duty.

It is time that we, the users, acknowledge that these systems compute rather than think, recognizing that the true intelligence lies in how physicians design, validate, interpret, and apply them in practice. A future grounded in CCI invites a more honest, collaborative, and scientifically faithful understanding of what these tools can achieve. Such a shift not only improves communication but also strengthens the ethical foundation upon which clinical innovation must stand.

I used AI-assisted tools (ChatGPT, OpenAI) to support editorial tasks such as grammar refinement, formatting, and organization during manuscript preparation. All intellectual content, interpretations, opinions, and conclusions are solely my own.

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