Sebastian Holtedahl Castedo

Paris, France | **US / UK / Norwegian Citizen**
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Education

Ecole Normale Supérieure, FR Oct 2023 – Dec 2026

PhD in Statistical Physics under the supervision of Rémi Monasson.

- Investigating the trade-offs between performance and energy consumption in natural and artificial neural networks to uncover principles of computational efficiency. Developing statistical models to analyse high-dimensional neural data, using theoretical tools.
- Published: *Speed Vascular Patterns in the Spatial Navigation System* Cell Reports
- Submitted: *Neural mechanisms for resilient sensory computation under metabolic stress* bioRxiv
- Invited talks: PINTS Paris 2025, PBPCD Paris 2025, UK Neural Computation 2025
- Posters presented at conferences: Eresfjord School (Math Methods for Comp Neuro), Cargèse (Maturation & Plasticity in NN) and Int'l Conf. on Mathematics of NeuroAI.

The University of Manchester, UK Sept 2019 – June 2023

MPhys Theoretical Physics with Study in Europe.

- First Class Honours (82%). Third year exchange programme at *Sorbonne Université* in Paris

Skills

Language: Fluent in English, Spanish, Norwegian and French.

Technical: Python (PyTorch), C++, R, Fortran; statistical modelling, machine learning, Monte Carlo methods.

Work Experience

The University of Manchester, UK Sept 2022 – June 2023

Master Thesis in Statistical Physics under the supervision of Tobias Galla

- Analysed the impact of structured correlations on the dynamics of disordered systems using mean-field theory, with applications to theoretical ecology. Results published in *Phys. Rev. E* arXiv:2409.12751.

Institute for Cross-Disciplinary Physics and Complex Systems, Palma ES Jul 2022 - Aug 2022

Summer Undergraduate Research Fellowship (SURF)

- Applied Variational Autoencoders to microbiota data for childhood obesity prediction.

Laboratoire de Physique Théorique et Hautes Energies, Paris FR Apr 2022 - Jun 2022

Master's Internship under the supervision of Leticia Cugliandolo

- Theoretical analysis of a stochastic system using the Langevin and Fokker-Planck formalisms. Results published in *Phys. Rev. B* arXiv:2205.10418.

Fermi National Accelerator Laboratory, Chicago US Jul 2021

Quantum Computing Internship for Physics Undergraduates

- Implemented quantum algorithms (QFT, Grover's, QPE) using Python & Qiskit and covered theoretical foundations of quantum information theory.

Additional Experience & Interests

- **Accenture Horizons Internship (Sept 2018 – May 2019):** Developed optimisation tools for a government technology delivery project.
- **Social Impact:** Helped found an educational charity mentoring under-represented students; co-founded a student-housing cooperative; co-authored an open-source deforestation-mitigation report for COP26.