

# Anas Barakat

Ph.D. Student

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## Education

- october 2018– **Doctor of Philosophy Degree in preparation**, *IP Paris, Télécom Paris*, Paris.  
Dynamical study of optimization algorithms in random environments.  
Supervised by Prof. Pascal Bianchi and Dr. Walid Hachem.
- 2017–2018 **Master of Science in Data Science (M2)**, *Université Paris Saclay*, Paris, *Highest honors*.  
International Masters program jointly operated by Ecole Polytechnique and Télécom ParisTech, in collaboration with ENSAE and Université Paris-Sud.
- 2015–2018 **Master of Science, Engineer Degree**, *Télécom ParisTech*, Paris, top 5% ranking.  
Data science, applied mathematics, advanced probabilities and statistics, stochastic calculus, computer science
- 2013–2015 **Preparatory classes**, *Lycée Stanislas*, Paris.  
Post-secondary studies leading to the nationwide highly competitive exam for admission to a graduate-level Engineering School (“Grande Ecole”), Intensive courses of Mathematics and Physics
- 2013 **International Baccalaureate**, *Lycée Descartes*, Rabat, Morocco, *with high honors*.  
Merit scholarship

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## Experience

- 4/2018-9/2018 **Research Internship**, *Télécom ParisTech*, Paris.  
Studied adaptive optimization algorithms for Machine Learning applications.  
Supervised by Prof. Pascal Bianchi.  
Funded by the CNRS - Gaspard-Monge Computer Science Laboratory (LIGM), Paris-Est Marne-La-Vallée University.
- 3/2017 **Athens Program**, *Technical University of Delft*, Delft, Netherlands.  
European Student Exchange  
Implemented Finite Elements Algorithms to solve differential equations in MATLAB.
- 11/2016 **Athens Program**, *Technical University of Munich*, Munich, Germany.  
European Student Exchange  
Implemented failure probabilities computation for systems to estimate structural reliability (Monte-Carlo estimation) in MATLAB.

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## Publications

1. A. B. , Pascal Bianchi, Walid Hachem, and Sholom Schechtman. Stochastic optimization with momentum: convergence, fluctuations, and traps avoidance, *submitted*, arxiv:2012.04002.
2. A.B. and Pascal Bianchi. Convergence and Dynamical Behavior of the Adam Algorithm for Non-Convex Stochastic Optimization, to appear in *SIAM Journal on Optimization*, 2020, arXiv:1810.02263.
3. A.B. and Pascal Bianchi. Convergence Rates of a Momentum Algorithm with Bounded Adaptive Step Size for Nonconvex Optimization, *ACML 2020*, in *PMLR vol.128* p.225-240.

4. A.B. and Pascal Bianchi. Convergence de l'algorithme Adam du point de vue des systèmes dynamiques, *GRETSI 2019*.

## Talks

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

Oct. 15th 2020 **Invited talk at the seminar of the 'Image, Optimization and Probabilities' team**, Institut de Mathématiques de Bordeaux.

Sep. 21st 2020 **2nd Symposium on Machine Learning and Dynamical Systems**, Fields Institute, online.

Sep. 7th 2020 **SMAI MODE days**, Paris Saclay, online.

Laureate of the Dodu Prize for the best communication of a young researcher at the conference.

Oct. 17th 2019 **GdR Mathematics of Optimization and Applications (MOA) annual days 2019**, INSA, Rennes, France.

*Convergence of the ADAM Algorithm from a Dynamical Systems Viewpoint.*

Sep. 12th 2019 **JDSE 2019**, Centrale Supélec, Gif-sur-Yvette, France.

Aug. 29th 2019 **GRETSI 2019**, Université de Lille, Lille, France.  
(in french), oral presentation of the paper

## Posters

*Convergence Analysis of a Momentum Algorithm with Adaptive Step Size for Non-convex Optimization.*

Dec. 14th 2019 **11th OPT Workshop on Optimization for Machine Learning 2019**, Vancouver, Canada.

*Convergence of the ADAM Algorithm from a Dynamical Systems Viewpoint.*

Oct. 8th 2019 **International Workshop on Machine Learning and Artificial Intelligence (MLAI)**, Télécom Paris, Paris, France.

Oct. 2nd 2019 **Machine Learning in the Real World workshop**, Criteo, Paris, France.  
Spotlight Talk and Poster

Aug. 5th 2019 **ICCOPT 2019**, TU Berlin, Berlin, Germany.

Jun. 24th 2019 **Data Science Summer School (DS3)**, Ecole Polytechnique, Palaiseau, France.

## Academic Service

Reviewer for IEEE Transactions on Image Processing journal.

## Teaching and Tutoring Experience

I am a Teaching assistant at Télécom Paris. Since september 2018, I conduct exercises sessions, give few lectures, supervise lab sessions, evaluate students projects and grade final exams. I am in particular involved in the following courses (more than 128 hours) :

2018–2020 **Optimization for Machine Learning**, Télécom Paris, SD-TSIA211.

