# BAPTISTE GOUJAUD

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## EDUCATION

**Ecole Polytechnique** *Palaiseau, France*
*PhD candidate in Optimization* *Oct. 2020 – Apr. 2024*
- Supervision: Aymeric Dieuleveut, Adrien Taylor.

**Ecole normale supérieure de Cachan** *Cachan, France*
*Master of Science in Applied Mathematics: MVA* *2016 – 2017*
*Master of Science in Fundamental Mathematics leading to "Agrégation de mathématiques"*, ranked $18^{th}$ nationally *2014 – 2016*
*Bachelor of Mathematics* *2013 – 2014*
*Bachelor of Computer science* *2013 – 2014*

## EXPERIENCE

**Ecole Polytechnique** *Palaiseau, France*
***Doctoral Research Assistant**, advised by Aymeric Dieuleveut and Adrien Taylor* *Oct. 2020 – Apr. 2024*
- *Research Area*: Numerical optimization, first-order algorithms, and systematic approaches to performance analyses and design of practical algorithms.
- 8 research papers, 1 tutorial paper, and 1 blog post listed in the "Publications" section.
- Developed the python package PEPit to ease the discovery of performance guarantees for numerical optimization.
  ↳ **Downloaded more than 20k times with pip.**
- Co-organized the workshop PEP talks uniting researchers on the topic of performance certification for numerical optimization.

***Teaching assistant***
- Statistics, Machine Learning, Deep Learning, Optimization, Python, R, Scikitlearn, Keras, PyTorch.

**Montreal Institute for Learning Algorithms (MILA)** *Montreal, Canada*
***Research engineer**, advised by Ioannis Mitliagkas* *2019 – 2020*
- *Research Area*: Optimization for Machine Learning
- Published the paper A Study of Condition Numbers for First-Order Optimization at AISTATS2021.

**Montreal Institute for Learning Algorithms (MILA)** *Montreal, Canada*
***Research engineer**, advised by Yoshua Bengio* *2018 – 2019*
- *Research Area*: Deep Learning, Continual Learning
- Published the paper Gradient-based sample selection for online continual learning at NeurIPS2019.

**Apple, Advanced Computation Group** *Paris, France*
***Machine Learning Research Intern**, advised by Bruno Conejo* *2017 – 2018*
- *Research Area*: Computer Vision, Dense Image Registration, Deep Learning, Optimization
- Developed the Portrait mode deployed on iOS12, iphone Xs and Xs max.

**Owkin** *Paris, France*
***Machine learning research intern*** *Apr. – Sep. 2017*
- *Research Area*: Statistics, Clinical trials
- Published the paper Robust Detection of Covariate-Treatment Interactions in Clinical Trials at ISCBASC2018.

## SUPERVISION

**Damien Ferbach**, CMAP, Ecole Polytechnique *Apr. – Sep. 2023*
- ENS Ulm's final year (M.Sc.) internship on aligning Neural networks, in cosupervision with Aymeric Dieuleveut.
- Published the paper Proving linear mode connectivity of neural networks via optimal transport at AISTATS2024.

**Darya Todoskova**, CMAP, Ecole Polytechnique *Apr. – Sep. 2023*
- Bachelor thesis supervision on proof techniques in first-order optimization.

## SELECTED HONORS AND AWARDS

*Top reviewer* at NeurIPS 2022 *2022*
*Best student paper award* in the Workshop OPT20 at NeurIPS *2020*
*Ranked* $18^{th}$ at the "agrégation de mathematiques" *2016*

## TEACHING EXPERIENCE

**Université Catholique de Louvain, Performance certification for numerical optimization** *Summer 2022*
- TraDE-OPT Doctoral summer school
- Computer-assisted proofs of performance certification for numerical optimization.
- Link to practical exercises.

**Ecole Polytechnique, MAP545 Deep Learning and Optimization** *Winter 2021, Winter 2022, Winter 2023*
- Master X-HEC Data science for business (DSB)
- Deep learning with Keras and PyTorch and Optimization with Python.

**Ecole Polytechnique, MAP531 Statistics with R** *Fall 2022*
- Master X-HEC Data science for business (DSB)
- Statistics, hypothesis testing, bayesian statistics, R.

**Ecole Polytechnique, MAP534 Machine Learning** *Fall 2020, Fall 2021*
- Master X-HEC Data science for business (DSB)
- Machine Learning from Linear regression to random forest, python and scikitlearn.

**Ecole Polytechnique, MAP361P Python** *Spring 2021, Spring 2022, Spring 2023*
- First year Polytechnique engineering course
- Introduction to Python, numpy, matplotlib.

**Lycée Blaise Pascal, Khôlles** *2014-2015, 2016-2017*
- First year (MPSI) and second year (MP)
- Mathematics.

## PUBLICATIONS *: co-first author

### Preprints

Provable non-accelerations of the heavy-ball method.
Goujaud B., Taylor A., Dieuleveut A. (2023).

