Yifan Zhou, PhD:
So interconnected power grids are possibly one of the largest and most complicated memory systems on this planet. In recent years, things are becoming even more complex as we are seeing our growing demands, distributed resources, new grid technologies, as well as the increasing frequency of extreme events. To successfully operate such a super complicated system, a critical aspect is really to have very scalable and powerful computational methodologies to support the system operation. In our lab, we exploit the efficacy of quantum computing to simulate and optimize power system operations. We are particularly interested in leveraging the near term quantum computers to handle very large scale power systems with millions or even tens of millions components, which might go beyond the capability of classical computing. In this discovery project, we propose to synergize the power system physics knowledge with quantum mechanisms to develop domain specific quantum algorithms. So this new perspective will help to achieve enhanced scalability, noise resilience, and accuracy that couldn't be offered by general purpose quantum algorithms, bridge the gap between quantum and classically formulated real world engineering problems, and possibly provide us a path towards practical quantum advantage.