Abstract

Quantum Computing has the potential to significantly alter the computing landscape. However, there are many technological and scientific challenges that need to be addressed before its potential is realized. This protocenter envisions SBU as a highly visible player for realizing the potential of quantum computing. To this end, this protocenter aims to build a sustainable center constructed on three pillars: research excellence, diverse and inclusive workforce development, and active collaboration with industry, government, and other stakeholders.

The research in this protocenter will be largely focused on algorithmic and computing challenges that arise in the design and implementation of large, scalable, and robust quantum computing platforms, and demonstrating quantum advantage via novel quantum algorithms and complexity analysis in a variety of quantum computing platforms. The protocenter will have four specific research thrusts: (i) Quantum Networks and Distributed Quantum Computing, (ii) Quantum Algorithms and Advantage, (iii) Quantum Cryptography, and (iv) Quantum Verification. These thrusts have the potential to comprehensively address the key challenges in the quantum computing arena, while effectively leveraging the quantum computing strengths of our team.

Our research goals and agenda overlaps with many of the eight frontiers in the 2020 Quantum Frontiers report of the White House's National Quantum Coordination Office. The breadth of the research agenda positions the protocenter to attract other collaborators and compete for a variety of funding opportunities. We will also develop a robust suite of activities to build a diverse and capable workforce, and engage with the industry and other stakeholders for research collaborations and technology transfer. Thus, the overall goals of the protocenter are to perform fundamental research in the scientific and technological foundations of quantum computing platforms, to build a vibrant, diverse community of researchers and practitioners, and be a self-sustaining center in a few years.