

Vincent Roulet

Positions

- 2020 – **Acting Instructor**, *University of Washington, Seattle*.
Teaching instructor at the Department of Statistics.
- 2018– 2020 **Postdoctoral Researcher**, *University of Washington, Seattle*.
Postdoctoral researcher at the Department of Statistics for the Algorithmic Foundations of Data Science Institute (ADSI).

Education

- 2014 – 2017 **Doctorate in Applied Mathematics**, *Paris Sciences et Lettres Research University, Paris*.
Equivalent of PhD in Optimization and Machine Learning.
Title: *On the geometry of optimization problems and their structure*.
Advisor: Alexandre d’Aspremont.
Location: Department of Computer Science of the École Normale Supérieure.
- 2013 – 2014 **Master in Applied Mathematics**, *Télécom Paris, Paris*.
Specialty in Mathematics, Vision, Learning at École Normale Supérieure Paris-Saclay.
Obtained with high honors.
- 2010 – 2014 **Master and Engineering degree**, *École Polytechnique, Paris*.
Equivalent of Master in Applied Mathematics, Physics, Computer Science.
Top ranked French university, admission through competitive national exams.
- 2008 – 2010 **Classes Préparatoires**, *Lycée Louis-le-Grand, Paris*.
Equivalent to Bachelor in Mathematics and Physics.

Papers

I have made several contributions to *optimization* and *machine learning*. Those have been published in peer-reviewed international journals (SIAM Journal on Optimization, Information and Inference) and main international conferences in machine learning (Conference on Neural Information Processing Systems, International Conference on Machine Learning). These conferences are very selective with an acceptance rate in general below 25%, and their proceedings play a role which is as important as international journals.

Published

On the Convergence to Stationary Points of the Iterative Linear Exponential Quadratic Gaussian Algorithm, Vincent Roulet, Maryam Fazel, Siddhartha Srinivasa, Zaid Harchaoui, in *Proceedings of the 2020 American Control Conference (ACC)*, 2020.

End-to-end Learning, with or without Labels., Corinne Jones, Vincent Roulet, Zaid Harchaoui, Short version in *Proceedings of Joint Statistical Meetings*, Long version submitted, *Winner of the 2020 ASA Computing/Graphics Student Paper Award*, 2020.

An Elementary Approach to Convergence Guarantees of Optimization Algorithms for Deep Networks, Vincent Roulet, Zaid Harchaoui, in *Proceedings of the 57th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, 2019.

Sharpness, Restart and Acceleration, (*Journal version*), Vincent Roulet, Alexandre d’Aspremont, in *SIAM Journal on Optimization (SIOPT)*, 2019.

Iterative Linearized Control: Stable Algorithms and Complexity Guarantees, Vincent Roulet, Siddhartha Srinivasa, Dmitriy Drusvyatskiy, Zaid Harchaoui, in *Proceedings of the 36th International Conference on Machine Learning (ICML)*, 2019.

Complexity versus Statistical Performance on Sparse Recovery Problems, Vincent Roulet, Nicolas Boumal, Alexandre d'Aspremont, *Information and Inference: a Journal of the IMA*, 2019.

A Smoother Way to Train Structured Prediction Models, Krishna Pillutla, Vincent Roulet, Sham Kakade, Zaid Harchaoui, in *Advances in Neural Information Processing Systems 31 (NeurIPS)*, 2018.

Sharpness, Restart and Acceleration, (*Conference version*), Vincent Roulet, Alexandre d'Aspremont, in *Advances in Neural Information Processing Systems 30 (NeurIPS)*, 2017.

Integration Methods and Accelerated Optimization Algorithms, Damien Scieur, Vincent Roulet, Francis Bach, Alexandre d'Aspremont, in *Advances in Neural Information Processing Systems 30 (NeurIPS)*, 2017.

Working papers

Differentiable Programming à la Moreau, Vincent Roulet, Zaid Harchaoui, *Manuscript available at arXiv: 2012.15458*, 2021.

Software

- 2019 **ilqc**, Main contributor, <https://github.com/vroulet/ilqc>.
Software library for analyzing non-linear control algorithms from an optimization perspective. Implemented iterative linearized control algorithms for exact, average or risk-sensitive control problems in a differentiable programming framework with illustrations in OpenAI Gym.
- 2019 **casimir**, Contributor, <https://github.com/krishnap25/casimir>.
Software library for structured prediction problems. Implemented accelerated prox-linear algorithms by extrapolation.

