# Etienne LASALLE Ph.D. in Mathematics

## August 21, 1994

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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.

# **S**TUDIES

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

### **66** Publications

### **Preprints**

PASCO (PArallel Structured COarsening): an overlay to speed up graph clustering algorithms. E.L., R. Vaudaine, T. Vayer, P. Borgnat, R. Gribonval, P. Gonçalves, M. Karsai.

arxiv:2412.13592

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]

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

[arxiv:2109.13213]



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

Dec 2024	Seminar of the COMPACT team, IRISA, Rennes, France.
	Compressive recovery of sparse precision matrices.
Nov 2024	Seminar of the MALT team, IRISA, Rennes, France.
	Statistical comparison of graph-structured data and its application to distribution shift detection
Sept 2024	Seminar of the SIMS team, LS2N, Nantes, France.
	Compressive recovery of sparse precision matrices.
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.
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 <i>Identifying the deviator.</i> 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, lle 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.

# 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.

Presenting Finding Adam in random growing trees. arxiv:1411.3317

#### 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)

Master internship (4 months), INRIA-Saclay, Palaiseau, France. 2018

> Development of anomaly detection methods based on tools and features from topological data analysis. (@ frederic.chazal@inria.fr)

Master internship (4 months), Simon Fraser University, Vancouver, Canada. 2017

Bio-Informatics: unsupervised clustering on tuberculosis genomic data.

(@ cedric.chauve@sfu.ca, @ leonid@sfu.ca)

Internship, ENS Paris-Saclay, Cachan, France. 2016

Numerical Hydrology: modeling water flow on elevation grids.

(@ moreljeanmichel@gmail.com, @ marc.lebrun.ik@gmail.com)



#### **TEACHING**

#### ENS de Lyon (casual teaching)

2024-2025 Complex Networks, Master: Complex Systems (practicals and projects supervision)

#### 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 Languages

> Python | Github | R

> GUDHI (Python library for TDA)

> LaTex | ipe

## French • English German • O O O

#### INTERESTS

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