32 master students,  $2 \times 12$  hours

Topics: convex analysis, gradient descent, proximal point method, proximal gradient method, stochastic gradient descent, duality, ADMM.

- 2018–2020 **Statistics**, *Télécom Paris*, MDI220.  
32 master students,  $2 \times 8$  hours  
Topics: point estimation, quadratic risk, bias-variance tradeoff, Fisher information, Cramér-Rao bound, bayesian model, statistical tests, confidence intervals.
- 2019–2020 **Statistics : Linear Models**, *Télécom Paris*, MDI220.  
32 master students,  $2 \times 8$  hours  
Topics: ordinary least-squares, confidence intervals and hypothesis testing, ridge regularization, Lasso.
- 2018–2020 **Probabilities**, *Télécom Paris*, MDI104.  
30 undergraduate students, 21 hours  
Topics: discrete probabilities, discrete Markov chains, measure theory, integration, random variables, independence, characteristic function, gaussian vectors, conditional expectation, convergence of random variables.
- 2018–2019 **Machine Learning**, *Télécom Paris*, MDI343-724, 15 hours.  
120 Big Data Specialized Master students.  
Topics: Rosenblatt's Perceptron, SGD, SVM classification and regression, ensemble learning, neural networks, unsupervised learning, time series.
- 2017–2018 **Tutoring**, *Ecole Polytechnique*, Paris.  
Tutored 2nd year students (individually and group of 10) in computer science (INF421: Design and Analysis of Algorithms, INF441: Advanced Programming)
- 2018–2019 **Project of Research and Innovation for Masters**, *Télécom Paris*.  
Supervised two 2nd year master students (Yuqing Wang and Zhengkang Shi) for their 6-months project in collaboration with the startup XLearn and evaluated their report and oral defense.  
Subject: Development of an online job advising system : learning skill titles' relations based on users' profiles using Machine Learning methods.

## Scholarships and Awards

- 2020 **Dodu Prize**, *SMAI MODE days*, Best communication of a young researcher at the conference.  
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– **Ph.D funding**, *Mines-Télécom Institute (IMT)*.  
Future & Disruptive technologies research program, awarded to top 5% students.
- 2015–2018 **Merit Scholarship**, *Moroccan Ministry of Higher Education, Scientific Research and Professional Training*.  
for students who reached top french engineering and business schools ('Grandes Ecoles').
- 2013–2015 **'Excellence-Major' scholarship**, *Agency for French Education Abroad (AEFE)*.  
for foreign (non french) students who passed a baccalaureate degree in French high school with highest honors and planned to pursue high-level studies in France.

## Projects

2017-2018 **Data challenges**, *Télécom ParisTech*, Paris.

- **Prediction of the watching duration of advertising videos** : Designed a learning model using XGBoost algorithm for prediction from data provided by Teads online advertising company.
- **Acoustic Scene Classification** : Ranked in the top 10 (/80) of a Kaggle-like data challenge consisting of multi-class classification, "environment" recognition from a set of 1170 audio files (30 seconds each one) corresponding to 15 classes, using neural networks in Python (scikit-learn, keras).
- **Gender classification** : Participated to a Kaggle-like data challenge consisting of predicting a person's gender using features extracted from his/her photo. Data were provided by Morpho company.

2015–2016 **Smart Green House**, *Télécom ParisTech*, Paris.

Participated to a one-year project with a team of seven students to design an autonomous greenhouse to take care of plants. Tested the structure and implemented the client-server communication.

6/2016 **Quality Tester of Random Generated Numbers**, *Télécom ParisTech*, Paris.

Implemented in Python a program with a graphical interface to estimate the quality of random generated numbers using algorithms based on statistics.

## Computer skills and certifications

Designed programs and implemented algorithms for data mining, statistical purposes, and machine learning concerns using Python (scikit-learn, numpy, scipy, pandas, keras, PyTorch), R, MATLAB, developed programs in Java, C++.

8/2017 **Machine Learning by Stanford University**, *online course*, coursera.

## Work Experience

summer 2016 **Worker Internship**, *Algodonera Paso Viejo*, Cordoba, Argentina.

Assisted the textile production, delivered orders and received customers in a Spanish speaking environment.

## Languages

Arabic Native

French Native

English Fluent (C2)

Spanish Working level (C1)

*Working language*

*Experience in Argentina*

## Hobbies

- **Classical music** : violonist in the "Académie de Musique de Paris" orchestra conducted by Jean-Philippe Sarcos (50 musicians and more than 100 singers) since 2015, Music theory diploma and violin diploma (9 years).
- **Sports**: horseback riding (first certificate in galloping and jumping in 2010), Brown belt in Full Contact (combat sport) in 2008, Swimming in a professional club.