

Work Experience

- Sept.2023- **Associate Professor (MCF)**, *Laboratory of Computational and Quantitative Biology (LCQB)*, 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. **Data Scientist**, *for Cancer detection and classification in medical imaging*, Median Technologies, 2022 with *Pierre Baudot and Yaël Frégier*, Sophia Antipolis.
- Jan.-Sep. **Postdoctoral researcher**, *Theory and applications of self-supervised learning*, Laboratoire de 2022 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, Algebraic tools in statistical mechanics, coming from algebraic topology, as a first step for new models for adaptive systems, *Link to PhD thesis*.
- Advisor : **Prof. Daniel Bennequin**, Département de Mathématiques 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 Supérieure de Paris, Physics* .

Publications

Published

Journals.

- 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.
- 2023 D. Rudrauf, **G. Sergeant-Perthuis**, Y. Tisserand, T. Monnor, and O. Belli. Combining the Projective Consciousness Model and Virtual Humans for immersive psychological research: a proof-of-concept simulating a ToM assessment, 2023. ACM Transactions on Interactive Intelligent Systems, 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](#).

Conferences.

- 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*, 2023.
- 2023 **G. Sergeant-Perthuis**. A categorical approach to statistical mechanics, 2023. Accepted to GSI 2023, [link to paper](#).
- 2022 **G. Sergeant-Perthuis**, J. Maier, J. Bruna, and E. Oyallon. On Non-Linear operators for Geometric Deep Learning. *NeurIPS 2022*, 2022. [link to paper](#).

Submitted

- 2023 **G. Sergeant-Perthuis**, D. Rudrauf, D. Ognibene, and Y. Tisserand. Action of the Euclidean versus Projective group on an agent's internal space in curiosity driven exploration: a formal analysis, 2023. Submitted, [link to paper](#).
- 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. working paper or preprint, February 2024.
- 2022 **G. Sergeant-Perthuis**. Regionalized optimization, 2022. [link to paper](#).
- 2021 **G. Sergeant-Perthuis**. Interaction decomposition for Hilbert spaces, 2021. [link to paper](#).
- 2020 **G. Sergeant-Perthuis**. Interaction decomposition for presheaves, August 2020. [link to paper](#).
- 2019 **G. Sergeant-Perthuis**. Intersection property and interaction decomposition, April 2019. [link to paper](#).
- 2019 **G. Sergeant-Perthuis**. Bayesian/Graphoid intersection property for factorisation spaces, March 2019. [link to paper](#).

Grants involvement and rewards

- 2021-2022 **Modélisation du vivant - AAP 2021 & 2022, CNRS**, with *Youri Timsit and Daniel Bennequin*, Architecture of Ribosomal Protein Networks : towards the idea of molecular brains.
- 2022 NeurIPS 2022 Scholar Award.

Computer skills

PyTorch, Python, Matlab, R, Mathematica

Academic Service

- 2024- Organiser of the seminar CSPM, *Compositional Structures in Probabilistic Modeling*.
- 2023- Organiser of the seminar PMMC, *Paris Mathematical Models of Cognition and Consciousness*.
- 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).
- 30 Aug.- 1 Sep. 2023 **Co-Organiser**, *Session 'Information, statistics and topology' of the Conference on Geometric Science of Information (GSI)*, with Pierre Baudot.
- 3 December 2022 **Member of Program Committee**, *Workshop 'NeurReps: Symmetry and Geometry in Neural Representations'*, Neurips Workshop.
- 2021 **Co-Organiser**, *Workshop 'Geometrie de Wassertein'*, Laboratoire de Mathematique de Lens, Université d'Artois, with Yael Frégier.

Supervision experience

- 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.
- May-July 2021 Robin Sobczyk, Licence 3 École normale supérieure Paris-Saclay ,
Title: Active inference for emotional agents within the PCM, Université de Genève and École normale supérieure Paris-Saclay.
- February-July 2021 Rida Lali, Master 1 École normale supérieure Paris-Saclay,
Title: Use of heuristics for improving computation times of the Projective Consciousness Model, Université de Genève and École normale supérieure Paris-Saclay.

Talks

- 6 Feb. 2024 **Mathematical Aspects of Integrated Information Theory (IIT) 2**, *Paris Mathematical Models of Cognition and Consciousness*, video.
- 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.
- 15 Dec. 2023 **Influence of the geometry of the feature space on curiosity based exploration**, *MoC4, NeurIPS InfoCog workshop*, (poster), with N. Ruet.
- 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*, video.
- 16 Sep. 2023 **Agency with structured latent state-spaces: a model for computational phenomenology.**, *ActInf GuestStream*, Active Inference Institute, 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.
- 26 June 2023 **Optimization over presheaves**, *Life, Structure and Cognition (LSC)*, Invited Junior Guest (poster), IHES.
- 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*, SIFP, 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.

Teaching experience

- Jan.– ,2024 **Teacher: Statistiques en bioinformatique et algorithmes sur les séquences**, *Master 1 Bioinformatics and Modeling Master (BIM)*, Sorbonne Université.
- Jan.– ,2024 **Teacher: Deep life**, *Master 1 Master Data Science Paris (DAC)*, Sorbonne Université, 4EU+ alliance, Sorbonne co-coordinator.
- Jan.– ,2024 **Teaching Assistant : Projet Bioinformatique**, *Licence 3 Informatique*, Sorbonne Université.
- Sept.– ,2023 **Teaching Assistant : Probabilistic and Statistical Models and Algorithms for Computer Science**, *Master 1 Master Data Science Paris (DAC)*, Sorbonne Université.
- Sept.– ,2023 **Teaching Assistant : Discrete mathematics**, *Licence 2 of Computer Science*, Sorbonne Université.
- Jan.– May,2020 **Teaching Assistant (ATER) : Statistics**, *Master 1 ISIFAR*, Université Paris-Cité, 64 hours.
- Jan.– May,2020 **Teaching Assistant (ATER) : Statistics and probabilistic simulations**, *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.*