GUILLAUME POURCEL

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EDUCATION

M.Sc. Bioengineering and Innovation in Neurosciences, Paris University 2019 - 2020

M.Sc. Cognitive Science (Cogmaster), major modeling, ENS ULM 2018 - 2019

French graduate engineering school, Arts et Métiers 2016 - 2020

Classe préparatoire aux Grandes Écoles, Lycée Jean-Baptiste Say 2013 - 2016

RESEARCH EXPERIENCE

PhD student, Herbert Jaeger's team Nov 2020 - Nov 2023 ; May 2025 - ongoing
AI Department of the Bernoulli Institute *University of Groningen*

- Hardware-efficient alternatives of Backpropagation through time. Collaboration with Maxence Ernoult (DeepMind Paris). Published at NeurIPS 2025 (Oral) (Pourcel & Ernoult, 2025).
- Adaptive control of Recurrent Neural Network with conceptors to improve robustness against perturbations. Published in Chaos (Pourcel et al., 2024), awarded the Edward N. Lorenz Early Career Award. In collaboration with IFISC (2-month visit).

PhD Research Internship at Inria Lille (SCOOL lab, 7-months) Jan 24-March 24 ; Jan 25-April 25
Generalization of Equilibrium Propagation for time series. Now turned into a journal paper to be submitted (Pourcel et al., 2025). Poster at Mathematics Of Neuroscience and AI 24. *Supervised by Aditya Gilra and Debabrota Basu*

PhD Research internship at Inria Bordeaux (Flowers lab, 7-months) April 24 - Nov 24
LLM-guided evolution of reward functions in open-ended environment. Accepted at NeurIPS 2024 workshop (Pourcel et al., 2024), now submitted to ICML 2026.
Supervised by Pierre-Yves Oudeyer

Hackhathon hack1robot: Project leader, Won first prize Nov 2024
Optimizing (prompt evolution) for persuasion in multi-agent LLM-debates improves general reasoning capacities. Work turned into a paper accepted at NeurIPS workshop (Reedi et al., 2025).

PhD-level Summer schools

- International Interdisciplinary Computational Cognitive Science Summer School (IICCSSS), Tübingen, Germany 2023
- Summer school on Neurosymbolic Programming, Caltech, USA 2022
- Machine Learning Summer School (MLSS^N), Jagiellonian University Kraków, Poland 2022

Master thesis, Axel Cleeremans' team Feb 2020 - Jun 2020
Center for Research in Cognition & Neurosciences *Université libre de Bruxelles*

- Modeling Metacognition in Visual Confidence Tasks Using Deep Neural Networks and Uncertainty Estimation.

Master thesis, Mehdi Khamassi's team — Feb 2019 - Jun 2019
Institut des Systèmes Intelligents et de Robotique — *Sorbonne University*

- Modeling of rodents hippocampal replays with hybrid (model-free, model-based) Reinforcement Learning architecture.

TEACHING AND SUPERVISION

- TAing in the courses of Herbert Jaeger *Neural Networks* (B.Sc.) and *Machine Learning* (M.Sc.), University of Groningen.
- BSc/MSc thesis. Conceptor for: continuous time (Daniel Woonings), clustering (Joris Peters), fuzzy logic (Satchit Chatterji). Spiking Neural Networks (Ryan O'Loughlin). Test-time Compute (Elisa Klunder, ongoing), Multi-agent LLM-debate (Aksel Reedi, ongoing), Design of open-ended RL environment (Brian Bruggen, ongoing).
- TAing in the PhD-level Spring School - Control Theory and Reinforcement Learning: Connections and Challenges. Tutorial on Function approximation for RL.
- Co-organiser of a 48h workshop to recruit students (design and production of a 3D printed foot prosthesis inspired from work at the Bio-mechanics Institute Georges Charpak), management and assistance of 4 groups of 5 students, Arts et Métiers

PUBLICATIONS

- **G. Pourcel** and M. Ernoult, *Learning long range dependencies through time reversal symmetry breaking*, The Thirty-ninth Annual Conference on Neural Information Processing Systems, Oct. 2025, OpenReview. Oral presentation (top 0.3%).
- A. S. Dauphin and **G. Pourcel**, *Recurrent Hamiltonian Echo Learning Enables Biologically Plausible Training of Recurrent Neural Networks*, Women in Machine Learning Workshop @ NeurIPS 2025, Sept. 2025, OpenReview.
- **G. Pourcel**, D. Basu, M. Ernoult, and A. Gilra, *Lagrangian-based Equilibrium Propagation: Generalisation to arbitrary boundary conditions & equivalence with Hamiltonian Echo Learning*, arXiv preprint, June 2025, arXiv. (to be submitted as journal paper)
- S. Abreu et al. (including **G. Pourcel**), *From Steering Vectors to Conceptors: Compositional Affine Activation Steering for LLMs*, 2025, OpenReview.
- **G. Pourcel**, T. Carta, G. Kovač, and P.-Y. Oudeyer, *Autotelic LLM-based exploration for goal-conditioned RL*, Intrinsically Motivated Open-ended Learning Workshop at NeurIPS 2024, HAL. (now submitted to ICML 2026)
- S. Abreu et al. (including **G. Pourcel**), *A photonics perspective on computing with physical substrates*" Reviews in Physics, Dec. 2024, DOI.
- **G. Pourcel**, M. Goldmann, I. Fischer, and M. C. Soriano, *Adaptive control of recurrent neural networks using conceptors*, Chaos: An Interdisciplinary Journal of Nonlinear Science, Oct. 2024, DOI.
- **G. Pourcel**, M. Goldmann, S. Abreu, and M. C. Soriano, *Two-shot learning of continuous interpolation usinga conceptor-aided recurrent autoencoder*, (submitted to ICLR24), OpenReview.
- A. J. Reedi, C. Léger, J. Pourcel, L. Gaven, P. Charriau, and **G. Pourcel**, *Optimizing for Persuasion Improves LLM Generalization: Evidence from Quality-Diversity Evolution of Debate*

Strategies, First Workshop on Multi-Turn Interactions in Large Language Models @ NeurIPS 2025, Nov. 2025, OpenReview.

- R. Dromnelle, E. Renaudo, **G. Pourcel**, R. Chatila, B. Girard, and M. Khamassi, "How to Reduce Computation Time While Sparing Performance During Robot Navigation? A Neuro-Inspired Architecture for Autonomous Shifting Between Model-Based and Model-Free Learning," in Biomimetic and Biohybrid Systems, 2020, DOI.

INVITED TALKS & AWARDS

- Edward N. Lorenz Early Career Award (2024, to be announced): For the paper "Adaptive control of recurrent neural networks using conceptors" published in Chaos
- First prize at hack1robot hackathon (2024): Optimizing prompts for persuasion in multi-agent LLM debates. Work turned into a paper accepted at NeurIPS workshop (Reedi et al., 2025).
- Artificial Intelligence and Logic talks (AILO) 2023: Learning and the problem of induction in AI. Artificial Intelligence and Logic talks
- Santa Fe Workshop: Sensory Prediction: Engineered and Evolved (2023). Controlling the geometry of neural dynamics for robust predictions
- Redwood Center for Theoretical Neuroscience Seminar (2023): Conceptor, a neuro-symbolic perspective on neural dynamics.
- International conference on neuromorphic, natural and physical computing (2023): Recurrent Neural Networks: from prediction to representation, a dynamical systems perspective