Poster Template Guidance

All active 6.2 FR LSI and LENS projects will be featured in the Summaries Booklet

- **Posters*** will be created by the PI and assigned technical editor with design team support
- Project summaries will be drafted by Managing Editor, Ed Desautels, and refined/approved by the PI
- Photos of PI and/or research team

Please use the sample poster on slide #2 as your template to begin sketching your poster layout. Click on the section of the poster that you want to update to make your edits.

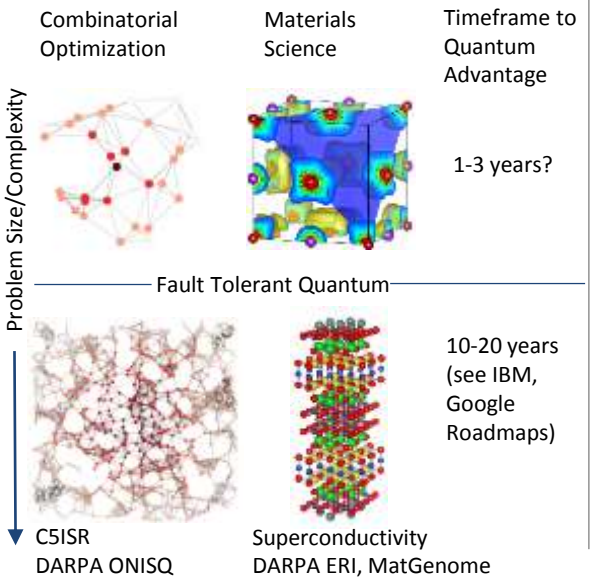
Technical editors will begin working with you after the program announcement targeted for July 20th.

*Only a subset of 6.2 FY project will have poster sessions this year

Quantum Advantage Evaluation Framework

Problem

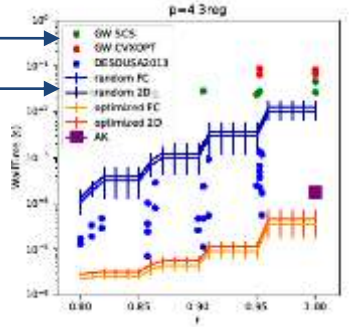
When and where can the DoD benefit from investing in quantum computing technology? To answer this question, we are working with noisy intermediate scale quantum (NISQ) computers as well as with fault-tolerant quantum error corrected computation. In particular, we want to determine when and where quantum advantage will exist for the following important DoD applications:



Framework to evaluate current and projected quantum computing advantage.

Classical State of the Art: PSC

Quantum Computers (simulated)



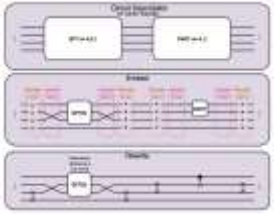
Where: to determine quantum advantage, benchmarks on specific problem instances must be performed on "real world" scales (O(100-1000+ nodes) (estimated 3 years IBM, Google)

https://arxiv.org/abs/2006.04831
Evaluation of Quantum Approximate Optimization Algorithm based on the approximation ratio of single samples
Assessment of Alternative Objective Functions for Quantum Variational Combinatorial Optimization, M. Jonsson, et al, IEEE QCE Quantum Week 2020

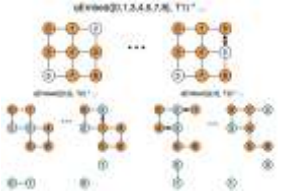
Campus Collaboration

Quantum algorithm performance depends critically on quantum circuit optimization. We are working with CMU ECE Franz Franchetti's group to adapt their well-known classical computing optimization tool, SPIRAL.

Quantum Circuit Optimization in SPIRAL



Scheduling to Quantum "Baremetal"



http://spiral.net/ https://github.com/spiralgen/spiral-package-quantum
Quantum Circuit Optimization with SPIRAL: A First Look, S Mionis, et al, Supercomputing 2020

QAEF Output: When and where can you leverage quantum computing to achieve advantage in solving your organization's problems?

- Input: the applications that have most potential for quantum advantage. It is critical to idenfity "real world" problem instances.
- Output: when and where will quantum advantage exist? Establish timeframe for Quantum Advantage Readiness.