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Introduction to Quantum Computing Area

Giacomo Nannicini

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Giacomo Nannicini

Contact: g.nannicini@usc.edu (GN)

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In 2021, the INFORMS Computing Society started a working group on quantum computing (QC). Among the possible activities to promote research areas related to quantum computing within INFORMS, the working group immediately considered the idea of editing a special issue on the topic. It took a few years until the community of researchers working at the intersection of quantum computing and operations research (OR) reached a sufficient size, but the effort eventually materialized into the *INFORMS Journal on Computing (IJOC)* issue published at the beginning of this year: <https://pubsonline.informs.org/toc/ijoc/37/1>.

The number of submissions exceeded our expectations; we received more than thirty, of which nine were accepted. This prompted the editor-in-chief, Alice, to start a new area fully dedicated to quantum computing. I believe that this is a forward-looking decision; there is sustained interest from government, industry and academia toward quantum computing, and the role that operations research plays in the development of this area of science and technology is likely to grow rapidly. Quantum hardware technologies are not set in stone—far from it—and this leaves plenty of opportunities for quantitative techniques to help device engineers to model, design, and operate the hardware; the OR community excels at these tasks. In addition, the new computational paradigm implemented by quantum computers opens new, exciting opportunities in the design and analysis of algorithms to solve computational problems, such as optimization or simulation problems. The open literature contains many studies of quantum algorithms for OR problems; some are theoretical, some are empirical. The expertise and feedback of researchers in OR is indispensable if these quantum algorithms are to have an impact. Our community has the expertise and well-established methodologies to assess the contribution of this type of work, and help translate theoretical insights into computational practice.

The new area is supported by three fantastic associate editors: Carleton Coffrin at Los Alamos National Laboratory, who was already an associate editor for the journal and will be transitioning to the new area (Carleton was also a guest editor for the special issue on quantum computing); Rebekah Herrman at the University of Tennessee; and Sander Gribling at Tilburg University. I will be moving from my previous role as associate editor in the “design & analysis of algorithms–discrete” area to area editor for quantum computing. My background is in computational optimization, and my interest in quantum computing started around 2017, primarily because I wanted to understand if existing quantum hardware could be helpful to solve difficult optimization problems. Considering how rapidly the field is evolving, this time span of about eight years somehow makes me a veteran. I am very grateful to Alice for her trust; I will try to repay her by advertising the new area and doing my best to keep turnaround times low, which I’m told is the best present for an editor-in-chief.

Our goal is that *IJOC* becomes widely recognized as a top publication venue not only by the OR community, but also by the quantum computing community for topics that relate to OR that are currently published outside traditional OR journals for lack of a dedicated outlet. To succeed in this goal, we need the help of our readers. I encourage you to spread the word about this new area; we are all eager to see the great contributions to come. I also encourage you to use this opportunity to learn about quantum computing, if you are curious about it, by reading the papers in the aforementioned special issue as well as the papers that we will publish in the future.

Let me conclude this message with the editorial statement of the new area: The quantum computing area publishes works at the intersection of quantum computing (QC) and operations research (OR). The rapid development of quantum technologies benefits from the application of traditional OR techniques in different phases of chip design and operation; examples are uncertainty quantification, simulation, optimization, modeling. At the same time, algorithmic techniques in these and other areas could benefit from the different computational paradigm, which leads to provable speedups under certain conditions. All high-quality research works that study the use of OR techniques for problems arising in the design and operation of quantum computers and those that

study the development of OR techniques that benefit from the QC paradigm (e.g., quantum algorithms for optimization, Monte Carlo simulation, game theory, learning and analytics) will be considered for publication in this area of the *INFORMS Journal on Computing*. This includes theoretical, computational, and experimental work. Articles related to quantum information theory or quantum computing that have no connection to OR are not considered to be within the scope of the journal.

We are all looking forward to your contributions!