Optimal first-order methods for convex functions with a quadratic upper bound.
Goujaud B., Taylor A., Dieuleveut A. (2022).

### Journal publications

PEPit: computer-assisted worst-case analyses of first-order optimization methods in Python. Minor revision in Math. Prog. C
Goujaud B., Moucer, C., Glineur F., Hendrickx J., Taylor A., Dieuleveut A. (2024). Also presented in TRADEOPT2022, ICCOPT2022, LOL2022.

Counter-examples in first-order optimization: a constructive approach. L-CSS
Goujaud B., Dieuleveut A., Taylor A. (2023). Also presented at FoCM23, SIAMOP23 and CDC2023.

### Peer-reviewed conference proceedings

Proving linear mode connectivity of neural networks via optimal transport. AISTATS2024
Ferbach D., Goujaud B., Gidel G., Dieuleveut A. (2024)

On Fundamental Proof Structures in First-Order Optimization. CDC2023
Goujaud B., Dieuleveut A., Taylor A. (2023).

Gradient descent is optimal under lower restricted secant inequality and upper error bound. NeurIPS2023
Guille-Escuret C., Ibrahim A., Goujaud B., Mitliagkas I. (2023).

Super-acceleration with cyclical step-sizes. AISTATS2022
Goujaud B., Scieur, D., Dieuleveut A., Taylor A., Pedregosa F. (2022).

A Study of Condition Numbers for First-Order Optimization. AISTATS2021
Guille-Escuret C.*, Goujaud B.*, Girotti M., Mitliagkas I. (2021) Also presented at OPT20.

Gradient-based sample selection for online continual learning. NeurIPS2019
Aljundi R., Lin M., Goujaud B., Bengio Y. (2019).

Robust Detection of Covariate-Treatment Interactions in Clinical Trials. ISCBASC2018
Goujaud B., Tramel E., Courtiol P., Zaslavskiy M., Wainrib G. (2018).

**Peer-reviewed workshop paper**

Quadratic minimization: from conjugate gradient to an adaptive Heavy-ball method with Polyak step-sizes. OPT2022
Goujaud B., Taylor A., Dieuleveut A. (2022). Also under journal review.

**Blog post**

On the Link Between Optimization and Polynomials: Cyclical Step-sizes.
Goujaud B., Pedregosa F. (2022).

## SOFTWARE

- PEPit, a Python package available on PyPI, assisting in finding proofs of inequalities.
- Apple portrait mode on iOS12.

## RESEARCH TALKS

**Conference and invited talks**

- MIT Operations Research Center. *Heavy-ball does not accelerate* *May 2024*
- EURO2024, Copenhagen, Denmark. *Heavy-ball does not accelerate* *Jul. 2024*
- EUROPT2024, Lund, Sweden. *Heavy-ball does not accelerate* *Jun. 2024*
- CDC2023, Singapore. *On Fundamental Proof Structures in First-Order Optimization* *Dec. 2023*
- CDC2023, Singapore. *Finding Counter-Examples in First Order Optimization. Application to the Heavy-Ball Method* *Dec. 2023*
- SIAMOP23, Seattle, Washington, USA. *Finding Counter-Examples in First Order Optimization* *Jun. 2023*
- LOL2022, Marseille, France. *PEPit: a computer assistant to study first-order optimization methods* *Oct. 2022*
- ICCOPT2022, Bethlehem, Pennsylvania. *PEPit: a computer assistant to study first-order optimization methods* *Jul. 2022*
- TRADEOPT2022, Louvain-la-Neuve, Belgium. *PEPit: a computer assistant to study first-order optimization methods* *Jul. 2022*
- MLOPT, Montreal, Quebec, Canada. *Super-Acceleration with Cyclical Step-sizes* *Jun. 2021*

**Internal talks**

*Team building seminars*

- Hyeres, France. *Understanding proof structures in first-order optimization* *Mar. 2023*
- Font Romeu, France. *PEP: a general framework to study first-order optimization methods* *Mar. 2022*
- Marseille, France. *Super-Acceleration with Cyclical Step-sizes* *Jun. 2021*

*Simpas Group Meetings*

- Palaiseau, France. *Heavy-ball does not accelerate* *Mar. 2024*
- Palaiseau, France. *PEP: a general framework to study first-order optimization methods* *Oct. 2021*

## SERVICE

**Workshop organizer**

- PEP talks

**Knowledge diffusion**

- Participatory workshop in a high school as part of the MATh.en.JEANS association actions
- Outreach talk on mathematics applications in a high school

**Reviewer and Area Chair**

*Machine Learning journal reviewer*

- JMLR

*Machine Learning conference Area chair*

- AISTATS2023

*Machine Learning conference reviewer*

- AISTATS2022
- NeurIPS2023
- NeurIPS2022 (Top reviewer)
- NeurIPS2021
- L4DC 2024

*Optimization workshop reviewer*

- OPT23 at NeurIPS2023
- OPT22 at NeurIPS2022
- OPT21 at NeurIPS2021