Computação Quântica
Problem 4 - 27 May 2020 - 27 June 2020

Problem 4

The course on Quantum Computation you have been following is essentially about quantum algorithms. We have seen a number of techniques used in the two basic, most common algorithmic classes: based on *amplitude amplification* and the *quantum Fourier transform*, respectively.

Quantum algorithms are essentially different from the classic ones; on the other hand the corresponding theory is still in its infancy. Moreover, as you may have got a glimpse in the lab sessions, doing quantum computations with current NISQ technology puts specific (technological) problems that have to be taken into account in practice.

This last problem asks you to write a small essay (in Portuguese) on a topic of your choice on quantum algorithmics, up to 8 pages. You may

- choose a particular algorithm (or class of algorithms) and explain it carefully in your own words;

- discuss algorithmic techniques and illustrate their use:

- relate quantum algorithms with classical and probabilisitic ones;

- discuss performance and complexity of a particluar class of algorithms;

- comment on NISQ technology and challenges to the implementation of quantum algorithms;

- research on existent quantum programming languages and illustrate their use;

- application of quantum algorithms to solve different problems;

- etc.

Your essay will be assessed for i) correctness of concepts and results, ii) clear exposition for a non expert audience, iii) good structure and overall organization.

In the course webpage we may find some papers that can be useful for choosing and going deeper into one of these themes; but you should expand your search over the web. In your report please refer in a clear and complete way all references consulted.