Hugo Lebeau

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French, born in Amiens, 26 years old

Family and environmental considerations influence my career choices.

Research topics (PhD)

My PhD work is based on the **theory of large random matrices**, which serves as a tool to provide insights into complex clustering tasks such as data stream clustering, multi-view clustering and time-varying clustering. Most of the models considered fall within the study of **large random tensors** and their low-rank approximations.

Education

2021 – 2024 **Université Grenoble Alpes** – Laboratoire d'Informatique de Grenoble, France
PhD – Random Matrix Models for Very Large Data Processing
"Teaching in Higher-Education" track.
Supervision: Romain Couillet, Florent Chatelain.

2020 – 2021 **ENS Paris-Saclay** – Gif-sur-Yvette, France
Master MVA – Mathematics, Vision and Learning
With honors of the jury.

2017 – 2021 **ENSTA Paris** – Palaiseau, France
Diplôme d'Ingénieur – Applied Mathematics, Optimization and Data Science
Ranked in the top 5% among 150 students.

Publications

2024 **Asymptotic Gaussian Fluctuations of Eigenvectors in Spectral Clustering**
Hugo Lebeau, Florent Chatelain, Romain Couillet.
Submitted to *IEEE Signal Processing Letters*.

2024 **A Random Matrix Approach to Low-Multilinear-Rank Tensor Approximation**
Hugo Lebeau, Florent Chatelain, Romain Couillet.
Submitted to *Journal of Machine Learning Research (JMLR)*.

2024 **Performance Gaps in Multi-view Clustering under the Nested Matrix-Tensor Model**
Hugo Lebeau, Mohamed El Amine Seddik, José Henrique De Morais Goulart.
International Conference on Learning Representations (ICLR).

2023 **HOSVD Tronquée : Analyse d'une Approximation Tensorielle Rapide**
Hugo Lebeau, Romain Couillet, Florent Chatelain.
Colloque GRETSI.

2022 **Une analyse par matrices aléatoires du clustering en ligne : comprendre l'impact des limitations en mémoire**
Hugo Lebeau, Romain Couillet, Florent Chatelain.
Colloque GRETSI.

2022 **A Random Matrix Analysis of Data Stream Clustering: Coping With Limited Memory Resources**
Hugo Lebeau, Romain Couillet, Florent Chatelain.
International Conference on Machine Learning (ICML).

Research experience

April 2021 – September 2021 **Research Internship in Machine Learning** – GIPSA-lab, UGA
Supervision: Romain Couillet, Florent Chatelain.
Analysis of online learning using random matrix theory.

March 2020 – July 2020 **Research Internship in Image Processing** – CEA, Saclay, France
Supervision: Antoine Drouart.
Implementation of proximal algorithms to improve the quality of industrial neutron imaging.

May 2019 – June 2019 **Research Internship in Statistics** – Politecnico di Milano
Supervision: Laura Maria Sangalli.
Statistical and numerical methods for functional data on complex multidimensional domains.

Teaching experience

Spring 2022 – 2023 **Teaching assistant, Random Matrices and Learning (ENS Paris-Saclay, Master MVA)**
Graduate level – 9 hours
Introduction to the theory of large random matrices and their applications to machine learning.

Fall 2021 – 2023 **Teaching assistant, INF103: Introduction to Artificial Intelligence (UGA)**
Undergraduate level – 18 hours
Introduction to basic concepts of machine learning: datasets, classifiers, training, performance evaluation, data processing.

Spring 2023 **Teaching assistant, STA401: Statistics and Probabilities (UGA)**
Undergraduate level – 18 hours
Basics of probabilities, standard probability laws, descriptive statistics, estimation, hypothesis testing.

Fall 2022 **Teaching assistant, Introduction to Machine Learning (Grenoble INP, ENSE^3 & Master MARS)**
Graduate level – 18 hours
Overview of the main tools in machine learning: model assessment, discriminant analysis, PCA, GLM and penalization, clustering with EM and k-means, trees and random forests, deep learning.

Spring 2022 **Teaching assistant, INF201: Functional Programming (UGA)**
Undergraduate level – 36 hours
Introduction to functional programming with OCAML.

Industry experience

September 2019 – February 2020 **AXA Climate (Data Scientist Internship)** – Paris, France
Weather data modeling and risk assessment for parametric insurance pricing.

August 2018 **Hotel Mikazuki (Internship)** – Katsuura, Japan
Daily bed-making.

Talks and tutorials

June 2023 Truncated HOSVD: A Random Matrix Analysis
INFORMS APS Conference

November 2022 A Random Matrix Analysis of Data Stream Clustering: Coping With Limited Memory Resources
3IA Doctoral Workshop

Technical skills

Programming languages
Proficient in: Python
Familiar with: R, MATLAB, C, C++, OCaml

Software
LaTeX, Git

Languages
English (fluent), French (mother tongue), German (B2), Japanese (A2)

Other interests

I love trail running and regularly practice triathlon (swimming, cycling, running). I enjoy hiking and play the piano at a basic level, mostly for myself.