Aristide Baratin, Ph.D — Curriculum Vitae

Citizenship: French & Canadian
Email: baratina@mila.quebec **Website - Google Scholar Profile**

Research Positions

Research Scientist 2021 – present
Samsung - SAIT AI Lab, Montreal
Affiliated at Mila

Visiting Fellow 2015 – 2017
McGill University, Dept of Mathematics and Statistics

Humboldt Research Fellow 2013 – 2016
Host: University of Waterloo, Dept of Applied Mathematics

Junior Scientist 2008 – 2013
Max Planck Institute for Gravitational Physics, Potsdam.

Education

Mila, Université de Montréal June 2022
Ph.D in Computer Science
Advisor: *Simon Lacoste-Julien*

Ecole Normale Supérieure (ENS), Lyon Jan 2009
& **Perimeter Institute**, Waterloo
Ph.D in Physics
Advisor: *Laurent Freidel*

Université Paris-Saclay & **ENS Paris** 2002-2004
Master's degrees (Mathematics & Physics)

ENS Paris-Saclay 2002-2004
Stipiendiary student (Mathematics)

Internships

Microsoft Research, Montréal 06/2020–09/2020
Host: Alessandro Sordoni

Microsoft Research, Montréal 09/2019–12/2019
Host: Devon R. Hjelm

Element AI, Montréal (part time) 02/2018–07/2018
Host: Negar Rostamzadeh

Teaching Experience

Lecturing at undergraduate level:

Teaching Assistant/Supply Lecturer Fall 2018
DIRO, Université de Montréal
Fundamentals of Algorithmics (Lecturer: Gilles Brassard)

Course Lecturer (6 semester courses) Sept 2015 - Aug 2017
McGill University, Dept of Mathematics and Statistics
Linear Algebra, General Algebra

Course Lecturer (3 semester courses) Sept 2013 - Aug 2015
University of Waterloo, Dept of Applied Mathematics
Calculus, Algebra

Lecturing at graduate level:

Teaching Assistant/Supply Lecturer Fall 2005
ENS Lyon, mathematics department.
Course: Integration and Fourier theory (Lecturer: Cedric Villani).

Teaching Assistant 2004-2007
ENS, physics department.
Assistant and mentor for the training program 'Agrégation' in physics.
(competitive examination for positions in public secondary education system).

Honors and Awards

Alexander Graham Bell Scholarship May 2019
Awarded by NSERC (Canada).

Feodor Lynen Research Fellowship June 2013
Awarded by the A.v. Humboldt Foundation (Germany).

ANR Research Grant (240,000 Euros) June 2013
Awarded by Agence Nationale de la Recherche (France)
to build a research team (Postdoc-Return Program)
I **declined** the offer to take the Feodor Lynen Fellowship

Max Planck Postdoctoral Fellowship Dec. 2008
Awarded by the Max Planck Society.

Government of Canada Award Sept. 2005
Research scholarship awarded by the Government of Canada.

French Olympiads in Philosophy Essays. 1997
National rank: 1st.

Publications (also available on arXiv and Google Scholar)

* indicates equal contribution

Machine learning

Conference Publications

25. J. Kim, **A. Baratin**, Y. Zhang, S. Lacoste-Julien. CrossSplit: Mitigating Label Noise Memorization through Data Splitting. ICML 2023. Available as arXiv:2212.01674.
24. Thomas George, Guillaume Lajoie, **A. Baratin**. Lazy vs hasty: linearization in deep networks impacts learning schedule based on example difficulty. TMRL 2022. Available as arXiv:2209.09658.
23. **A. Baratin***, T. George*, C. Laurent, R Devon Hjelm, G. Lajoie, P. Vincent, S. Lacoste-Julien. Implicit Regularization via Neural Feature Alignment. AISTATS 2021. Available as arXiv:2008.00938.
22. N. Rahaman*, **A. Baratin***, D. Arpit, F. Draxler, M. Lin, F. A. Hamprecht, Y. Bengio, A. Courville. On the Spectral Bias of Deep Neural Networks. ICML 2019. Available as arXiv:1806.08734.
21. I. Belghazi, **A. Baratin**, S. Rajeswar, S. Ozair, Y. Bengio, A. Courville, R Devon Hjelm. MINE: Mutual Information Neural Estimation. ICML 2018. Available as arXiv:1801.04062.

Refereed Workshop Contributions

20. B. Neal, S. Mittal, **A. Baratin**, V.Tantia, M. Scicluna, S. Lacoste-Julien, I. Mitliagkas. A Modern Take on the Bias-Variance Tradeoff in Neural Networks. ICML 2019 Workshop on Identifying and Understanding Deep Learning Phenomena. Also available as arXiv:1810.08591.
19. A. Erraqabi*, **A. Baratin*** Y. Bengio, S. Lacoste-Julien. A3T: Adversarially Augmented Adversarial Training. Machine Deception Workshop, NIPS 2017. Available as arXiv:1801.04055.

