Etienne **LASALLE**
Ph.D. in Mathematics

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My research focuses on **statistics related to graph-structured data**. During my thesis, I developed and studied tools for multi-scale graph comparisons based on heat diffusion and topological data analysis. These tools come with statistical guarantees that ensure the asymptotic validity of two-sample tests. I applied them to practical problems, particularly in machine learning and neural network classifiers. Currently, **I am exploring various aspects of graph data compression**. This includes work on graph inference through a compressive learning method and, more recently, investigating methods to accelerate community detection algorithms using coarsening techniques.

Statistics | Graphs | Data compression | Topological data analysis

Academic Positions

2023- *Post-doc,* ENS de Lyon (LIP) and Inria (Ockham).
On compressive learning and graph data.
Advisors : Rémi Gribonval and Paulo Gonçalves.

Studies

2019-2022 *Ph.D,* Université Paris-Saclay and Inria Saclay, France.
Statistical foundations of topological data analysis for graph-structured data.
Supervision : Frédéric Chazal and Pascal Massart.

2015-2019 *Ecole Normale Supérieure Paris-Saclay.*
- 2019 *Graduated from ENS Paris Saclay,* France
- 2018 *MSc in Probability and Statistics,* Université Paris-Saclay, France

2012-2015 *Preparatory classes,* Lycée Faidherbe, Lille, France

Publications

Preprints

2023 **Compressive Recovery of Sparse Precision Matrices**. T. Vayer, E.L., R. Gribonval, P. Gonçalves.
arxiv:2311.04673

Publications

2023 **Eve, Adam and the Preferential Attachment Tree**. A. Contat, N. Curien, P. Lacroix, E.L., V. Rivoirard.
Accepted in *Probability Theory and Related Fields*
arxiv:2303.04752

2021 **Heat diffusion distance processes : a statistically founded method to analyze graph data sets**.
Accepted in *J. of Applied and Computational Topology*.
arxiv:2109.13213

Awards

2021 *Winner of a Math-Company challenge (AMIES).* With O. Hacquard and V. Lebovici.
Reconstruction of trajectories from noisy real life 3D detection of people.
Challenge AMIES

Selected Talks

May 2024 **Statistical days of the French Statistical Society**, Lyon, France.
Compressive recovery of sparse precision matrices.

Nov. 2023 **MIA Workshop : Dimension reduction for learning and visualization**, ENS de Lyon, France.
Compressive recovery of sparse precision matrices.

May 2023 **Seminar of the DATA department**, LJK, Grenoble, France.
Statistical comparison of graph-structured data and its application to distribution shift detection.

Jan. 2023 **Meeting of the EcoNet project**, Campus Agro Paris-Saclay, France.
Statistical comparison of graph structured data.

Jan. 2023 **Workshop on Random Geometry**, CIRM, Luminy, France.
Finding Adam in the nearest-neighbor tree.

Nov. 2022 **working group of the Probability-Statistics team**, LMO, Orsay.
Testing SBM vs Erdös-Renyi, [article]. With L. Martins-Bianco and Z. Naulet.

June 2022 **Statistical days of the French Statistical Society**, Lyon, France.
Analyse statistique de graphes, via des processus de diffusion de la chaleur.

June 2022 **Machine Learning and Signal Processing Seminar**, ENS, Lyon.
Heat diffusion distance processes for graphs and their application to distribution shift detection.

June 2022 **Celeste team's seminar**, LMO, Orsay.
Heat diffusion distance processes for graphs, application to distribution shift detection.

May 2022 **working group of the Probability-Statistics team**, LMO, Orsay, France.
Presenting *Density estimation from unweighted k-nearest neighbor graphs,* [article].
With A. Contat and N. Curien.

May 2022 **Datashape team seminar**, Porquerolles, France.
Detecting distribution shifts using activation graphs from neural networks

Mar. 2022 **working group of the Probability-Statistics team**, LMO, Orsay, France.
Presenting *Identifying the deviator.* arxiv:2203.03744

Dec. 2021 **Forum des Jeunes Mathématicien.ne.s**, Besançon, France.
Statistical analysis of graph structured data, via heat diffusion processes.

Oct. 2021 **Colloque Jeunes Probabilistes et Statisticiens**, Ile d'Oléron, France
Statistical analysis of graph structured data, via heat diffusion processes.

Oct. 2021 **working group of the Probability-Statistics team**, LMO, Orsay, France.
Presenting *Finding Adam in random growing trees.* arxiv:1411.3317

Oct. 2021 **Datashape seminar**, INRIA Saclay, France.
Statistical analysis of graph structured data, via heat diffusion processes.

Mar. 2021 **Vulgarization seminar for Ph.D. students**, Université Paris-Saclay, France.
Gaussian approximations for random functions.

Research Activities

Editorial Activities

2024 *Reviewing activity for the* Bernoulli Journal

May 2023 *Review of a communication proposal,* 2023 edition of the *GRETSI* conference,
Special session : *Graph Learning and Learning with Graphs*.

Organization of scientific events

Sept. 2023 *Participation in the organization of the IXXI day :* **Frugality and machine learning**.
Event page

Research Internships

2018-2019 *Pre-doctoral internship (1 year),* EPFL, Lausanne, Switzerland.
Probabilistic and statistical studies of topological features for random graph analysis, in the context of Neuro-science. (@ kathryn.hess@epfl.ch)

2018 *Master internship (4 months),* INRIA-Saclay, Palaiseau, France.
Development of anomaly detection methods based on tools and features from topological data analysis. (@ frederic.chazal@inria.fr)

2017 *Master internship (4 months),* Simon Fraser University, Vancouver, Canada.
Bio-Informatics : unsupervised clustering on tuberculosis genomic data.
(@ cedric.chauve@sfu.ca, @ leonid@sfu.ca)

2016 *Internship,* ENS Paris-Saclay, Cachan, France.
Numerical Hydrology : modeling water flow on elevation grids.
(@ moreljeanmichel@gmail.com, @ marc.lebrun.ik@gmail.com)

Teaching

At IUT d'Orsay

2019-2022 *Modélisation* (linear algebra, diagonalization, Python practicals)

2020-2022 *Probabilités/Statistiques* (usual discrete and continuous distributions, approximation theorems, central limit theorem, estimators, statistical tests)

2019-2020 *Mathématiques Discrètes* (logic, linear algebra basics)

Others

May 2023 *What does it mean to be a researcher in math ?* A. Ribot High-School, Saint-Omer, France.
Presentation's content : studies, some fields of research (in statistics), a typical day/week.

Jan 2021 *Scientific mediation,* with la Maison d'Initiation et de Sensibilisation aux Sciences.
Construction and animation of "science/society" debate sessions for high-school students.

2017-2018 *Mentoring,* three students from the Villebon-Charpak institute, Orsay, France.

Skills

Code and IT

- Python Github R
- GUDHI (Python library for TDA)
- LaTex ipe

Languages

French ●●●●●
English ●●●●○
German ●○○○○

Interests

- Climbing
- Hiking, skiing, paragliding.
- Music, photography.