HUBERT LETERME

Postdoctoral Researcher in Astrostatistics

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🔗 hubert-leterme.github.io

EDUCATION

Postdoctoral Researcher in Astrostatistics

ENSICAEN (GREYC research institute) & CEA Paris-Saclay (Astrophysics Division)

📅 October 2023 – ongoing   📍 Caen, France

- **Advisors**: Jalal Fadili (ENSICAEN) and Jean-Luc Starck (CEA).

- **Topic**: Reconstruction of mass maps from shear measurements using deep learning techniques, with a specific emphasis on uncertainty quantification.

- **Project**: TOSCA project, focusing on weak lensing statistics for cosmology, which explores the synergies between Euclid and SKAO. The project includes three partners in France (CEA Paris-Saclay, Nice-Côte-d'Azur Observatory and ENSI-CAEN), and a collaboration with the University of Geneva.

PhD in Applied Mathematics and Computer Science

Université Grenoble Alpes & Inria, Laboratoire Jean Kuntzmann

📅 October 2019 – June 2023   📍 Grenoble, France

- **Advisors**:
  - Valérie Perrier (Grenoble INP, Université Grenoble Alpes);
  - Karteek Alahari (Inria, Université Grenoble Alpes);
  - Kévin Polisano (CNRS, Université Grenoble Alpes).

- **Topic**: A Complex Wavelet Approach for Shift-Invariant Convolutional Neural Networks.

- **Teams**: Joint project between EDP (partial differential equations) and Thoth (computer vision, machine learning).

- **Scholarships**: LabEx PERSYVAL-Lab (ANR-11-LABX-0025-01), funded by the French program Investissement d'avenir; ANR grant MIAI (ANR-19-P3IA-0003).

- **Thesis defense**: June 14th, 2023. Jury members:
  - Nelly Pustelnik (CNRS, ENS de Lyon) – reviewer;
  - François Malgouyres (Université Toulouse III - Paul Sabatier) – reviewer;
  - Massih-Reza Amini (Université Grenoble Alpes) – president;
  - Joan Bruna (New York University) – examiner;
  - Gabriel Peyré (CNRS, ENS Paris) – examiner.

MSc in Industrial and Applied Mathematics (MSIAM)

Université Grenoble Alpes, Grenoble INP Ensimag

📅 September 2018 – July 2019   📍 Grenoble, France

Resumption of studies after a few years of professional experience.

- **First semester**: Fundamentals of Data Science. Courses in machine learning and deep learning, Bayesian inference, signal and image processing (wavelets), model reduction, model selection, data assimilation, high performance computing.
- **Second semester**: Research internship at Laboratoire Jean Kuntzmann, Grenoble, under the supervision of Valérie Perrier and Karteek Alahari. Topic: Wavelet-Inspired Neural Networks and Application to Image Classification.

Graduate Engineering School

École Centrale Paris (now CentraleSupélec – Université Paris-Saclay)

📅 September 2009 – December 2012   📍 Paris, France

The diploma received from French institutes of technology is equivalent to a master's degree.

- **Main subject area**: Industrial Engineering and Operations Research.
- **Other topics**: Seminars on Operational Management.

Exchange Semester (Erasmus Program)
KTH Royal Institute of Technology

📅 January 2010 – June 2010   📍 Stockholm, Sweden

- **Main subject area**: School of Industrial Engineering and Management.

RESEARCH ACTIVITIES

Publications, Preprints, Reports

[1]   H. Leterme, K. Polisano, V. Perrier, and K. Alahari. "From CNNs to Shift-Invariant Twin Models Based on Complex Wavelets". Under review. 03/2023. arXiv: 2212.00394.

[2]   H. Leterme, K. Polisano, V. Perrier, and K. Alahari. "On the Shift Invariance of Max Pooling Feature Maps in Convolutional Neural Networks". Under review. 09/2022. arXiv: 2209.11740.

[3]   H. Leterme, K. Polisano, V. Perrier, and K. Alahari. "Modélisation Parcimonieuse de CNNs Avec Des Paquets d'Ondelettes Dual-Tree". In: *ORASIS*. 09/2021.

[4]   H. Leterme. "Wavelet-Inspired Neural Networks and Application to Image Classification". MSc thesis. Université Grenoble Alpes, 06/2019.

Software

[5]   H. Leterme. *WCNN, a Python Library for Shift-Invariant Twin Models Based on Complex Wavelets*. 2023. URL: `https://github.com/hubert-leterme/wcnn`.

