Bulletin of Computational Intelligence
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Editorial

Computational Intelligence: From Nature and Aristotle to Meta-Heuristic Algorithms

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It is with great enthusiasm that we announce the first issue of *Bulletin of Computational Intelligence*, a new journal dedicated to advancing the frontiers of computational methodologies, techniques, algorithms and their transformative applications across sciences. As Editor-in-Chief, I take this opportunity to present the journal's mission and scope, highlighting the rationale behind our chosen title, and define key areas where we aim to encourage novel contributions.

The title *Bulletin of Computational Intelligence*, embodies the broader and more inclusive nature of this field compared to the narrower scope implied by the term "Artificial Intelligence". While Artificial Intelligence (AI) focuses on simulating human cognitive functions as closely as possible, Computational Intelligence (CI) encompasses a diverse set of techniques aimed at solving complex real-world problems. Methodologies including machine learning, deep learning, fuzzy logic, evolutionary algorithms, swarm intelligence, and hybrid systems represent the rich toolbox of CI, offering robust solutions that extend beyond human-inspired reasoning.

The origins of computational thinking can be traced back to ancient Greek philosophy, where thinkers like Aristotle and Archimedes laid the groundwork for systematic problem-solving and logical reasoning. Aristotle's contributions to formal logic, particularly his syllogistic reasoning, represent an early precursor to algorithmic thought [1]. His collection of works on logical analysis and dialectic, known as the Organon (Ancient Greek: Ὄργανον, meaning "instrument, tool, organ"), was named by his followers, the Peripatetics, who argued against the Stoics that logic was merely an instrument of philosophy. Similarly, the Antikythera mechanism [2], an ancient Greek analog computer dating back to the 2nd century BCE, exemplifies humanity's early attempts to model complex systems and predict celestial events. Often regarded as the first known analog computer, this remarkable device underscores the enduring human pursuit of technology to understand and solve complex problems.

Our journal's mission is to serve as a platform for interdisciplinary collaboration. Generally, CI is inherently versatile, with applications across engineering, physics, biology, medicine, materials science, environmental science, and beyond. By encouraging contributions from diverse scientific domains, we seek to build bridges between disciplines, fostering a collective effort to tackle pressing challenges through innovative computational approaches.

One area of particular interest is the development of novel optimization techniques. As real-world problems grow increasingly complex, often involving thousands of parameters and multidimensional spaces, traditional optimization algorithms struggle to deliver reliable results. Therefore, we strongly belief that the future of CI lies in formulating robust, scalable optimization algorithms capable of navigating such intricate landscapes. Additionally, efforts to improve feature selection methods are encouraged to identify the most significant variables, thereby improving model interpretability and efficiency.

Another crucial aspect is the role of CI methods in revealing the nature of complex and multidimensional real-world problems. In the medical field, these techniques not only aid in predicting disease prognosis, but also in identifying the key factors contributing to disease onset and progression. Understanding these factors can facilitate early interventions, enhance patient outcomes, and potentially prevent diseases [3–6]. Consequently, CI provides an effective tool for identifying hidden patterns within big data, thus transforming data into actionable insights.

AI and CI are poised to transform and advance scientific discovery, particularly when combined with domain-specific knowledge. This synergy has the potential to accelerate breakthroughs across diverse fields, for instance, from materials science and biology to renewable energy. Emphasis is placed on developing interpretable and ethical AI systems that complement human expertise, envisioning a future where AI-driven insights, combined with traditional methods, lead to sustainable innovations. On the other hand, critical perspectives argue that despite AI's prowess in pattern recognition, it is not sufficiently effective in comprehending the innate, rule-based structures underlying human cognition. Such critiques advocate for a deeper integration of cognitive science and linguistics to address these limitations, challenging the community to refine AI's capacity to understand complex processes. Together, these viewpoints underscore the potential and limitations of AI, highlighting the need for ethical, interpretable, and interdisciplinary approaches.

Transparency and reproducibility are essential tenets of scientific progress. To support this, *Bulletin of Computational Intelligence* issue encourages authors to share the datasets used in their research as supplementary material. While many researchers focus on computational methods, the reliability of predictive models depends heavily on the quality and comprehensiveness of the underlying data. As the saying goes, "garbage in, garbage out." Thus, a reliable database must consist of accurate, trustworthy data that adequately covers all possible values of each variable in the studied problem [7–9]. Additionally, open data access not only strengthens the reliability of research findings but also fosters collaboration, enabling researchers to build on each other's work and accelerate discovery.

As the digital era continues to advance, the integration of CI into applied sciences is expected to advance. From structural analysis to fluid dynamics, from material design to digital twins, the applications are as vast as they are impactful. It is our hope that this journal will become a beacon for pioneering research, pushing the boundaries of what CI can achieve.

We invite researchers and practitioners from all scientific fields to join us in this endeavor. Let *Bulletin of Computational Intelligence* be the forum where ideas converge, methodologies evolve, and solutions emerge.

Conflicts of Interest: The authors declare no conflict of interest.

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