

PROJECT PROPOSAL

CMSC/PHYS 457 (Spring 2019)

Due by 12:30 pm on Thursday, February 14. Submit your proposal in PDF via Gradescope. For group projects, each group member should make a separate submission (but it is acceptable for all group members to submit the same document).

Proposal structure

Your project proposal should be a 1-page document, typeset using \LaTeX , that includes the following details:

- Tentative project title.
- List of group members (1–3 students).
- Brief summary of what you plan to cover. Your summary should motivate the topic and explain what aspects you expect to focus on.
- List of references you plan to consult to explore your topic.
- Brief timeline of project activities, including milestones you plan to achieve over the course of the semester and when you plan to finish them.

Choosing a topic

Your project can be any of the four types mentioned on the syllabus: an expository paper, a software project, an experiment on the IBM Quantum Experience, or an original research project. For any of these types, you may find it useful to consult a list of topics that is available on the course website at <http://www.cs.umd.edu/class/spring2019/cmssc457/topics.html>.

Some possible topics for a software project include

- quantum gate synthesis (using the Solovay-Kitaev algorithm or Clifford+ T synthesis techniques),
- methods for efficiently implementing any given quantum circuit on a device with restricted interactions between qubits,
- an efficient simulation of a restricted class of quantum circuits (such as stabilizer circuits or circuits with a limited number of non-Clifford gates), or
- an implementation of a well-known quantum algorithm using a quantum programming language such as Quipper or Q#.

For a Quantum Experience project, you might

- implement a simple quantum algorithm,
- implement an error correction procedure and compare the behavior of encoded and unencoded qubits, or
- try to assess the error model of the device using a technique such as randomized benchmarking or gate set tomography.

You are strongly encouraged to discuss your thoughts about possible project topics with the instructor before submitting your proposal. You will also receive feedback on your proposal, possibly including suggestions for adjustments to your topic or to your project plan.

You should think of your proposal as just a starting point for your project—it is fine if your focus evolves over the course of the semester. However, you should discuss any significant changes with the instructor.