Lorenzo CROISSANT

Research and Teaching Assistant (ATER), Ph.D. in Mathematics

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Cursus

Sep. '23 – Aug. '23 | **ATER, ENSAE, CREST & Inria (FairPlay team), Palaiseau, France**
- TA in Mathematics, Statistics and Machine Learning
- Research in Reinforcement Learning
- Research on Prophet Inequalities

Aug. '20 – Dec. '23 | **Ph.D. in Mathematics, Université Paris Dauphine-PSL, CEREMADE; Criteo AI Lab, Paris, France**
Diffusion limit control and Reinforcement Learning.
Under the supervision of Bruno Bouchard (CEREMADE) & Marc Abeille (Criteo AI Lab)
- Stochastic control and diffusive limits of pure jump processes
- Partial Differential Equations, HJB equations, viscosity solutions
- Online non-episodic Reinforcement Learning
- Auction Theory

Oct. '19 – Jul. '20 | **Researcher, Criteo AI Lab, Paris, France**
- Research in Auction Theory and Online Learning [4]
- Research on Reinforcement Learning Theory

'18–'19 **Research Masters** (M2), **École Normale Supérieure Paris-Saclay**; Paris, France. MVA : Mathematiques, Vision, Apprentissage. Thesis : *Dynamic reserve in Second-price Auctions*, under Marc Abeille (Criteo AI Lab).

'14–'18 **Master of Science (MSci)**, **University of Lancaster**; Lancaster, United Kingdom.

Research Talks and Posters

Apr. '24 **Mathematical and Computational Finance seminar**, Oxford, Uk. 45', [3].
Feb. '24 **ALT 2024**, San Diego, USA. 12', Poster, [3].
Jan. '24 **Workshop ANR Reliscorp**, Paris, France. 45', [3].
Jan. '24 **Séminaire Bachelier Doctorants**, Paris, France. 20', [3].
Oct. '23 **FairPlay Autumn School**, St.-Pierre-Canivet, France. 45', [3].
Sep. '23 **EWRL 2023**, Vrije Universiteit Brussels, Brussels, Belgium. Poster, [3].
Juin '23 **FiME Summer School**, Aussois, France. 45', [3]
Juin '23 **CEREMADE Young Researchers' Summer School**; Université Paris-Dauphine, Paris, France. 50'.
May '23 Quantmetry, Paris, France. 45', [4].
Avr. '23 CEREMADE **3rd years' Day**, Université Paris-Dauphine, Paris, France. 10', [1].
Sep. '22 **Paris-London Bachelier Workshop**; Institut Henri Poincaré, Paris, France. 15', [1]
Mars '22 **CEREMADE Young Researchers' Winter School**, St.-Pierre-Canivet, France. 60'.
Dec. '22 EDF Labs, Palaiseau, France. 150', [1, 2, 3].
Dec. '22 **Young Researchers' Seminar of LPSM**, Sorbonne Université, Paris, France. 45', [1].
Dec. '20 **CMStatistics 2020**, Virtual. Poster; 20', [4].
Jui. '20 **ICML 2020**, Virtual. Poster; 15', [4].

Publications

[1] Marc Abeille, Bruno Bouchard, and Lorenzo Croissant. Diffusive limit approximation of pure jump optimal ergodic control problems, September 2022. arXiv:2209.15284 [math].

[2] Marc Abeille, Bruno Bouchard, and Lorenzo Croissant. Diffusive limit approximation of pure-jump optimal stochastic control problems. *Journal of Optimization Theory and Applications*, 196(1):147–176, 2023.

[3] Lorenzo Croissant, Marc Abeille, and Bruno Bouchard. Reinforcement learning in near-continuous time for continuous state-action spaces. In *Proceedings of The 35th International Conference on Algorithmic Learning Theory*. PMLR, Feb 2024. (To appear).

[4] Lorenzo Croissant, Marc Abeille, and Clement Calauzenes. Real-time optimisation for online learning in auctions. In Hal Daumé III and Aarti Singh, editors, *Proceedings of the 37th International Conference on Machine Learning*, volume 119 of *Proceedings of Machine Learning Research*, pages 2217–2226. PMLR, 13–18 Jul 2020.

