Advances in Quantum Communications, Computing, Cryptography and Sensing

Call for Papers

The celebrated Moore's law is beginning to hit physical limits where the ever-shrinking transistor size is making it necessary to account for quantum effects. Concurrently, the growing demand for high-rate processing is imposing unsustainable power and heat dissipation requirements. Thus, there is an urgent need to develop quantum information processing systems that can circumvent the limitations of existing technology. Quantum computing paradigms have been investigated since the 1980s and foundational advances have shown that harnessing the unique quantum mechanical concepts of superposition and entanglement can lead to capabilities that are beyond the reach of classical systems. Several physical platforms for realizing quantum bits, or qubits, have been explored. One of the most promising technologies relies on superconducting qubits under investigation by D-Wave, IBM and Google, while another is based on trapped ions explored by other groups and startups. A chip with 1024 qubits, suitable for quantum annealing algorithms, is commercially available from D-Wave, while IBM and Google recently announced their gate-based architectures with 50-100 qubits. Furthermore, the recent launch of the Micius quantum-enabled satellite heralds a major advance in long-range secure quantum communication. Yet other efforts are aimed at exploiting quantum effects for sensing with unprecedented resolution and sensitivity. These advances also underscore the daunting technical challenges that have to be overcome to realize the full potential of quantum information science and engineering. Given the cross-disciplinary nature of challenges in quantum information technology, and the worldwide attention it is enjoying, this is a unique and timely opportunity for the signal processing, communications, information science, and networking communities to get engaged in this emerging research frontier. This special issue is aimed at promoting foundational, algorithmic, and experimental advances in quantum information science and engineering spanning communications, cryptography, computing, and sensing, as well as fostering new avenues for cross-disciplinary research. The topics of interest include, but are not limited to:

- Quantum communications
- Quantum information theory
- Quantum error correction & modulation
- Quantum algorithms and applications
- Quantum key distribution
- Entanglement distillation and purification
- Experimental results and demonstrations
- Prototypes and testbeds
- Quantum state preparation
- Quantum networks and architectures
- Quantum secure direct communication
- Modeling and simulation of quantum information processing systems
- Quantum detection and estimation
- Role of entanglement in encoding and decoding of information
- Quantum sensing and measurements

In addition to new research results, we invite high quality submissions of a tutorial or overview nature, including accessible summaries of important results to date, and/or visionary articles about emerging and future trends. We also welcome submissions on related topics that are not included in the above list. Prospective authors are encouraged to contact the Guest Editors regarding topics that are not listed.

Submission Guidelines

Prospective authors must follow the IEEE J-SAC manuscript format. For details and templates, please refer to the Information for Authors as published in the Journal website. Authors MUST submit their draft manuscripts through EDAS.

Important Dates

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Advisor:

Lajos Hanzo University of Southampton, UK