

Work Experience

- Sept.2023- Associate Professor (MCF), *Laboratory of Computational and Quantitative Biology (LCQB)*, Computer Science department, Sorbonne Université, Paris, France.
- Oct.22- Postdoctoral researcher, *Around theoretical results on sampling and learning probabilistic models with algebraic and combinatorial structure*, INRIA team Ouragan and, IMJ-PRG team 'Combinatoire et Optimisation' with *Elias Tsigaridas*, Sorbonne Université, Paris, France.
- Aug.23
- Jan.-Sep. 2022 Data Scientist, *for Cancer detection and classification in medical imaging*, Median Technologies, with *Pierre Baudot and Yaël Frégier*, Sophia Antipolis.
- Jan.-Sep. 2022 Postdoctoral researcher, *Theory and applications of self-supervised learning*, Laboratoire de Mathématiques de Lens, with *Pierre Baudot and Yaël Frégier*, Université d'Artois, France.
- 2021 Postdoctoral researcher, *Modeling conscious artificial intelligent agents in multi-agent environments using active inference, reinforcement learning and game theory*, Laboratory MMEF, with *David Rudrauf*, Université de Genève, Switzerland.

Education

- 2016–2021 PhD in Pure Mathematics, Université Paris-Cité, IMJ-PRG, defended in May 2021, *Title: Intersection property, interaction decomposition, regionalized optimization and applications, Link to PhD thesis.*
- Advisor : Prof. Daniel Bennequin, Departement of Mathematics Université Paris Diderot
- Jury : Daniel Bennequin, Matilde Marcolli (reviewer), François Gay-Balmaz (reviewer), Grégory Ginot, Frédéric Helein, Paul-André Mellies, Sylvie Paycha, Jean-Pierre Nadal
- 2014–2015 Master 2 in Pure Mathematics, *Université Paris Diderot*, Paris 7.
- 2013– 2014 Master in Pure Mathematics : Mathematical Tripos Part III, *University of Cambridge*.
- 2012–2013 Master 2 in Theoretical Physics, *Ecole Normale Supérieure de Paris*.
- 2010 Normalien "sur concours", *Ecole Normale Supérieur de Paris*, Physics .

Communications

Journals

- 2025 Yuri Timsit, Grégoire Sergeant-Perthuis, and Daniel Bennequin. The role of ribosomal protein networks in ribosome dynamics. *Nucleic Acids Research*, January 2025.
- 2025 Grégoire Sergeant-Perthuis, Nils Ruet, Dimitri Ognibene, Yvain Tisserand, Kenneth Williford, and David Rudrauf. Action of the Euclidean versus projective group on an agent's internal space in curiosity driven exploration. *Biological Cybernetics*, volume 119, page 4, January 2025.
- 2023 D. Rudrauf, *G. Sergeant-Perthuis*, Y. Tisserand, G. Poloudenny, K. Williford, and M-A. Amorim. The projective consciousness model: Projective geometry at the core of consciousness and the integration of perception, imagination, motivation, emotion, social cognition and action. *Brain Sciences*, volume 13, 2023. [link to paper](#).

- 2023 D. Rudrauf, G. Sergeant-Perthuis, Y. Tisserand, T. Monnor, V. De Gevigney, and O. Belli. Combining the projective consciousness model and virtual humans for immersive psychological research: A proof-of-concept simulating a tom assessment. *ACM Trans. Interact. Intell. Syst.*, volume 13. Association for Computing Machinery, 2023. [link to paper](#).
- 2022 D. Rudrauf, G. Sergeant-Perthuis, O. Belli, Y. Tisserand, and G. Di Marzo Serugendo. Modeling the subjective perspective of consciousness and its role in the control of behaviours. *Journal of Theoretical Biology*, 2022. [link to paper](#).
- 2021 Y. Timsit, G. Sergeant-Perthuis, and D. Bennequin. Evolution of ribosomal protein network architectures. *Scientific Reports*, 2021. [link to paper](#).
- 2021 Y. Timsit and G. Sergeant-Perthuis. Toward the idea of molecular brain. *International Journal of Molecular Science*, 2021. [link to paper](#).