Preprints

18. Y. Lu, Z. Liu, **A. Baratin**, R. Laroche, A. Courville, A. Sordoni. Expressiveness and Learnability: A Unifying View for Evaluating Self-Supervised Learning. Available as arXiv:2206.01251.
17. J. Vuckovic, **A. Baratin**, R. Tachet des Combes. On the Regularity of Attention. Available as arXiv:2102.05628. *Note: this is a conference version of arXiv:2007.02876.*
16. J. Vuckovic, **A. Baratin**, R. Tachet des Combes. A Mathematical Theory of Attention. Available as arXiv:2007.02876.
15. **A. Baratin***, S. Tan*, P-A Brousseau, A, Goyal, A. Lamb. Exploring Machine Learning for Particle Physics. Technical report, 2017. Available at this URL.

Theoretical Physics

Journal Publications

14. **A.Baratin**, L.Freidel (2015). A 2-categorical state sum model. Journal of Mathematical Physics 56, 011705.
13. **A.Baratin**, L.Freidel and R.Gurau (2014). Weighting bubbles in group field theory. Physical Review D 90, 024069.
12. **A.Baratin**, S.Carrozza, D.Oriti, J.Ryan, M.Smerlak (2014). Melonic phase transition in group field theory. Letters in Mathematical Physics 104 8, 1003-1017.

11. J.C Baez, **A.Baratin**, L.Freidel, D.Wise (2012). Infinite Dimensional Representations of 2-Groups. Memoirs of the American Mathematical Society 219, No.1032 (120 pages).
10. **A.Baratin**, D.Oriti (2012). Group field theory and simplicial gravity path integrals: A model for Holst-Plebanski gravity. Physical Review D 85, 044003.
9. **A.Baratin**, C.Flori, T.Thiemann (2012). The Holst Spin Foam Model via Cubulations. New Journal of Physics 14, 103054.
8. **A.Baratin**, D.Oriti (2011) Quantum simplicial geometry in the group field theory formalism: reconsidering the Barrett-Crane mode1. New Journal of Physics 13, 125011.
7. **A.Baratin**, F.Girelli, D.Oriti (2011). Diffeomorphisms in group field theories. Physical Review D83, 104051.
6. **A.Baratin**, B.Dittrich and J.Tambornino (2011), Non-commutative flux representation for loop quantum gravity. Classical Quantum Gravity 28, 175011
5. **A.Baratin**, D.Oriti (2010) , Group field theory with non-commutative metric variables. Physical Review Letter 105, 221302.
4. **A.Baratin**, L.Freidel (2007). Hidden quantum gravity in 4d Feynman diagrams: Emergence of spin foams. Classical and Quantum Gravity 24, 2027-2060
3. **A.Baratin**, L.Freidel (2007). Hidden quantum gravity in 3d Feynman diagrams. Classical and Quantum Gravity 24 , 1993-2026.

Conference Proceedings

2. **A.Baratin**, D.Oriti (2012). Ten questions on group field theory (and their tentative answers). J. Phys.: Conf. Ser. 360, 012002.
1. **A.Baratin**, D.Wise (2009). 2-group representations for spin foams. AIP Conf. Proc.1196, 28-35

Invited Conference Talks (Selection)

Machine learning Conferences

July 2019: Theoretical Advances in Deep Learning Workshop.
Istanbul Center for Mathematical Sciences, Turkey.
Talk: Implicit bias in deep learning: a view from function space.

Jan 2019: Theoretical Physics for Machine Learning Conference.
Aspen, Colorado.
Talk: On the spectral bias of neural networks.

Mathematics & Physics Conferences

July 2015: Invited to Loops '15 as plenary speaker.
Friedrich-Alexander University, Erlangen, Germany

July 2014: 2014 CAP Congress
Laurentian University, Sudbury, Ontario

March 2013: "Quantum Gravity in Paris"
Orsay University

Sept. 2012: "Recent Advances in Topological Quantum Field Theories"
University of Lisbon.

July 2012: "3Quantum: Algebra Geometry Information"
Tallinn University of Technology.

March 2012: "Quantum Gravity in Paris"
Orsay University, Paris 7 University

Nov. 2011: "Categories and Physics"
Paris 7 University

Nov. 2011 "Renormalization: algebraic, analytic and geometric aspects"
Institut Poincaré, Paris.

May 2011 "Higher Gauge Theory, TQFTs, and Categorification"
School of Mathematics, Cardiff University

March 2011:"Quantum space-time: from discreteness to continuum"
Orsay University

March 2011: "Mathematical, Physical and Conceptual aspects of Quantum Gravity"
Paris 7 University

Feb. 2011 "Higher Gauge Theory, TQFT and Quantum Gravity"
Instituto Superior Técnico, Lisbon.

Oct 2010: Quantum Gravity Colloquium 5
Paris 7 University

March 2010: "Loops and foams"
Zakopane, Poland.