Anas Barakat

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EDUCATION

Institut Polytechnique de Paris, Télécom Paris, France Oct. 2018 - Dec. 2021
Ph.D. in Applied Mathematics and Computer Science
Advisors: Prof. Pascal Bianchi and Prof. Walid Hachem
Thesis: Contributions to non-convex stochastic optimization and reinforcement learning.

Université Paris Saclay, France Sep. 2017 - Jun. 2018
M.Sc. in Data Science (with highest honors)

Télécom Paris, France Sep. 2015 - Sep. 2018
Engineering Degree, M.Sc. in Applied Mathematics and Computer Science
Machine Learning track
Top 5% ranking in one of the top french engineering schools

Lycée Stanislas, Paris, France Sep. 2013 - Jul. 2015
Classes préparatoires (intensive courses of Mathematics and Physics)
Post-secondary studies leading to the nationwide highly competitive exam
for admission to a graduate-level engineering school ("Grande Ecole")

PUBLICATIONS

1. **Anas Barakat**, Pascal Bianchi and Julien Lehmann, "Analysis of a Target-Based Actor-Critic Algorithm with Linear Function Approximation." *Under Review*, 2021. https://arxiv.org/pdf/2106.07472.pdf

2. **Anas Barakat**, Pascal Bianchi, Walid Hachem, and Sholom Schechtman, "Stochastic optimization with momentum: convergence, fluctuations, and traps avoidance." In: *Electronic Journal of Statistics 15 (2), 3892-3947*, 2021. https://doi.org/10.1214/21-EJS1880

3. **Anas Barakat** and Pascal Bianchi, "Convergence and Dynamical Behavior of the Adam Algorithm for Non-Convex Stochastic Optimization." In: *SIAM Journal on Optimization 31 (1), 244-274*, 2021. https://doi.org/10.1137/19M1263443

4. **Anas Barakat** and Pascal Bianchi, "Convergence Rates of a Momentum Algorithm with Bounded Adaptive Step Size for Nonconvex Optimization." In: *Proceedings of The 12th Asian Conference on Machine Learning (ACML), PMLR vol.129, 225-240*, 2020. http://proceedings.mlr.press/v129/barakat20a.html

5. **Anas Barakat** and Pascal Bianchi, "Convergence de l'algorithme Adam du point de vue des systèmes dynamiques." In: *The 27th Francophone Colloquium of Signal and Image Processing (GRETSI)*, 2019.

PRESENTATIONS

Scientific Talks

Stochastic optimization with momentum: convergence, fluctuations, and traps avoidance.

- Invited talk at the 14th CMStatistics International Conference Dec. 18th 2021
  Session: "Dynamical systems in machine learning" organized by Anna Korba.
  King's College, London, United Kingdom

Convergence and dynamical behavior of the ADAM algorithm for non-convex stochastic optimization.

- Invited Seminar: "Image, Optimization and Probabilities" research group — Oct. 15th 2020
  Bordeaux Institute of Mathematics (IMB), Bordeaux, France
- 2nd Symposium on Machine Learning and Dynamical Systems — Sep. 21st 2020
  Fields Institute for Research in Mathematical Sciences, online
- Mathematical Optimization and Decision (MODE) group days — Sep. 7th 2020
  French Society of Applied and Industrial Mathematics (SMAI), online
- Mathematics of Optimization and Applications (MOA) annual days — Oct. 17th 2019
  National Institute of Applied Sciences (INSA), Rennes, France

Convergence of the ADAM algorithm from a dynamical systems viewpoint.

- Junior Conference on Data Science and Engineering — Sep. 12th 2019
  Centrale Supélec, Gif-sur-Yvette, France
- Francophone colloquium of Signal and Image Processing (GRETSI) — Aug. 29th 2019
  Lille University, Lille, France

Posters

Convergence analysis of a momentum algorithm with adaptive step size for non-convex optimization.

- 11th OPT Workshop on Optimization for Machine Learning — Dec. 14th 2019
  Exchange Hotel Vancouver, Vancouver, Canada

Convergence of the ADAM algorithm from a dynamical systems viewpoint.

- International Workshop on Machine Learning and Artificial Intelligence — Oct. 8th 2019
  Télécom Paris, Paris, France
- Machine Learning in the Real World workshop — Oct. 2nd 2019
  Criteo, Paris, France
- International Conference on Continuous Optimization (ICCOPT) — Aug. 5th 2019
  Technical University (TU) of Berlin, Berlin, Germany
- Data Science Summer School (DS3) — Jun. 24th 2019
  Ecole Polytechnique, Palaiseau, France

ACADEMIC SERVICE

Reviewer for:
Systems & Control Letters,
25th International Conference on Artificial Intelligence and Statistics (AISTATS 2022),
IEEE Transactions on Image Processing journal.