International Conferences with proceedings

- 2023 Grégoire Sergeant-Perthuis. A categorical approach to statistical mechanics. In Frank Nielsen and Frédéric Barbaresco, editors, *Geometric Science of Information*, pages 258–267, Cham, 2023. Springer Nature Switzerland. [link to paper](#).
- 2022 Grégoire Sergeant-Perthuis, Jakob Maier, Joan Bruna, and Edouard Oyallon. On non-linear operators for geometric deep learning. In Alice H. Oh, Alekh Agarwal, Danielle Belgrave, and Kyunghyun Cho, editors, *Advances in Neural Information Processing Systems*, 2022. [link to paper](#).

International Conferences without proceedings

- 2024 G. Sergeant-Perthuis. Functoriality of inference on diagrams in the category of markov kernels. Talk at NCGHS 2024, September 2024.
- 2024 G. Sergeant-Perthuis, N. Ruet, T. Yan, K. Williford, and D. Rudrauf. Dualities in homogeneous spaces may underly pre-reflective self-consciousness. Poster at ASSC27, July 2024.
- 2024 N. Ruet, T. Yan, D. Ognibene, K. Williford, D. Rudrauf, and G. Sergeant-Perthuis. Exploring how the geometry of the representation space influences curiosity-based exploration. Poster at ASSC27, July 2024.
- 2024 D. Rudrauf, T. Yan, N. Ruet, K. Williford, and G. Sergeant-Perthuis. Integrated Information Theory (IIT) with simple maths. Talk at ASSC27, July 2024.
- 2024 G. Sergeant-Perthuis and Nils Ruet. Inference on diagrams in the category of Markov kernels (Extended abstract). Talk at ACT 7, University of Oxford, June 2024. [link to preprint](#).
- 2024 G. Sergeant-Perthuis. Compositional statistical mechanics, entropy and variational free energy (Extended abstract). Talk at ACT 7, University of Oxford, June 2024. [link to preprint](#).
- 2024 G. Sergeant-Perthuis. Compositional statistical mechanics, entropy and variational inference. Talk at SYCO 12, University of Birmingham, April 2024. [link to paper](#), [link to slides](#).
- 2024 G. Sergeant-Perthuis. Challenges and prospects for the projective consciousness model. Talk at "Causal Cognition in Humans and Machines conference", University of Oxford, January 2024.
- 2023 G. Sergeant-Perthuis, N. Ruet, D. Rudrauf, D. Ognibene, and Y. Tisserand. Influence of the geometry of the feature space on curiosity based exploration. In *NeurIPS 2023 workshop: Information-Theoretic Principles in Cognitive Systems*, December 2023.
- 2023 D. Rudrauf G. Sergeant-Perthuis and K. Williford. The projective consciousness model: Formal developments from projective geometry to epistemic drives. Talk at MoC4, University of Oxford, September 2023.
- 2023 D. Rudrauf K. Williford and G. Sergeant-Perthuis. The projective consciousness model: Phenomenological prolegomena. Talk at MoC4, University of Oxford, September 2023.

Invited

- 2023 *G. Sergeant-Perthuis*. Optimization over presheaves, June 2023. Invited Junior Guest (poster) at Life, Structure and Cognition (LSC), IHES, [link to poster](#).

Submitted

- 2020 D. Bennequin, O. Peltre, *G. Sergeant-Perthuis*, and J. P. Vigneaux. Extra-fine sheaves and interaction decompositions, September 2020. In revision for Algebraic and Geometric Topology, [link to paper](#).

