

Raphaël Tinarrage

Curriculum vitae

Born 09/06/1993

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ResearchGate <https://www.researchgate.net/profile/Raphael-Tinarrage>
Google Scholar <https://scholar.google.com/citations?user=bkIa2aYAAAAJ>
arXiv <https://arxiv.org/search/?searchtype=author&query=Tinarrage%2C+R>
HAL <https://hal.science/search/index/?q=raphael-tinarrage>
theses.fr <https://theses.fr/2020UPASM001>
Lattes <http://lattes.cnpq.br/4228656164724270>
GitHub <https://github.com/raphaelTinarrage>
YouTube <http://www.youtube.com/@raphaelTinarrage128>

Academic positions

- 2024–present **Postdoc**, Institute of Science and Technology Austria (ISTA), Klosterneuburg
Classifying spaces in Topological Data Analysis, in Uli Wagner's team
- 2021–2024 **Postdoc**, Fundação Getulio Vargas – Escola de Matemática Aplicada (FGV EMAP), Rio de Janeiro
Theory and applications of Topological Data Analysis, supervised by César Camacho

Education

- 2017–2020 **Graduate degree (PhD)**, Inria Saclay and Laboratoire de Mathématiques d'Orsay
Topological inference from measures and vector bundles — [HAL:tel-02970491](https://hal.science/hal-02970491)
Supervised by Frédéric Chazal and Marc Glisse
[Manuscript](#) — [reports](#) — [slides](#)
- 2016–2017 **Graduate degree (MSc)**, Université Paris-Saclay
M2 research – Mathematics for life sciences
Thesis: *Modeling Aging Populations*, advised by Gaël Raoul
Internship: *Topological Data Analysis*, advised by Frédéric Chazal and Marc
- 2015–2016 **Graduate degree (MSc)**, École Normale Supérieure Paris-Saclay
M2 FESUP – Preparation to the *agrégation* degree
- 2014–2015 **Graduate degree (MSc)**, Université Paris-Saclay
M1 – Fundamental and applied mathematics & Magistère de mathématiques 2nd year
Thesis: *Equidistribution of singularity connections of a translation surface*, advised by Frédéric Paulin
Internship: *Primary neuronal culture exhibits spontaneous network patterns*, advised by Jérémie Sibille
- 2013–2014 **Undergraduate degree**, Université Paris-Saclay
L3 – Fundamental and applied mathematics & Magistère de mathématiques 1st year
- 2011–2013 **Classes préparatoires**, Lycée Camille Pissarro, Pontoise
MPSI & MP

Examinations, competitions, fellowships

- 09/2024 **ISTA-Fellow: Postdoctoral Program**, Institute of Science and Technology Austria (ISTA)
2-year award
- 11/2023 **Assistant Professor competition**, Universidade do Estado do Rio de Janeiro (UERJ)
[Rank: 1st](#)
- 07/2016 **Agrégation externe de mathématiques**, French teaching diploma
[National rank: 68th](#)

Teaching

- 2024 **Vector Calculus**, FGV EMAP, Rio de Janeiro
2nd year undergraduate course (30 hours)
[Course webpage](#) — [notes](#) (original document, 180 pages, in Portuguese)
- 2023 **General and Combinatorial Topology**, FGV EMAP, Rio de Janeiro
Summer course for undergraduate and master's students (26 hours)
[Course webpage](#) — [notes](#) (original document, 95 pages, in English)

- 2021 **Topological Data Analysis with Persistent Homology**, FGV EMap, Rio de Janeiro
Summer course for undergraduate and master's students (22 hours)
[Course webpage](#) — [notes](#) (original document, 97 pages, in English) — [videos](#)
- 2017–2020 **Statistical Interpretation of Data**, *UE M331, L3 MINT*, Université Paris-Saclay, Orsay
Teaching fellow for undergraduate students
- 2017–2020 **Modeling Project**, *UE M326, L3 MINT*, Université Paris-Saclay, Orsay
Teaching fellow for undergraduate students
- 2017–2019 **Ordinary Differential Equations**, *UE M257, L2 BC*, Université Paris-Saclay, Orsay
Teaching fellow for undergraduate students
[Course webpage](#)
- 2017–2020 **Workshop MATH.en.JEANS**, Collège Alain Fournier, Orsay
Popularization of mathematics in middle school
[Course webpage](#)

