

CS 101-3: Homework 3

Deadline: May 11, 23:59 PST

For this homework you will have to read one of three papers, listed below, and write a short (2-3 page) summary on that paper. The goal of this homework is to give you additional perspective on the subjects that we've covered so far (interference computation, quantum computation, algorithms, complexity), give you an idea about what the current state of the art is for those subjects, as well as give you ideas for the upcoming group project.

The papers you have to choose from are:

- *One Complexity Theorists View of Quantum Computing* - Lance Fortnow. This paper has served as a basis for much of the content of the course up to this point. It very nicely explains how quantum computation is a form of interference computation, making this connection explicit through complexity theory. <https://people.cs.uchicago.edu/~fortnow/papers/quantview.pdf>.
- *Quantum algorithms: an overview* - Ashley Montanaro. As the title suggests, this is a survey paper on quantum algorithms. We've discussed some of them in the lectures already and we'll be covering a bunch of the other ones in future lectures. <https://arxiv.org/abs/1511.04206>.
- *Quantum Computational Supremacy* - Aram W. Harrow, Ashley Montanaro. Another survey paper, this time on the topic of quantum computational supremacy, which we cover in Lecture 10. This goes over recent approaches towards coming up with tasks that can be performed efficiently on a quantum computer and for which we have "complexity-theoretic evidence" that no classical computer can perform them efficiently. <https://arxiv.org/abs/1809.07442>.

Pick one of these papers and write in your own words what the paper is about. Focus on answering these specific questions:

1. Why did you choose that specific paper?
2. What are some of the main takeaways from the paper?
3. Which aspects did you find most interesting and why?
4. What are some of the open problems pertaining to what's discussed in the paper?
5. After reading the paper, is there a specific topic or question that you'd be interested in exploring further? Why? What did you find interesting about it?

Your summary should be no more than 3 pages and no less than 1 page, use 11pt font and have reasonable margins. L^AT_EX is preferred, but not required.