

# Vinicius Hernandes

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## EDUCATION

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### Delft University of Technology

Ph.D. in Physics

Advisor: Eliska Greplova

Delft, the Netherlands

Expected 2025

### Federal University of Pelotas

M.Sc. in Physics

Thesis: *Machine learning applied to phase classification in soft matter systems*

Advisor: Jose Rafael Bordin

B.Sc. in Physics

Pelotas, Brazil

08/2021

12/2019

## SELECTED PROJECTS

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### Finding Quantum Phase Transition in the Weights of Neural Quantum States 01/2025 – Present

- Implemented a fine-tuning strategy that makes weights of neural quantum states correlated, which makes it possible to find phase transitions in the simulated systems
- Accepted as spotlight at the ICLR 2025 Workshop on Neural Networks Weights as a New Data Modality ([arXiv](#) | [gitlab](#))

### Representations of Neural Network Quantum States for Transfer Learning 03/2024 – Present

- Analyze how different encodings affect the accuracy of deep learning models for the simulation of quantum systems, how they generalize across different systems, and how they can be applied to different tasks like phase classification
- Build a theoretical basis to guide model design for deep learning simulation of quantum system

### Generative Models Reduce Number of Measurements in Quantum Experiments 05/2024 – Present

- Use generative models to infer measurement outcomes based on a reduced number of measurements
- Paper in preparation

### AutoMEA: Automated analysis of Multi-Electrode Array Datasets 01/2022 – 03/2024

- Designed a Python package for analysis of Multi-Electrode Array data
- Implemented a supervised learning approach to automate burst detection, one of the crucial steps in MEA analysis
- Reduced experimental analysis time from ~1 week per dataset to ~1 day
- Resulted in the paper [V Hernandes et al 2024](#). Package [gitlab link](#) / [documentation](#)

### QDsim: A user-friendly toolbox for simulating large-scale quantum dot devices 02/2022 – 03/2024

- Developed a Python package that simulates data from quantum dot devices, generating data similar to experiments, and that can be used to train machine-learning models
- Resulted in the paper [V Gualtieri et al 2024](#). Package [gitlab link](#)

### Exploring Biological Neuronal Correlations with Quantum Generative Models 01/2022 – 08/2024

- Implemented a Quantum Generative Adversarial Network to generate synthetic neuronal data
- Resulted in the paper [V Hernandes and E Greplova 2024](#).

## SKILLS

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Python, Machine Learning, PyTorch, Scientific Computing, Data Visualization and Analysis

## LANGUAGES

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Portuguese (Native), English (Advanced), Italian (Fluent), Spanish (Intermediate)

## SUPERVISION

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Guided 5 MSc thesis projects and 1 BSc internship to successful completion.

## TEACHING

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### AI for physicists

04/2024 – 06/2024

Teaching Assistant for the course offered to ~100 MSc in Applied Physics students. Designed exercises, corrected class material, assisted students weekly and supervised final project, and graded homework and exams.

### Machine Learning for Semiconductor Quantum Devices

03/2023 – 12/2023

Helped design, build, teach, and moderate the course offered by TU Delft through the edX platform, with ~500 students enrolled

### Computational Science

02/2023 – 04/2023

Teaching Assistant for the course offered to ~100 2<sup>nd</sup>-year BSc in Applied Physics students. Designed exercises, corrected class material, assisted students weekly, and graded homework and exams.

### Machine Learning for Quantum Experiments

06/2022 – 10/2022

Helped design, build, teach, and moderate the short course offered to ~40 PhD students from the Faculty of Applied Sciences.

## SELECTED PUBLICATIONS

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1. **V. Hernandez**, T. Spriggs, S. Khaleefah, E. Greplova. *Adiabatic Fine-Tuning of Neural Quantum States Enables Detection of Phase Transitions in Weight Space*. ICLR 2025 Workshop on Neural Network Weights as a New Data Modality (*Spotlight*). arXiv:2503.17140
2. **V. Hernandez**, E. Greplova. *Exploring Biological Neuronal Correlations with Quantum Generative Models*. arXiv preprint arXiv:2409.09125 (2024)
3. V. Gualtieri, C. Renshaw-Whitman, **V. Hernandez**, E. Greplova. *QDsim: A user-friendly toolbox for simulating large-scale quantum dot devices*. arXiv preprint arXiv:2404.02712 (2024)
4. **V. Hernandez**, A. M. Heuvelmans, V. Gualtieri, D. H. Meijer, G. M. van Woerden, E. Greplova. *autoMEA: Machine learning-based burst detection for multi-electrode array datasets*. bioRxiv, 2024-05 (2024)
5. **V. F. Hernandez**, M.S. Marques, J.R. Bordin. *Phase classification using neural networks: application to supercooled, polymorphic core-softened mixtures*. J. Phys.: Condens. Matter 34 024002 (2022)
6. D. S. Cardoso, **V. F. Hernandez**, T. P. O. Nogueira, J. R. Bordin. *Structural behavior of a two length scale core-softened fluid in two dimensions*. Physica A: Stat. Mech. 566 125628 (2021)