Oral Communications and Poster Presentations

Mar. 2023	Conference "Interplay between AI and Mathematical Modelling in the Post-Structural Genomics Era", CIRM, Marseille, France. Poster presentation: "On the Shift Invariance of Max Pooling Feature Maps in CNNs."
Nov. 2022	3IA Doctoral Workshop, Grenoble, France. Co-organized by the four French Artificial Intelligence Interdisciplinary Institutes (ANITI, 3iA Côte d'Azur, MIAI and PRAIRIE). Poster presentation: "On the Shift Invariance of Max Pooling Feature Maps in CNNs."
Jun. 2022	Invited speaker at Rutgers University, New Jersey, USA. "How Shift Invariant Are Feature Extractors in CNNs?"
Jan. 2022	Team seminar (EDP), Laboratoire Jean Kuntzmann, Grenoble, France. Oral presentation: "Sparsifying Convolutional Layers with Dual-Tree Wavelet Packets."
Nov. 2021	Third edition of the International Collaborative Workshop of Université Grenoble Alpes, Ruhr-Universität Bochum and University of Tsukuba, virtual. Oral presentation: "Sparsifying Convolutional Layers with Dual-Tree Wavelet Packets."
Oct. 2021	Team seminar (Thoth), Villars de Lans, France. Oral presentation: "Sparsifying Convolutional Layers with Dual-Tree Wavelet Packets."
Sep. 2021	ORASIS, French-speaking conference for young researchers in computer vision, Toulouse area, France. Presentation of accepted paper [3].
Juil. 2021	PAISS – PRAIRIE/MIAI Artificial Intelligence Summer School, virtual. Poster presentation: "Sparsifying Convolutional Layers with Dual-Tree Wavelet Packets."
Juil. 2020	Reading group on graph wavelets, Laboratoire Jean Kuntzmann, virtual. Paper presentation on graph convolutional neural networks: M. Defferrard, X. Bresson, and P. Vandergheynst. "Convolutional Neural Networks on Graphs with Fast Localized Spectral Filtering". In: *Advances in Neural Information Processing Systems*. 2016.

Other Events Attended as Participant

Jun. 2022	CVPR 2022, New Orleans, Louisiana, USA.
May 2022	Kymatio Workshop 2022, Nantes, France.
May 2022	Signal Processing Methods for Machine Listening, CNRS, Paris, France.
Apr. 2021	Explainability and Interpretability of AI Methods for Computer Vision, CNRS, virtual.
Jan. 2021	Mathematics and Image Analysis (MIA'21), virtual.
Apr. 2019	StatLearn'19, Grenoble, France.

WORK EXPERIENCE

2019 – 2022	Teaching assistant, Grenoble INP Ensimag, France. See "Teaching activities" for more details.
2016 – 2018	Data analyst, AREP (SNCF Group), Paris, France.
2015 – 2016	Data Analyst, Air Liquide, Paris, France.
2013 – 2015	Supply Chain Analyst and Coordinator, Air Liquide Nordics, Malmö, Sweden.

RESPONSIBILITIES

2021 – 2022	Elected co-representative of PhD students on the laboratory council.
2020 – 2022	Co-organizer of a recurring PhD student seminar at LJK.
Jan. 2020	Co-organizer of the doctoral school's annual PhD Student Day.

TEACHING ACTIVITIES

Mathematical Analysis for Engineers

Grenoble INP Ensimag – Université Grenoble Alpes
First year of graduate engineering school

📅 2019-2022 (3 academic years), 1st semester   📍 Grenoble, France

Teaching volume: 30.5 hours per academic year.

- Tutorial classes (18.5 hours): basics of integration, Fourier transform, normed vector spaces.
- Practical work with Jupyter Notebook (two groups, 6 hours per group): floating-point arithmetic, computation of integrals, Fourier series and Gibbs phenomenon, Gerschgörin theorem.

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Image Processing

Grenoble INP Ensimag – Université Grenoble Alpes
Second year of graduate engineering school

📅 2019-2022 (3 academic years), 2nd semester   📍 Grenoble, France

Practical works, implementation in C.
Teaching volume: 12 hours per academic year.

- Implementation of spectral and spatial filtering for image denoising, complexity of the two approaches.
- Edge detection using first and second order differential operators.
- Nonlinear denoising: noise estimation, median filter, adaptive filters.