Workshop organization:
Main organizer of an online half-day RL workshop with 5 invited speakers for industrial partners (Airbus Defence & Space, Engie, Idemia, Safran and Valeo) of the Data Science & Artificial Intelligence for Digitalized Industry & Services research and teaching chair.

RESEARCH INTERNSHIP

Télécom Paris — Apr. 2018 - Sept. 2018
Topic: Adaptive gradient algorithms for first-order optimization
Supervisor: Prof. Pascal Bianchi
Funding: French National Research Center (CNRS)

TEACHING EXPERIENCE

Télécom Paris 2018-2021
Teaching assistant: conducted exercises sessions, gave few lectures, supervised lab sessions, evaluated students projects and graded final exams.

- Optimization for Machine Learning (SD-TSIA211), 3 x 12 h, 32 master students 2018-2021
  Instructors: Profs. Pascal Bianchi and Olivier Fercoq
- Statistics (MDI220), 2 x 8 h, 32 master students 2018-2020
  Instructors: Profs. Anne Sabourin and Pavlo Mozharovskyi
- Statistics: Linear Models (SD204), 2 x 8 h, 32 master students 2019-2020
  Instructor: Prof. François Portier
- Probabilities (MDI104), 21 h, 30 undergraduate students 2018-2020
  Instructor: Prof. Pascal Bianchi
- Machine Learning (MDI343-724), 15 h, 120 Big Data specialized master students 2018-2019
  Instructors: Profs. Florence d'Alché Buc and Pavlo Mozharovskyi

MENTORING EXPERIENCE

- Co-supervision of a Master student research internship (Julien Lehmann) May 2021 - Oct. 2021
- Supervision of two Master students final research and innovation project Oct. 2018 - Feb. 2019
  6-months project of Yuqing Wang and Zhengkang Shi
  Collaboration: XLearn startup
  Topic: Development of an online job advising system
  Learning skill titles' from users' profiles using Machine Learning methods
- Tutoring undergraduate students in computer science Oct. 2017 - Sep. 2018
  (individually and group of 10)
  Design and Analysis of Algorithms (INF421), Advanced Programming (INF441)
  Ecole Polytechnique, Palaiseau, France

AWARDS AND SCHOLARSHIPS

- Dodu Prize http://smai.emath.fr/spip.php?article624&lang=en Sep. 9th 2020
  Best communication of a young researcher at the Optimization and Decision annual days, French Society of Applied and Industrial Mathematics (SMAI)
  Jury: M. Akian, P. Bich, J. Bolte, J-B. Caillau, S. Gaubert, V. Leclere, P. Mertikopoulos, F. Santambrogio (president of the jury), H. Zidani
- Ph.D funding Oct. 2018 - Oct. 2021
  Mines-Télécom Institute (IMT), Future & Disruptive technologies research program
  Awarded to top 5% students of Télécom Paris.
- Merit Scholarship Sep. 2015 - Sep. 2018
  Moroccan Ministry of Higher Education, Scientific Research and Professional Training
  Awarded to students in top french engineering and business schools.
- "Excellence-Major" scholarship Sep. 2013- Sep. 2015
  Agency for French Education Abroad (AEFE)
  Awarded by the French Ministry for Europe and Foreign Affairs to top foreign (non french) students from french high schools all over the world for pursuing high-level studies in France

COMPUTER SKILLS

Python (scikit-learn, numpy, scipy, pandas, keras, PyTorch) for Machine Learning

LANGUAGES

Arabic (native), French (native), English (fluent), Spanish (working level).

HOBBIES

Classical music : violonist in the "Académie de Musique de Paris" orchestra conducted by Jean-Philippe Sarcos (50 musicians and more than 100 singers), music theory diploma and violin diploma.

REFERENCES

Prof. Pascal Bianchi
Professor in the Image, Data and Signal Department in the Signal, Statistics and Learning group at Télécom Paris, Institut Polytechnique de Paris
Email: pascal.bianchi@telecom-paris.fr

Prof. Walid Hachem
Research director at the French National Research Centre (CNRS), Gustave Eiffel University, Gaspard Monge Computer Science Laboratory (LIGM)
Email: walid.hachem@univ-eiffel.fr