Teaching

S2 '23 - '24 | ATER, ENSAE, Palaiseau, France

- **Theoretical foundations of Machine Learning (2nd year engineers/M1).**
  Syllabus : Introduction to and formal methods of Machine Learning, classification and regression. Empirical risk minimization, separation of data, generalisation, overfitting, optimisation. Model and variable selection, cross-validation, regularization. Ethical considerations : privacy and fairness. Linear regression, ridge, lasso. Regression trees, k-nearest neighbors, support vector machines, kernel methods, decision trees, perceptron, neural networks, boosting, clustering, and PCA.
  Details : 2×3h Workshops, 2×9h IT practicals, taught in french, groups of 20 students. Professor : Vianney Perchet

- **Differentiable Optimization (1st year engineers/L3).**
  Syllabus : Convexity, existence and uniqueness of solutions, operations on convex sets, optimality conditions (Kantorovich, Lagrange, KKT, etc.). Tangent cone, duality, conjugation, subdifferentiability. Descent algorithms, Newtonian algorithms, quasi-Newtonian algorithms. Linear optimization, successive quadratic optimization, penalization.
  Details : 2×16h30 TD, taught in French, groups of 20 students. Professor : Arnak Dalalyan. Advice on the syllabus, grading of midterms.

- **Introduction to Statistical Learning (Master at Ecole Polytechnique).**
  Syllabus : Concepts of statistical learning, regression, classification, accuracy, interpretability, bias-variance trade-off. Model evaluation, cross-validation, visualizations, model selection. Linear regression, logistic regression, generalized linear models, discriminant analysis, ridge and lasso regression, decision trees, support vector machines, neural networks. Unsupervised learning, clustering, PCA.
  Details : 8h IT practicals (python, sklearn), taught in English, 5 students. Professors : Nicolas Schreuder & Anthony Strittmatter. Creation of the IT practicals, advice on the syllabus, grading of final projects.

S1 '23 - '24 | ATER, ENSAE, Palaiseau, France

- **Statistics 1 (2nd year engineers/M1).**
  Syllabus : General principles of statistics, frequentist and Bayesian approaches, types of statistical models. Sampling, estimation, method of moments, maximum likelihood estimation, Bayesian estimator (subjective and objective). Hypothesis testing, simple tests, asymptotic tests, goodness-of-fit tests, student's t-test. Computational statistics, EM algorithm, bootstrap, Gibbs sampler.
  Details : 2×16h30 workshops, taught once in French and once in English, groups of 20 students. Professors : Arnak Dalalyan (FR) & Azadeh Khaleghi (EN). Grading of Midterms, creation of language guide to mathematics in English.

- **Applied Statistical Learning (M2)**
  Syllabus : Introduction to statistical learning, classification, perceptron algorithm, empirical risk minimization, generalization error, guarantees on generalization, VC dimension. Margin of a classifier, support vector machines, primal and dual problems, kernel methods. Model evaluation, cross-validation, hyperparameter selection.
  Details : 4h30 Wwrkshops + 4h30 IT practicals (python, sklearn), taught in French, group of 25 students. Professor : Azadeh Khaleghi. Creation and typing up in LaTeXof solutions, grading coursework.

- **Advanced Machine Learning (M2)**
  Syllabus : Theory of classification, high probability generalization bounds, VC dimension. Rademacher complexity, covering numbers, and convexification of binary classification losses. Logistic regression, random forests, support vector machines, kernel methods, neural networks. Data preprocessing, cross-validation, hyperparameter selection, model evaluation.
  Details : 4h30 workshops + 4h30 IT practicals (python, sklearn, PyTorch), taught in mixed English/French, group of 30 students. Professor : Austin J. Stromme. Creation and typing up in LaTeXof solutions, review of Labs, grading of final projects.

Organisational Responsibilities

FairPlay Reading Group — Aug. '23 – Aug. '24

Organizing a reading group for about fifteen people. Planning, including managing scheduling constraints, room booking. Scientific program, including book selection, pedagogical breakdown, and chapter distribution.

FairPlay Autumn School June '23 – Oct. '23

Advising and supporting the organization of a 3-day retreat for 25 researchers (faculty, postdocs, Ph.D. students) based on the experience from the following point.