Advisorsip

- 2022–2023 **Fine-tuning legal language models via annotations**, FGV EMap, Rio de Janeiro
BSc students: Livia Cales, Victoria Cury, Samanta Duarte Clara Lopes, Eduardo Portol, João Meirelles, Ana Rosenburg, and Helena Torres
- 2021–2023 **Data analysis of symmetries with Lie groups**, FGV EMap, Rio de Janeiro
MSc student: Henrique Ennes
- 2021–2023 **Machine learning for Súmulas Vinculantes**, FGV EMap, Rio de Janeiro
BSc students: Beatriz Sabdin Chagas, Carla Marcondes Damian, Ana Clara Macedo Jaccoud and Pedro Burlini de Oliveira

Academic service

- 2018–2025 Reviewer for **Symposium on Computational Geometry (SoCG)**
- 2025 Reviewer for **Journal of Mathematical Imaging and Vision**
- 2023 Discussant at the workshop **Transforming the Role of International Courts and Tribunals in a New Era of Adjudication**, *FGV Jean Monnet Centre of Excellence*, FGV, Rio de Janeiro
[Workshop webpage](#)
- 2023 Reviewer for **Foundations for Undergraduate Research in Mathematics (FURM)**
- 2023 Reviewer for **SIAM Journal on Applied Algebra and Geometry (SIAGA)**
- 2022 Reviewer for **MathSciNet (American Mathematical Society)**

Journal articles

- 06/2025 **LieDetect: Detection of representation orbits of compact Lie groups from point clouds**
(with Henrique Ennes)
To appear in *Foundations of Computational Mathematics* (2025)
[arXiv:2309.03086](#)
110 pages, in English
- 05/2025 **Empirical analysis of binding precedent efficiency in Brazilian Supreme Court via case classification**
(with Henrique Ennes, Lucas Resck, Lucas T. Gomes, Jean R. Ponciano, Jorge Poco)
Artificial Intelligence and Law (2025)
[doi:10.1007/s10506-025-09458-6](#) — [arXiv:2407.07004](#)
67 pages, in English
- 01/2025 **ZigzagNetVis: Suggesting temporal resolutions for graph visualization using zigzag persistence**
(with Jean Ponciano, Cláudio Linhares, Agma Traina, Jorge Poco)
IEEE Transactions on Visualization and Computer Graphics **31**, 1–18 (2025)
[doi:10.1109/TVCG.2025.3528197](#) — [arXiv:2304.03828](#)
18+7 pages (double column), in English
- 02/2023 **Recovering the homology of immersed manifolds**
Discrete & Computational Geometry **69**, 659–744 (2023)
[doi:10.1007/s00454-022-00409-5](#) — [arXiv:1912.03033](#)
86 pages, in English
- 11/2021 **Computing persistent Stiefel-Whitney classes of line bundles**
Journal of Applied and Computational Topology **6**, 65–125 (2022)
[doi:10.1007/s41468-021-00080-4](#) — [arXiv:2005.12543](#)
61 pages, in English

Conference articles

- 09/2022 **O impacto da Súmula Vinculante 26 na diminuição de demanda similar no STF: uma análise quantitativa por modelos de ML**
(with Beatriz Sabdin Chagas, Carla Marcondes Damian)
XI Encontro Internacional do CONPEDI Chile, 82–103 (2022)
[ISBN:978-65-5648-559-1](#)
22 pages, in Portuguese
- 09/2022 **Progressão de regime em crimes hediondos no Supremo Tribunal Federal: uma análise empírica pela Súmula Vinculante 26**
(with Ana Clara Macedo Jaccoud, Pedro Burlini de Oliveira)
XI Encontro Internacional do CONPEDI Chile, 399–418 (2022)
[ISBN:978-65-5648-569-0](#)
29 pages, in Portuguese
- 06/2020 **DTM-based filtrations**
(with Hirokazu Anai, Frédéric Chazal, Marc Glisse, Yuichi Ike, Hiroya Inakoshi, Yuhei Umeda)
Symposium on Computational Geometry (2019) — [doi:LIPICs.SoCG.2019.58](#)
Abel Symposia 15, Springer, Cham. (2020) — [doi:10.1007/978-3-030-43408-3_2](#)
[arXiv:1811.04757](#)
33 pages, in English