Preprints

- 2024 *G. Sergeant-Perthuis*. Characterization of extreme Gibbs measures for a Categorical Approach to Statistical Mechanics. [link to preprint](#), February 2024.
- 2022 *G. Sergeant-Perthuis*. Regionalized optimization, 2022. [link to preprint](#).
- 2021 *G. Sergeant-Perthuis*. Interaction decomposition for Hilbert spaces, 2021. [link to preprint](#).
- 2020 *G. Sergeant-Perthuis*. Interaction decomposition for presheaves, August 2020. [link to preprint](#).
- 2019 *G. Sergeant-Perthuis*. Intersection property and interaction decomposition, April 2019. [link to preprint](#).
- 2019 *G. Sergeant-Perthuis*. Bayesian/Graphoid intersection property for factorisation spaces, March 2019. [link to preprint](#).

Other

- 2024 *G. Sergeant-Perthuis*, Tonglin Yan, Nils Ruet, Kenneth Williford, and David Rudrauf. Integrated Information Theory (IIT) with Simple Maths. [link to preprint](#), April 2024.
- 2024 Jules Tsukahara and *G. Sergeant-Perthuis*. A short presentation of Active Inference . [link to preprint](#), March 2024.
- 2024 Grégoire Sergeant-Perthuis. Compositional statistical mechanics, entropy and variational inference, 2024. Document for accepted talk at SYCO 12 conference.

Grants involvement and rewards

- 2024 PI Intel Corporation Grant $\sim 140k$ €.
- 2024 Collaborator SEED4EU+ $\sim 35k$ €.
- 2024 BRIDGE Sorbonne Université $\sim 2,5k$ €.
- 2024 PRMO Young FMJH Program PGMO $\sim 5k$ €.
- 2024 co-PI AMIES PEPS 1 & Sony $\sim 13k$ €.
- 2021-2022 Collaborator AAP 2021 & 2022 CNRS $\sim 10k$ €.
- 2022 NeurIPS 2022 Scholar Award.

Research Visits

- 2025 Beijing Institute of Mathematical Sciences and Applications, *Beijing, China*, invited for two weeks.
- 2025 Chinese University of Hong Kong, *Shenzhen, China*, invited for one week.

Teaching experience

- 2024- Teacher: Statistiques en bioinformatique et algorithmes sur les séquences, *Master 1 Bioinformatics and Modeling Master (BIM)*, Sorbonne Université.
- 2024- Teacher: Deep life, *Master 1 Master Data Science Paris (DAC)*, Sorbonne Université, 4EU+ alliance, Sorbonne co-coordinator.
- 2024- Teaching Assistant : Projet Bioinformatique, *Licence 3 Informatique*, Sorbonne Université.

- 2023- Teaching Assistant : Probabilistic and Statistical Models and Algorithms for Computer Science, *Master 1 Master Data Science Paris (DAC)*, Sorbonne Université.
- 2023- Teaching Assistant : Discrete mathematics, *Licence 2 of Computer Science*, Sorbonne Université.
- Jan.– Teaching Assistant (ATER) : Statistics,
May,2020 *Master 1 ISIFAR*, Université Paris-Cité, 64 hours.
- Jan.– Teaching Assistant (ATER) : Statistics and probabilistic simulations,
May,2020 *Licence 3 of Mathematics*, Université Paris-Cité, 64 hours.
- Sept.– Teaching Assistant (ATER) : Data analysis,
Dec.,2019 *Master 1 ISIFAR*, Université Paris-Cité, 64 hours.
- Jan.– Teaching Assistant (Moniteur): Inferential statistics,
May,2019 *Licence 1 Science des Données (ex-STID)*, IUT Paris Descartes (P5), 32 hours.
- Sept.,2018– Teaching Assistant (Moniteur): Probability and simulations,
Jan.,2019 *Licence 1 Science des Données (ex-STID)*, IUT Paris Descartes (P5), 32h.
- Jan.– Teaching Assistant (Contractuel): Analysis on Hilbert Spaces and Fourier analysis,
May,2017 *Licence 3 of Mathematics*, Université Paris-Cité, 64 hours.

