

CALL FOR PAPERS

IEEE Transactions on Emerging Topics in Computational Intelligence

Special Issue on Quantum Computing meets Computational intelligence: A New Vision for Smart Systems

I. AIM AND SCOPE

Although computational and artificial intelligence have made rapid progress over past decades, the technological limitations that characterize the development of current computing devices pose serious restrictions to further improvements in the performance of the basic algorithms of computational intelligence. Indeed, Moore's Law, the observation that the number of transistors in a dense integrated circuit doubles about every two years, is coming to an end simply because current technologies are unable to develop chips with smaller transistors to further improve the performance of digital computers. Therefore, it is necessary to look for alternative ways of computing outside of electrons and not based on transistors made of silicon. In this scenario, quantum computing is taking a central role due to two important factors: first, quantum computing can improve the performance of current computing devices due to the maximum parallelism induced by quantum properties such as superposition, entanglement, and interference; second, the evolution of quantum technologies has led to the availability of Noise Intermediate Scale Quantum (NISQ) devices, quantum computers equipped with 50-100 qubits capable of performing tasks that exceed the capabilities of current classical digital computers, where noise in the quantum gates limits the size of quantum circuits that can be reliably executed, but which allow to test early implementations of quantum algorithms. In this new computing scenario, computational intelligence is one of the research areas that can greatly benefit from the capabilities provided by quantum computing. Indeed, quantum superposition, entanglement and interference can support the design of innovative approaches for approximate reasoning, machine learning and evolutionary computation. Also, classical methodologies for machine learning and evolutionary optimization can support the training of variational quantum circuits, a native quantum approach for learning from data. Moreover, computational intelligence methods can support the design of reliable quantum computers by enabling the development of innovative techniques for error mitigation, reducing the size and optimizing quantum circuits, and so on.

The aim of this special issue is to bring together researchers and practitioners to highlight and discuss the technical and scientific challenges associated with the emerging research area that hybridizes quantum computing and computational intelligence. This special issue will discuss the integration of quantum computing and computational intelligence to demonstrate how both approaches can benefit from each other.

II. TOPICS

The topics relevant to the special issue include (but are not limited to) the following topics:

- Quantum computing for fuzzy logic.
- Quantum computing for neural networks.
- Quantum computing for evolutionary computation.
- Computational intelligence for quantum circuit optimization.
- Computational intelligence for quantum error mitigation.
- Computational intelligence algorithms for quantum compilers.
- Computational intelligence for variational quantum circuits.
- Computational intelligence in quantum software.
- Computational intelligence and quantum annealing.

III. SUBMISSIONS

Manuscripts should be prepared according to the "Information for Authors" section of the journal and submissions should be done through the journal submission website: <https://mc.manuscriptcentral.com/tetci-ieee>, by selecting the Manuscript Type of "Quantum Computing meets Computational intelligence: A New Vision for Smart Systems" and clearly marking "Quantum Computing meets Computational intelligence: A New Vision for Smart Systems" as comments to the Editor-in-Chief. Submitted papers will be reviewed by at least three different reviewers. Submission of a manuscript implies that it is the authors' original unpublished work and is not being submitted for possible publication elsewhere.

IV. IMPORTANT DATES

Paper Submission Deadline: December 20, 2023

First Round Review Notice: February. 20, 2024

Revision Due: March 20, 2024

Final Notice of Acceptance/Reject: April 20, 2024

V. GUEST EDITORS

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