

# Anas Barakat

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## EDUCATION

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<b>Institut Polytechnique de Paris, Télécom Paris</b> <b>Ph.D. in Applied Mathematics and Computer Science</b> Thesis: Contributions to non-convex stochastic optimization and reinforcement learning. Advisors: Prof. Pascal Bianchi and Prof. Walid Hachem	2018 - 2021
<b>Université Paris Saclay</b> <b>M.Sc. in Data Science</b> (with highest honors)	2017 - 2018
<b>Télécom Paris</b> <b>M.Sc. in Applied Mathematics and Computer Science</b> , Engineering Degree Machine Learning track Top 5% ranking in one of the top french engineering schools	2015 - 2018
<b>Lycée Stanislas, Paris</b> 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”)	2013 - 2015

## PUBLICATIONS

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### Preprints

Anas Barakat, Pascal Bianchi and Julien Lehmann.

**Analysis of a Target-Based Actor-Critic Algorithm with Linear Function Approximation.**  
*Under Review*, 2021.

### Journal and peer-reviewed conference papers

Anas Barakat, Pascal Bianchi, Walid Hachem, and Sholom Schechtman.

**Stochastic optimization with momentum: convergence, fluctuations, and traps avoidance.**  
*Electronic Journal of Statistics* 15 (2), 3892-3947, 2021.

Anas Barakat and Pascal Bianchi.

**Convergence and Dynamical Behavior of the Adam Algorithm for Non-Convex Stochastic Optimization.**

*SIAM Journal on Optimization* 31 (1), 244-274, 2021.

Anas Barakat and Pascal Bianchi.

**Convergence Rates of a Momentum Algorithm with Bounded Adaptive Step Size for Nonconvex Optimization.**

*Proceedings of The 12th Asian Conference on Machine Learning (ACML)*, vol.129, 225-240, 2020.

Anas Barakat and Pascal Bianchi.

**Convergence de l’algorithme Adam du point de vue des systèmes dynamiques.**

*The 27th Francophone Colloquium of Signal and Image Processing (GRETSI)*, 2019.

### Thesis

Anas Barakat.

**Contributions to non-convex stochastic optimization and reinforcement learning.**

PhD dissertation, Institut Polytechnique de Paris, 2021

## PRESENTATIONS

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### Talks

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

- 20 Dec 2021: Invited talk, 14th CMStatistics International Conference  
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.”

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

“Convergence of the ADAM algorithm from a dynamical systems viewpoint.”

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

### Posters

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

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

“Convergence of the ADAM algorithm from a dynamical systems viewpoint.”

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

## PROFESSIONAL SERVICE

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### **Reviewer for:**

*Systems & Control Letters,*

*International Conference on Artificial Intelligence and Statistics (AISTATS): 2022,*

*IEEE Transactions on Image Processing journal.*

### Workshop Organizer:

RL workshop 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

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### 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

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### Télécom Paris

2018 - 2021

Tutor for the courses:

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

### Ecole Polytechnique

2017 - 2018

Tutor for undergraduate students in Computer Science:

- Design and Analysis of Algorithms (INF421)
- Advanced Programming (INF441)

## MENTORING EXPERIENCE

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- 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

## AWARDS AND SCHOLARSHIPS

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- 9 Sep 2021: Dodu Prize <http://smi.emath.fr/spip.php?article624&lang=en>  
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. Caillaud, S. Gaubert, V. Leclerc, P. Mertikopoulos, F. Santambrogio (president of the jury), H. Zidani
- 2018-2021: Ph.D funding  
Mines-Télécom Institute (IMT), Future & Disruptive technologies research program  
Awarded to top 5% students of Télécom Paris.

- 2015-2018: Merit Scholarship  
Moroccan Ministry of Higher Education, Scientific Research and Professional Training  
Awarded to students in top french engineering and business schools.
- 2013-2015: “Excellence-Major” scholarship  
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

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

## LANGUAGES

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

## HOBBIES

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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

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### **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](mailto:pascal.bianchi@telecom-paris.fr)

### **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](mailto:walid.hachem@univ-eiffel.fr)