Juan Daniel Torres Luna

PhD Candidate, Wimmer Group, QuTech and Delft University of Technology

jd.torres1595@gmail.com | jdtorres.org | juandaanieel

Research Profile

I am a final-year PhD candidate in condensed matter theory at QuTech and Delft University of Technology. I study hybrid superconducting-semiconducting quantum devices, with a focus on simulation-guided device design, Majorana and Andreev physics, and scientific software for quantum-device modeling. In my research, I combine theoretical modeling, numerical optimization, and close collaboration with experimental groups to design, simulate, and interpret semiconductor nanodevices.

Research Appointments

PhD Candidate, Wimmer Group / QuTech / TU Delft Sep 2022 – present

Dissertation: Design and optimization of hybrid Majorana devices. Expected completion: 2026.

Research Intern, Orange Quantum Systems Jun 2021 – Aug 2021

Project: superconducting qubit characterization using pyGSTi.

Education

2022 – present PhD in Physics, **Delft University of Technology**
2020 – 2022 MSc in Applied Physics, **Delft University of Technology** (cum laude)
2016 – 2020 BSc in Physics, **Yachay Tech University** (cum laude)

Research Software And Open Science

- `tempura`. Documentation. Open-source framework for converting GDS/CAD layouts into three-dimensional electrostatic simulations of semiconductor devices.
- `second-quantization`. Documentation. Python package for simulating many-body fermionic systems.
- `qrate`. Documentation. Python package for rate-equation transport calculations.

Methods And Expertise

Research areas Hybrid superconducting-semiconducting devices, Majorana and Andreev physics, semiconducting quantum dots, three-terminal Josephson junctions
Methods Effective modeling, numerical optimization, transport simulations, electrostatics simulations, automated tuning workflows
Software Python, NumPy, SciPy, SymPy, Matplotlib, Pandas, scientific software development, GitLab CI/CD, Unix tooling
Languages Spanish (native), English (professional), Dutch (conversational)

Peer-Reviewed Publications

- A. Bordin, F. J. Bennebroek Evertsz', B. Roovers, **J. D. Torres Luna**, W. D. Huisman, F. Zatelli, G. P. Mazur, S. L. D. ten Haaf, G. Badawy, E. P. A. M. Bakkers, C.-X. Liu, R. Seoane Souto, N. van Loo, and L. P. Kouwenhoven. Probing Majorana localization of a phase-controlled three-site Kitaev chain with an additional quantum dot. *Nature Communications* 17, 2313 (2026).
- **J. D. Torres Luna**, K. Vilkelis, and A. L. R. Manesco. Probing valley phenomena with gate-defined valley splitters. *SciPost Physics* 18, 062 (2025).
- **J. D. Torres Luna**, A. Mert Bozkurt, M. Wimmer, and C.-X. Liu. Flux-tunable Kitaev chain in a quantum dot array. *SciPost Physics Core* 7, 065 (2024).
- K. Vilkelis, A. Manesco, **J. D. Torres Luna**, S. Miles, M. Wimmer, and A. Akhmerov. Fermionic quantum computation with Cooper pair splitters. *SciPost Physics* 16, 135 (2024).
- **J. D. Torres Luna**, S. R. Kuppuswamy, and A. R. Akhmerov. Design of a Majorana trijunction. *SciPost Physics* 16, 044 (2024).
- **J. D. Torres**, R. Hidalgo, S. Varela, and E. Medina. Mechanically modulated spin orbit couplings in oligopeptides. *Physical Review B* 102, 035426 (2020).
- D. Hernangómez-Pérez, **J. D. Torres**, and A. López. Photoinduced electronic and spin properties of two-dimensional electron gases with Rashba spin-orbit coupling under perpendicular magnetic fields. *Physical Review B* 102, 165414 (2020).

Preprints

- W. Samuelson, **J. D. Torres Luna**, S. Miles, A. Mert Bozkurt, M. Leijnse, M. Wimmer, and V. Svensson. Quantifying robustness and locality of Majorana bound states in interacting systems. arXiv:2510.20538 (2025).
- **J. D. Torres Luna**, S. Miles, A. Mert Bozkurt, C.-X. Liu, A. L. R. Manesco, A. R. Akhmerov, and M. Wimmer. Pareto-optimality of Majoranas in hybrid platforms. arXiv:2510.07406 (2025).
- D. O. Oriekhov, S. Bergkamp, G. Jin, **J. D. Torres Luna**, B. Zouggari, S. van der Meer, N. El Yazidi, and E. Greplova. Why is topology hard to learn?. arXiv:2509.26261 (2025).