Awards

- 2019 University of Washington Data Science Postdoctoral Fellowship
- 2018, 2019, Outstanding reviewer for the Neural Information processing Systems Conference, granted 2020 to 10% of the reviewers.
- 2016 Start-up prize *Be the Future of Sound* organized by Société d'Accélération du Transfert de Technologies Lutech, received 70 000€ for the project Bloom.
- 2014 Outstanding investment award "*Outstanding student who has distinguished himself through his behavior, dedication and commitment to the student body*", granted to 10% of the students of Ecole Polytechnique.

Teaching

Lecturer

- Spring **STAT 395 Probability II**, University of Washington, Seattle.
 - 2021 Random variables; expectation and variance; laws of large numbers; normal approximation and other limit theorems; multidimensional distributions and transformations. 80 students.
- Winter **STAT 394 Probability I**, University of Washington, Seattle.
 - 2021 Axiomatic definitions of probability; random variables; conditional probability and Bayes' theorem; expectations and variance; classical distributions. Transformations of a single random variable. Markov and Chebyshev's inequality. Weak law of large numbers for finite variance. 120 students.
- Winter **STAT 517 Stochastic Modeling of Scientific Data II**, University of Washington, Seattle.
 - 2021 Covers Markov random fields; continuous-time Markov chains; birth-death and branching processes; and point processes and cluster models. Procedures for inference for these stochastic processes, including Likelihood methods and estimating equations. 25 students.
- Fall **STAT 516 Stochastic Modeling of Scientific Data I**, University of Washington, Seattle.
 - 2020 Covers discrete-time Markov chain theory; inference for discrete-time Markov chains; Monte Carlo methods; missing data; hidden Markov models; and Gaussian Markov random fields. 25 students.
- Spring **STAT 395 Probability II**, University of Washington, Seattle.
 - 2020 Random variables; expectation and variance; laws of large numbers; normal approximation and other limit theorems; multidimensional distributions and transformations. 80 students.

Winter **STAT 538 Statistical Learning**, *University of Washington*, Seattle.

2020 Reviews optimization and convex optimization in its relation to statistics. Covers the basics of unconstrained and constrained convex optimization, basics of clustering and classification, entropy, KL divergence and exponential family models, duality, modern learning algorithms like boosting, support vector machines, and variational approximations in inference. 17 students.

Teaching assistant

2014 – 2017 **Convex Optimization**, *Master Mathematics, Vision, Learning*, École Normale Supérieure Paris-Saclay, Paris.

Identification and resolution of a broad class of convex optimization problems arising in various fields such as machine learning, finance or signal processing. 90 students.

2013 – 2014 **Oral Interrogations in Mathematics**, *Classes Préparatoires in Mathematics and Physics*, Lycée Janson de Sailly, Paris.

Algebra, linear algebra, topology, Hilbert spaces, Fourier transform, series and sequences of functions, power series, integration, differential equations. 30 students.

Tutorials

2019, 2020 **Automatic Differentiation**, *Statistical Machine Learning for Data Scientists*, University of Washington.

Lecture on automatic differentiation with code examples covering: how to compute gradients of a chain of computations, how to use automatic-differentiation software, how to use automatic-differentiation beyond gradient computations.

2018 **Optimization for Deep Learning**, *Summer School on Fundamentals of Data Analysis*, University of Wisconsin-Madison.

Interactive Jupyter Notebook for 30 attendees to understand the basics of optimization for deep learning: automatic-differentiation, convergence guarantees of SGD, illustration of the batch-normalization effect.

Mentoring

2018 – 2019 Mentored PhD student **Krishna Pillutla** on
- A Smoother Way to Train Structured Prediction Models.

2018 – 2019 Mentored PhD student **Corinne Jones** on
- Kernel-based Translations of Convolutional Networks,
- Learning Feature Representations for Discriminative Clustering with Limited Supervision.

2019–2020 Mentored 4 students for the Research Preliminary Exam at the Department of Statistics of the University of Washington.

Academic service

Reviewer, Session Chair

Conference Reviewer Neural Information Processing Systems 2018-2020, International Conference on Machine Learning 2019, International Conference on Artificial Intelligence and Statistics 2021.

Journal Reviewer Journal of Machine Learning Research, Foundations of Computational Mathematics, Mathematics of Operation Research, IEEE Transactions on Information Theory, IEEE Transactions on Image Processing.

