Quantum Information and computing

Delfina Iriarte - Karan Kabbur Hanumanthappa Manjunatha - Andrea Nicolai

Exam assignment

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Exercise 1:

Study quantum Monte Carlo techniques
(see for example the lecture notes at https://cm.sissa.it/phdsection/descriptioncourse.php?ID=15)

Exercise 2:

Write a code to find the ground state energy of the Heisenberg Hamiltonian by using quantum Monte Carlo

$$H = \sum_{i,\gamma\in\{x,y,z\}} \sigma_i^\gamma \sigma_{i+1}^\gamma + h\sigma_i^z \tag{1}$$

Exercise 3:

Compute the exact ground state for the Hamiltonian by using a Lanczos algorithm

Exercise 4:

Test your codes, compare and discuss the results you obtain