Théo Lacombe

Postdoctoral researcher - Inria Saclay - Datashape

Paris, France
theo.lacombe@inria.fr
tlacombe.github.io

Research interests

My Ph.D. thesis, done under the supervision of Steve Oudot and Marco Cuturi, was focused on leveraging tools coming from the Optimal Transport literature and linking them with Topological Data Analysis in order to provide a theoretically consistent and numerically efficient framework to perform statistics on topological descriptors. I am now a post-doctoral researcher in the Datashape team (until March 2021). I will then join the team of Yasuaki Hiraoka (RIKEN AIP, Kyoto University).
Keywords: Statistics, Optimal Transport, Topological Data Analysis, Machine Learning.

Education

2017-2020 **Inria Saclay**, *Datashape*, Ph.D. Student.
- *Statistical tools for Topological Data Analysis via Optimal Transport*
- PhD under supervision of Steve Oudot (Inria Saclay) and Marco Cuturi (ENSAE - Google Brain)
- Grant from AMX, École polytechnique.
- Defended on September 8th, 2020, after reports of Peter Bubenik and François-Xavier Vialard.

2016-2017 **ENS Cachan**, *MSc: Mathematics, Vision and Learning*.
- *Summa cum laude*
- Specialization on statistics, data analysis and geometry.

2013-2017 **École polytechnique**, *Engineering track*, Palaiseau, France.
Formation in applied mathematics and computer science with focus on statistics, data analysis and algebra.

Publications & Preprint

2020 **V.Divol, TL.**, Journal of Applied and Computational Topology.
Understanding the Geometry and Topology of the Persistence Diagram Space using Optimal Transport.

2019 **M.Carriere, F.Chazal, Y.Ike, TL., M.Royer, Y.Umeda**, AISTATS 2020.
PersLay: A Neural Network Layer for Persistence Diagrams and New Graph Topological Signatures.

2018 **TL., M.Cuturi, S.Oudot**, NeurIPS 2018.
Large-scale computation of Means and Cluster for Persistence Diagrams using Optimal Transport.

Participation to workshops and Conferences

Jul. 2020 **Optimal Transport, Topological Data Analysis and Applications to Shapes and Machine Learning Workshop**, *MBI - OSU, USA*, Talk.
An optimal partial transport viewpoint on topological data analysis .

Jun. 2020 **AISTATS Conference**, *Palermo, Italy*, Talk.
PersLay: a neural network for persistence diagrams and new graph topological signatures.

Mai 2020 **ATMCS 2020 via AATRN**, *Ohio State University (remote)*, Oral presentation.
Studying the space of persistence diagrams using optimal transport

Jan. 2020 **SmartData at Polito Workshop**, *Torino, Italy*, Video recording.
PersLay: Neural Networks for Persistence Diagrams and related topics.

Jui. 2019 **Saint-Flour Probability school**, *Saint-Flour, France*, Talk.
An optimal transport viewpoint on Topological Data Analysis.

May 2019 **SMAI**, *Guidel, France*, Talk, Mini-symposium *Geometrie dans les donnees*.
An introduction to Topological Data Analysis and Barycenters of Topological Descriptors.

Jan. 2019 **Workshop of Applied Topology**, *Kyoto, Japan*, Poster presentation.
Large-scale computation of Means and Cluster for Persistence Diagrams using Optimal Transport.

Dec. 2018 **NIPS Conference**, *Montreal, Canada*, Poster presentation.
Large-scale computation of Means and Cluster for Persistence Diagrams using Optimal Transport.

June 2018 **Curves and Surfaces**, *Arcachon, France*, Talk.
Invited speaker for Mini-Symposium *Topological Data Analysis and Learning* (MS9).

May 2018 **SFDS, Journées Statistiques**, *EDF Labs Paris-Saclay*, Talk.
Invited speaker for the Topological Data Analysis session.

May 2018 **Bridging Statistics and Sheaves**, *IMA - Minneapolis, USA*, Poster presentation.

Feb. 2018 **TAGS Workshop**, *Max Plank Institute, Leipzig, Germany*, Poster presentation.

Dec. 2017 **Journées de Géométrie Algorithmique**, *Aussois, France*, Talk.
Smoothed optimal transport: fast computation of matching distances and other applications.

Research internships

April 2017- Aug 2017 **ENSAE**, Paris-Saclay, CREST.
- *Wasserstein barycenters for persistence diagrams*
- Co-supervised by Marco Cuturi (Ensae, CREST) and Steve Oudot (Inria Saclay, Datashape)

March - Aug 2016 **BNP Paribas**, Paris, Quantitative Research team.
- Modeling client behavior and building recommender systems.
- Collaborative filtering, classification (SVM, Random Forest), basics of neural networks (with Python - Tensorflow).

Teaching activity

2017-2020 **École polytechnique**, *Teacher assistant*.
- CSE204 - Introduction to Machine Learning. Lecturer: Jesse Read.
- INF556 - Topological Data Analysis. Lecturer: Steve Oudot.
- INF311 - Introduction to computer science. Lecturer: François Morain.
- INF442 - Algorithms for Data analysis in C++. Lecturer: Steve Oudot.

Sept 2016 - March 2017 **Lycée Condorcet**, Paris.
Oral examination for undergraduate students in classe preparatoires MP* (colles).

Programming skills

Languages
- Advanced : Python (contribution to the `Gudhi` library).
- Notions : Java, C++, Scilab/Matlab

Languages

English C1 *IELTS 7.5/9*

Japanese Notions