Session Chair Optimization and Deep Learning Session of the Annual Allerton Conference on Communication, Control, and Computing (Allerton) 2019.

Seminar Organization

Fall 2019 Machine Learning and Optimization Reading Group at the University of Washington.

Scientific events

Aug. 2019 Summer School on Foundations of Data Science, *University of Washington*, Seattle. Supervised the conduct of the event each day, organized dinners for the speakers.

Presentations

- Jul. 2020 Automatic Differentiation Friendly Complexity Guarantees, *Workshop Beyond first order methods in Machine Learning Systems at the International Conference on Machine Learning 2020*, Vienna, Poster Online.
- Jul. 2020 On the Convergence to Stationary Points of the Iterative Linear Exponential Quadratic Gaussian Algorithm, *American Control Conference*, Denver, Talk, Poster Online.
- Jun. 2020 Computational Complexity versus Statistical Performance on Sparse Recovery Problems, *Seminar of the Department of Statistics*, Seattle, Talk.
- Mar. 2020 Optimization Oracles for Chains of Computations, *Optimization for Machine Learning*, Centre International de Rencontres Mathématiques, Luminy, Talk.
- Oct. 2019 Iterative Linearized Control from an Optimization Viewpoint, *Annual meeting of the Institute for Operations Research and the Management Sciences Annual Meeting (INFORMS)*, Seattle, Talk.
- Oct. 2019 Risk-Sensitive Control via Iterative Linearizations, *2nd Biennial Meeting of the SIAM Pacific Northwest Section*, Seattle, Talk.
- Sep. 2019 Restarts of Accelerated Gradient Methods: Generic Theoretical Speed-up, *West Coast Optimization Meeting*, Vancouver, Talk.
- Sep. 2019 An Elementary Approach to Convergence Guarantees of Optimization Algorithms for Deep Networks, *57th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, Urbana-Champaign, Talk.
- Jun. 2019 Iterative Linearized Control: Stable Algorithms and Complexity Guarantees, *36th International Conference on Machine Learning (ICML)*, Long Beach, Talk and Poster.
- Dec. 2018 A Smoother Way to Train Structured Prediction Models, *32nd Conference on Neural Information Processing Systems (NeurIPS)*, Montreal, Poster.
- Dec. 2017 On the Geometry of Optimization Problems and their Structure, *Institut National de Recherche en Informatique et en Automatique (INRIA)*, Paris, Thesis Presentation.
- Dec. 2017 Sharpness, Restart and Acceleration, *31st Conference on Neural Information Processing Systems (NeurIPS)*, Montreal, Poster.
- Dec. 2017 Integration Methods and Accelerated Optimization Algorithms, *31st Conference on Neural Information Processing Systems (NeurIPS)*, Montreal, Poster.
- Jun. 2017 Integration Methods and Accelerated Optimization Algorithms, *Institut de Recherche en Informatique de Toulouse (IRIT)*, Toulouse, Talk.
- Jun. 2017 Learning with Clustered Penalties, *Institut de Recherche en Informatique de Toulouse (IRIT)*, Toulouse, Talk.
- Feb. 2017 Sharpness, Restart and Acceleration, *Optimization and Statistical Learning Workshop*, Les Houches, Talk and Poster.
- Dec. 2015 Supervised Clustering in the Data Cube, *Transfer and Multi-Task Learning Workshop at the Conference on Neural Information Processing Systems*, Montreal, Talk and Poster.

Work Experiences

Internships

- Summer **Intern**, *INRIA*, Paris.
 - 2014 Studied hierarchical feature learning with kernel methods for computer vision.
- Summer **Intern**, *Imperial College*, London.
 - 2013 Studied applications of *Knows What It Knows* paradigm to bandit problems for recommendation.
- Summer **Intern**, *Astrium EADS*, Bremen.
 - 2012 Developed the statistical analysis of the pneumatic tests on the Ariane 5.

Entrepreneurship

2015 – 2016 **Entrepreneur**, *Bloom*, Paris.

Led the development of a high quality multi-usage pocket size speaker within a team of 4 engineers.

Selected to present the project at Échappée Volée organized by TedX Paris.

Social work

2010 – 2011 **Educator**, *Fondation d'Auteuil*, Paris.

Helped teenagers in social difficulties, e.g. young immigrants, orphans, to get education and work.

Lived in a social residence with 8 teenagers for seven months to help providing them good living conditions.