Supervision experience

- 2024-2027 Jules Tsukahara, *PhD*, with E. Tsigaridas*, Sorbonne Université.
- 2023-2026 Tonglin Yan, *PhD*, with D. Rudrauf* and A. Finkel, Université Paris-Saclay.
- 2023-2026 Nils Ruet, *PhD*, with D. Rudrauf* and A. Finkel, Université Paris-Saclay.
- 2025 Léo Boitel, *M2 intern*, 6 months.
- 2025 Ruyi Tang, *M2 intern*, with David Colliaux and E. Tsigaridas, 6 months.
- 2024 Simon Lietar, *M1 intern*, with E. Laine, 2 months.
- 2024 Adam Boumessaoud, Antoine Grislain, Steve Jatiere, Andrea Mergez et Océane Li, *M1 intern*, 1 month.
- 2024 Christine Anton Jesuthasan et Defne Ozguven, *L3 intern*, 1 month.
- 2021 Rida Lali, *M1 intern*, with David Rudrauf*, 6 months.
- 2021 Robin Sobczyk, *M1 intern*, with David Rudrauf*, 3 months.

Academic Service

- 2025 Co-organiser, *Geometry and machine learning 2*, with Yael Frégier and Ping Xu.
- 2024- Organiser of the seminar CSPM, *Compositional Structures in Probabilistic Modeling*, [link to description](#).
- 2023- Organiser of the seminar PMMC, *Paris Mathematical Models of Cognition and Consciousness*, [link to description](#).
- 2023-26 Jury Member of Prix de thèse Gilles Kahn (Société informatique de France).
- 2023- Reviewer for **ICML** (International Conference on Machine Learning) and **NeurIPS** (Neural Information Processing Systems) and **ICLR** (International Conference on Learning Representations).
- 2023,2025 Co-organiser, *Session 'Information, statistics and topology' of the Conference on Geometric Science of Information (GSI)*, with Pierre Baudot.
- 2022 Member of Program Committee, *Workshop 'NeurReps: Symmetry and Geometry in Neural Representations'*, Neurips Workshop.
- 2021 Co-organiser, *Workshop 'Geometrie de Wassertein'*, Laboratoire de Mathématique de Lens, Université d'Artois, with Yael Frégier.

