

## Work Experience

- 2022–Present **Postdoctoral researcher**, *Around theoretical result on sampling and learning probabilistic models over hyper-graphs*, INRIA team Ouragan and, IMJ-PRG team 'Combinatoire et Optimisation' with *Elias Tsigaridas*, Sorbonne Université, Paris, France.
- 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*, 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

- 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](#).
- 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](#).

2021 D. Rudrauf, **G. Sergeant-Perthuis**, Y. Tisserand, T. Monnor, and O. Belli. Combining the Projective Consciousness Model and Virtual Humans to assess ToM capacity in Virtual Reality: a proof-of-concept, 2021. Accepted to ACM Transactions on Interactive Intelligent Systems, link to paper.

#### Submitted

2023 **G. Sergeant-Perthuis**, D. Rudrauf, D. Ognibene, and Y. Tisserand. Curiosity driven exploration through perspective transformation, 2023. Submission to RO-MAN 2023, 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.

#### Preprint

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

2023 Reviewer for **ICML** (International Conference on Machine Learning).

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 Mathématique de Lens, Université d'Artois, with Yael Frégier.

### Supervision experience

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.

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## Talks

- 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.

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## Teaching experience, total of 320 hours

- 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.– Dec.,2019 **Teaching Assistant (ATER) : Data analysis**, *Master 1 ISIFAR*, Université Paris-Cité, 64 hours.
- Sept.,2018– Jan.,2019 **Teaching Assistant (Moniteur): Probability and simulations**, *Licence 1 Science des Données (ex-STID)*, IUT Paris Descartes (P5), 32h.
- Jan.– May,2019 **Teaching Assistant (Moniteur): Inferential statistics**, *Licence 1 Science des Données (ex-STID)*, IUT Paris Descartes (P5), 32 hours.
- Jan.– May,2017 **Teaching Assistant (Contractuel): Analysis on Hilbert Spaces and Fourier analysis**, *Licence 3 of Mathematics*, Université Paris-Cité, 64 hours.