Julian Brandon

julian.brandon@ens.psl.eu

PhD Student
Group for Neural Theory | Department of Cognitive Sciences
DATA Team | Centre Science des Données
Ecole Normale Supérieure | PSL University

EDUCATION

Master of Science in Artificial Intelligence, *University of Edinburgh* *2024 – 2025*

- *Grade:* First class/distinction
- *Classes (mark/100):* Machine Learning and Pattern Recognition (82), Computational Neuroscience (72), Computational Cognitive Neuroscience (74), Reinforcement Learning (79), Computer Vision (81), Simulation Analysis and Validation of Computational Models (86)

Bachelor of Science in Theoretical Physics, *University of Birmingham* *2021 – 2024*

- *Grade:* First class (ranked 2/130)
- *Classes (mark/100):* Mathematics for Physicists (88), Complex Variable Theory (88), Applied Mathematical Analysis (87), Quantum Mechanics (93), Statistical Physics (79), Continuum Mechanics (88)

RESEARCH EXPERIENCE

École Normale Supérieure — *Supervision by N Alex Cayco-Gajic, Arthur Pellegrino and Bruno Loureiro*

PhD Student Oct 2026 —

- Applying kernel methods to study the Riemannian geometry of neural activations.
- Deriving error bounds on learned metric tensor.
- Applications machine learning and neuroscience datasets.

Research Assistant *Nov 2025* — Oct 2026

- Developed an operator theoretic framework to study the learning dynamics of generative dynamical systems.
- Analytically derived summary statistics to characterise the gradient flow over learning.
- High-dimensional data analysis and dimensionality reduction for analysis of neural trajectories over optimisation.
- Accepted at NeurIPS (Brandon et al. 2026)
- Led to accepted poster at peer-reviewed High-dimensional Learning Dynamics (HiLD) workshop of ICML 2026

University of Edinburgh — *Supervision by Angus Chadwick and Arthur Pellegrino* *May — July 2025*

Master's Thesis: *A Riemannian Geometry Analysis of Discrete Computations in Neural Networks*

- Developed analytic and numerical tools to study collapse and manifold geometry in neural networks.
- Implemented large-scale experiments, combining geometric analysis with Bayesian perspectives on noise.
- Accepted to NeurReps 2025 workshop for spotlight talk (Brandon, Chadwick, Pellegrino 2025)

PUBLICATIONS

- **Brandon, J.**, Loureiro, B., Cayco-Gajic, N.*, Pellegrino, A.* (2026). The balance between feature learning and collapse in dynamical systems-based generative models. [preprint] *Accepted at NeurIPS 2026*
- **Brandon, J.**, Chadwick, A.*, & Pellegrino, A.* (2025). Emergent Riemannian geometry over learning discrete computations on continuous manifolds [DOI]. *Proceedings of Machine Learning Research, Symmetry and Geometry in Neural Representations 2025*

POSTERS

NeurIPS *Paris, 2026*

- The balance between feature learning and collapse in dynamical systems-based generative models, Brandon, J., Loureiro, B., Cayco-Gajic, N. A., Pellegrino, A.

HiLD (ICML workshop on high-dimensional learning dynamics) *Seoul, 2026*

- Mode Collapse Emerges from Low-Rank Biases in the Learning Dynamics of Generative Models, Brandon, J., Loureiro, B., Cayco-Gajic, N. A., Pellegrino, A.

NeurReps (NeurIPS workshop on geometry and symmetry in neural representations) *San Diego, 2025*

- Emergent Riemannian geometry over learning discrete computations on continuous manifolds. Brandon, J., Pellegrino, A., Chadwick, A.

NeurIPS@Paris *Paris, 2025*

- The Riemannian geometry of discrete computations on continuous manifolds, Brandon J., Chadwick A., Pellegrino A.

AWARDS AND ACHIEVEMENTS

- **Moreton Prize** – graduating with the second-highest mark in Theoretical Physics, University of Birmingham (2024).