All talks

- 24 Sep. 2024 Functoriality of inference on diagrams in the category of Markov kernels, *NCGHS 2024*, University of Thessaloniki.
- 21 Jun. 2024 Optimization over functors and application to Bayesian inference and statistical mechanics, *Geometry and Machine Learning*, Scalea.
- 4 Jul. 2024 Integrated Information Theory (IIT) with Simple Maths, *ASSC 27*, University of Tokyo, with D. Rudrauf, T. Yan, N. Ruet, K. Williford.
- 18 Jun. 2024 Inference on diagrams in the category of Markov kernels, *ACT 7*, University of Oxford, with Nils Ruet, video.
- 18 Jun. 2024 Compositional statistical mechanics, entropy and variational free energy, *ACT 7*, University of Oxford, video.
- 16 Apr. 2024 Compositional statistical mechanics, entropy and variational inference, *SYCO 12*, video, University of Birmingham.
- 5 Apr. 2024 Sheaves in data science, *Compositional Structures in Probabilistic Modeling*, video, Sorbonne Université.
- 4 Apr. 2024 Active Inference, *Paris Mathematical Models of Cognition and Consciousness*, video, Sorbonne Université.
- 6 Feb. 2024 Mathematical Aspects of Integrated Information Theory (IIT) 2, *Paris Mathematical Models of Cognition and Consciousness*, video, Sorbonne Université, Paris.
- 11 Jan. 2024 Challenges and Prospects for the Projective Consciousness Model, *Causal Cognition in Humans and Machines conference*, University of Oxford.
- 19 Jan. 2024 Around Optimization over Presheaves, Huawei Centre de recherche Lagrange.
- 24 Nov. 2023 Agency with structured latent state-spaces: recent developments., *Computational phenomenology weekly discussion group*, VERSES Research Lab/Spatial Web Foundation.
- 9 Nov. 2023 Agency with structured latent state-spaces: a model for computational phenomenology., *Sony CSL Paris Seminar*, Sony CSL Paris.
- 29 Sep. 2023 Mathematical Aspects of Integrated Information Theory (IIT), *Paris Mathematical Models of Cognition and Consciousness*, Sorbonne Université, video.
- 16 Sep. 2023 Agency with structured latent state-spaces: a model for computational phenomenology., *ActInf GuestStream*, Active Inference Institut, video.
- 6 Sep. 2023 The Projective Consciousness Model: Formal developments from projective geometry to epistemic drives, *MoC4*, Oxford, with K. Williford and D. Rudrauf.
- 6 Sep. 2023 The Projective Consciousness Model: Phenomenological Prolegomena, *MoC4*, Oxford, with K. Williford and D. Rudrauf.
- 30 Aug. 2023 A categorical approach to Statistical Mechanics, *GSI'23*, Saint-Malo.
- 31 May 2023 A categorical approach to Statistical Mechanics, *Combinatorics and optimization (CO) team day*, IMJ-PRG, Sorbonne Université.
- 28 Apr. 2023 A categorical approach to Statistical Mechanics, *Arbeitsgruppenseminar Analysis*, Institut für Mathematik Potsdam.
- 16 Apr. 2023 The Projective Consciousness Model: an on-board system for simulating the integrative role of projective geometry in the control of social-affective agents, *with D. Rudrauf*, *Category Theory for Consciousness Science*, University of Oxford.
- 19 Jan. 2023 Optimization over presheaves and message passing algorithms (with applications), *Foundations of Geometric Statistics and Their Application in the Life Sciences (G-Stats) Seminar*, G-Stats, Inria d'Université Côte d'Azur.

- 17 Jan. 2023 Optimization over presheaves and message passing algorithms (with applications), *Algorithmes et Biologie Structurale (ABS) Seminar*, ABS, Inria d'Université Côte d'Azur.
- 17 Jan. 2023 Compositionality as a computational framework for encoding data with geometric structure and perspectives for the study of the ribosome as an information processing system, *Algorithmes et Biologie Structurale (ABS) Seminar*, ABS, Inria d'Université Côte d'Azur.
- 30 Nov. 2022 On Non-Linear operators for Geometric Deep Learning, *NeurIPS 2022*.
- 24 Nov. 2022 On Non-Linear operators for Geometric Deep Learning, *NeurIPS@Paris*, Paris.
- 16 October 2022 Structured representations in learning and action, *MLIA Team meeting*, MLIA, ISIR, Sorbonne Université.
- 6 October 2022 The role of consciousness in social active inference and the emergence of adaptive and maladaptive behaviours, *Computational phenomenology weekly discussion group*, VERSES Research Lab/Spatial Web Foundation.
- 31 March 2022 Regionalized optimisation and message passing algorithms, *Séminaire du Centre de Recherche en Informatique de Lens*, CRIL, Université d'Artois.
- 17 December 2021 Regionalized optimisation and message passing algorithms, *Workshop 'Geometrie de Wassertein'*, Laboratoire de Mathematique de Lens, Université d'Artois.
- 17 December 2021 Active inference with perspective taking, *Workshop 'Geometrie de Wassertein'*, Laboratoire de Mathematique de Lens, Université d'Artois.
- 1 October 2021 The role of consciousness in social active inference and the emergence of adaptive and maladaptive behaviors, *XXIX CONGRESSO NAZIONALE*, SIPF, Palermo.
- 29 September 2021 The role of consciousness in social active inference and the emergence of adaptive and maladaptive behaviors, *Seminario del Istituto di Fisiologia Umana*, Istituto di Fisiologia Umana, University of Palermo.
- 21 September 2021 Modelling consciousness using projective geometry, *Seminar on consciousness*, LPNC, Université de Grenoble.