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Strategies for braiding and ground state preparation in digital quantum hardware

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Curriculum Vitæ

I was born in Kyiv, Ukraine, in 1995. There, I attended primary and secondary school and received my high school education from the Natural Sciences Lyceum no. 145.

From 2012 to 2016, I studied physics at Kyiv National Taras Shevchenko University (Quantum Field Theory track). During this Bachelor's program, I completed an internship in the group of Carlo Beenakker in Leiden. Upon receiving my diploma in 2016, I took on a Master's program in Leiden. Then I interned at the Weizmann Institute in the group of Yuval Gefen and participated in several summer schools. I obtained my Master's degree *summa cum laude* in 2018.

In February 2018, I started my Ph.D. studies in Carlo Beenakker's group at Leiden University. My work first concentrated on the theory of non-conventional braiding platforms, then shifted towards the problem of preparing many-body states using quantum digital hardware. In the summer of 2021, I completed a 3-month internship at Google Quantum AI supervised by Thomas O'Brien and Vadim Smelyanskiy. During my Ph.D. studies, I also gave teaching assistance in a Condensed Matter Theory Master's course and two extra-curricular Advanced Theoretical Physics courses. In addition to that, I supervised one Bachelor and one Master student. I traveled to Kyiv, giving research-level introductory courses for university students, as well as popular science lectures for a broader audience. I attended several schools and conferences, presenting my work in Italy, Spain, Austria, Germany, USA, Israel, Ukraine and the Netherlands.

List of publications

- Y. Gerasimenko, B. Tarasinski, and C.W.J. Beenakker. *Attractor-repeller pair of topological zero-modes in a nonlinear quantum walk*. Physical Review A **93**, 022329 (2016).
- Y. Herasymenko, K. Snizhko, and Y. Gefen. *Universal quantum noise in adiabatic pumping*. Physical Review Letters **120**, 226802 (2018).
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- C.W.J. Beenakker, P. Baireuther, Y. Herasymenko, I. Adagideli, L. Wang, and A.R. Akhmerov. *Deterministic creation and braiding of chiral edge vortices*. Physical Review Letters **122**, 146803 (2019).
[Chapter 2]
- A. Carmi, Y. Herasymenko, E. Cohen, and K. Snizhko. *Bounds on nonlocal correlations in the presence of signaling and their application to topological zero modes*. New Journal of Physics **21**, 073032 (2019).
[Chapter 4]
- C.W.J. Beenakker, A. Grabsch, and Y. Herasymenko. *Electrical detection of the Majorana fusion rule for chiral edge vortices in a topological superconductor*. SciPost Physics **6**, 022 (2019).
[Chapter 3]
- Y. Herasymenko and T.E. O'Brien. *A diagrammatic approach to variational quantum ansatz construction*. Quantum **5**, 596 (2021).
[Chapter 5]
- S. Polla, Y. Herasymenko, and T.E. O'Brien. *Quantum digital cooling*. Physical Review A **104**, 012414 (2021).
[Chapter 6]
- Y. Herasymenko, I. Gornyi, and Y. Gefen. *Measurement-driven navigation in many-body Hilbert space: Active-decision steering*. arXiv:2111.09306.
[Chapter 7]