Optimization of quantum algorithms for near-term quantum computers
Bonet Monroig, X.

Curriculum Vitæ

I was born on the 29th of March 1991 in Xàtiva, València. I attended primary school in Manuel (València), and received my high school education at the institut d'educació pública Sivera Font in Canals (València). In parallel to my high school education I received music education at Conservatori Professional de Música Mestre Vert in Carcaixent (València), completing the professional degree of music with honors in the specialization of trombone.

In 2009, I started the degree of physics at Universitat de València. I attended the Universiteit Groningen during the final year of my bachelor studies through the Erasmus exchange programme. There, I completed my bachelor's research thesis under the supervision of Prof. Dr. ir. Caspar van der Wal. I received my bachelor of science degree in 2014.

Before starting my master's degree I spent two years in Ireland where I worked as information and technology support specialist.

In 2016 I started the master's program of physics at Universiteit Leiden. I completed my Master's thesis "*Comparison of error mitigation strategies in a hydrogen molecule quantum simulation*" under the supervision of Dr. T. E. O'Brien. I obtained my Master's degree cum laude in 2018.

In April 2018, I started my Ph.D. studies under the supervision of Dr. T. E. O'Brien and Prof. dr. C. W. J. Beenakker at the Instituut-Lorentz of Universiteit Leiden. Part of my research was done in the laboratory of Prof. dr. L. DiCarlo at TU Delft. My research focused on the practical implementation of quantum algorithms on real quantum processing units. This thesis covers most of the issues that existing quantum computers have: quantum noise, quantum state tomography, optimization of parametrized quantum circuits, and experimental applications in small quantum devices. During my Ph.D. studies I was teaching assistant to the Master's degree courses of Quantum Information, Quantum Mechanics and Applied Quantum Algorithms at Universiteit Leiden. I was also teaching assistant to the Master's degree course Fundamentals of Quantum Information at TU Delft. Additionally, I supervised bachelor and master students together with Dr. B. Senjean, Dr. H. Wang and Dr. J. Tura. I attended several international schools and conferences, presenting my work in the USA, France, Spain and The Netherlands. I

was invited to give a talk at the workshop "*New Trends in Computational Chemistry*" held in Barcelona in September 2022.

List of publications

- X. Bonet-Monroig, H. Wang, D. Vermetten, B. Senjean, C. Moussa, T. Bäck, V. Dunjko and T. E. O'Brien, *Performance comparison of optimization methods on variational quantum algorithms*, ArXiv:2111.13454 (2021) submitted to Physical Review A. [Chapter 5]

- X. Bonet-Monroig, R. Babbush and T. E. O'Brien, *Nearly optimal measurement scheduling for partial tomography of quantum states*, Physical Review X **10**, 031064 (2020). [Chapter 4]

- T. E. O'Brien, B. Senjean, R. Sagastizabal, X. Bonet-Monroig, A. Dutkiewicz, F. Buda, L. DiCarlo and L. Visscher, *Calculating energy derivatives for quantum chemistry on a quantum computer*, npj Quantum Information **5**, 113 (2019). [Chapter 7]

- R. Sagastizabal, X. Bonet-Monroig, M. Singh, M. A. Rol, C. C. Bultink, X. Fu, C. H. Price, V. P Ostroukh, N. Muthusubramanian, A. Bruno, M. Beekman, N. Haider, T. E. O'Brien and L. DiCarlo, *Experimental error mitigation via symmetry verification in a variational quantum eigensolver*, Physical Review A **100**, 010302(R) (2019). [Chapter 3]

- X. Bonet-Monroig, R. Sagastizabal, M. Singh and T. E. O'Brien, *Low-cost error mitigation by symmetry verification*, Physical Review A **98**, 062339 (2018). [Chapter 2]

- J. R. McClean, N. C. Rubin, K. J. Sung, I. D. Kivlichan, X. Bonet-Monroig, Y. Cao, C. Dai, E.Schuyler-Fried, C. Gidney, B. Gimby, P. Gokhale, T. Häner, T. Hardikar, V. Havlíček, O. Higgott, C. Huang, J. Izaac, Z. Jiang, X. Liu, S. McArdle, M. Neeley, T. E. O'Brien, B. O'Gorman, I. Ozfidan, M. D. Radin, J. Romero, N. P. D. Sawaya, B. Senjean, K. Setia, S. Sim, D. S. Steiger, M. Steudtner, Q. Sun, W. Sun, D. Wang, F. Zhang and R. Babbush, *OpenFermion: the electronic structure package for quantum computers*, Quantum Science and Technology **5**, 034014 (2020)