CEREMADE Young Researchers' Winter School Oct. '21 – Mar. '22

Web Page

Organizing a 5-day retreat for 30 young researchers in applied mathematics. Budget management, including accommodation and transportation selection, requesting and comparing quotes, and obtaining funding. Organizing the scientific program, including format choices, thematic composition, speaker selection, registration and logistical management. As part of a three-person organizing committee.

Criteo AI Lab Ph.D. Seminar '19 – '20

Organizing a seminar for Ph.D. students, including planning, speaker selection, and inviting external speakers. Setting up and managing a virtual solution (COVID-19).

Ph.D. Committee

Mathieu Rosenbaum, Président, PU École Polytechnique.
Jean-François Chassagneux, rapporteur, PU Université Paris Cité.
Vianney Perchet, rapporteur, PU ENSAE.
Pierre Cardaliaguet, examinateur, PU Université Paris-Dauphine.
Marc Hoffmann, examinateur, PU Université Paris-Dauphine.
Charles-Albert Lehalle, examinateur, Global head - quantitative research & development, Abu Dhabi investment authority.
Athena Picarelli, examinatrice, Associate professor, Università di Verona.
Bruno Bouchard, directeur, PU Université Paris-Dauphine.

Participation in Scientific Events

Conferences

Dec. '23	**From matchings to markets. A tale of Mathematics, Economics and Computer Science**, CIRM, Luminy
Sept. '23	**EWRL 2023**, Vrije Universiteit Brussels, Bruxelles, Belgique.
June. '23	**FiME Summer School on Big Data and Finance**, Centre Paul Langevin, Aussois, France.
Sept. '22	**Advances in Stochastic Control and Optimal Stopping with Applications in Economics and Finance**, CIRM, Luminy.
June '21	**Summer School "Distributed control : Decentralization and Incentives"**, CIRM, Luminy.
Dec. '20	**CMStatistics 2020**, Virtuel.
Jui. '20	**ICML2020**, Virtuel.

Reading Groups

Jan. '24 - Mar. '24	**FairPlay Reading Group**, An Introduction to Queueing Theory : Modeling and Analysis in Applications, U. N. Bhat
Sep. '23 - Jan. '24	**FairPlay Reading Group**, Introduction to Random Graphs, A. Frieze & M. Karonski
Mar. '23 - June '23	**FairPlay Reading Group**, Computational Aspects of Cooperative Game Theory, G. Chalkiadakis, E. Elkind, & M. Wooldridge
Feb. '23 - Mar. '23	**FairPlay Reading Group**, Online Nonstochastic Control, E. Hazan & K. Singh
Sep. '22 - Jan. '23	**FairPlay Reading Group**, Lectures on BSDEs, Stochastic Control, and Stochastic Differential Games with Financial applications, R. Carmona.
Mar. '22 - Jul. '22	**FairPlay Reading Group**, Beyond the Worst-Case Analysis of Algorithms, T. Roughgarden Ed.
Jan. '22 - Mar. '22	**Criteo Reading group** Markov decision processes : discrete stochastic dynamic programming, M. L. Puterman
Sep. '19 - Jan. '20	**Criteo Ph.D. Students Reading Group**, Computational Optimal Transport, G. Peyré & M. Cuturi

Seminars

'20-'23	**Analysis-Probability Seminar**, CEREMADE, Université Paris-Dauphine.
'20-'23	**Probability-Statistics Seminar**, CEREMADE, Université Paris-Dauphine.
'21-'23	**FDD-FiME Seminar**, Institut Henri Poincaré.
'21-'23	**Young Researchers' Seminar**, CEREMADE, Université Paris-Dauphine.
'19-'20	**Ph.D. Students' Seminar**, Criteo AI Lab.

Reviewing

- International Conference on Machine Learning, Reviewer 2020, 2021
- International Colloquia on Automata, Languages and Programming (ICALP), Reviewer 2022
- Journal of Optimisation Theory and Applications, Reviewer
- Dynamic Games And Applications, Reviewer
- Finance and Stochastics, Reviewer

Languages

French
English

Code

- Python
- R
- LaTeX
- Jekyll