Preprints

- 01/2024 **Train-Free Segmentation in MRI with Cubical Persistent Homology**
(with Anton François)
[arXiv:2401.01160](#)
17 double column pages, in English
- 09/2022 **Simplicial approximation to CW complexes in practice**
[arXiv:2112.07573](#)
53 pages, in English

Posters

- 06/2022 **Simplicial approximation to CW-complexes in practice**, Algebraic Topology: Methods, Computation and Science, University of Oxford
[Poster](#)
- 06/2018 **DTM-filtrations**, Algebraic Topology: Methods, Computation and Science, IST Austria
[Poster](#)

Invited and contributed talks

- 06/2025 **AATRN Seminar**, Online
Detection of representation orbits of compact Lie groups from point clouds
[Slides](#) — [video](#)
- 02/2025 **Infinite-dimensional Geometry Conference**, Erwin Schrödinger Institute (ESI)
Train-Free Segmentation in MRI with Cubical PH
[Slides](#)
- 10/2024 **Seminário de análise**, Universidade Federal Fluminense (UFF)
LieDetect: Detecção de órbitas de representações de grupos de Lie
[Slides](#) — [video](#)
- 10/2024 **Colóquio de Matemática Aplicada**, Universidade Federal do Rio de Janeiro (UFRJ)
LieDetect: Detecção de órbitas de representações de grupos de Lie
[Slides](#) — [video](#)
- 07/2024 **XXIII Encontro Brasileiro De Topologia**, Universidade Federal da Bahia (UFBA)
Classifying spaces in TDA
[Slides](#) — [program](#)
- 05/2024 **Seminário PMA**, Universidade Estadual de Maringá (UEM), Online
LieDetect: Detection of representation orbits of compact Lie groups from point clouds
[Slides](#)
- 04/2024 **EMAp Seminar**, FGV EMAP
Simplicial approximation in practice
[Slides](#)
- 03/2024 **Brazilian Workshop on Continuous Optimization**, FGV EMAP
LieDetect: Detection of representation orbits of compact Lie groups from point clouds
[Slides](#)

- 01/2024 **Datashape Seminar**, Université Paris-Saclay, Online
LieDetect: Detection of representation orbits of compact Lie groups from point clouds
[Slides](#) — [video](#)
- 01/2023 **Workshop On Legal Digital Intelligence**, FGV EMAP
TDA and Súmulas Vinculantes
[Slides](#)
- 11/2022 **ICMC Seminário**, Universidade de São Paulo (USP), São Carlos
TDA para escolha de resolução temporal na visualização de grafos
[Slides](#)
- 09/2022 **XI Encontro Internacional do CONPEDI**, Santiago, Chile
O impacto da Súmula Vinculante 26 na diminuição de demanda similar no STF
- 09/2022 **XI Encontro Internacional do CONPEDI**, Santiago, Chile
Progressão de regime em crimes hediondos no Supremo Tribunal Federal
- 04/2021 **SoCG - Minisymposium on Computational Topology**, online
Simplicial approximation to CW-complexes in practice
[Slides](#) — [video](#)
- 12/2020 **Applied Algebraic Topology Network**, online
Persistent Stiefel-Whitney classes
[Slides](#) — [video](#)
- 11/2020 **Applied Topology Seminar**, EPFL Lausanne, online
Persistent Stiefel-Whitney classes
[Slides](#) — [video](#)
- 10/2020 **Thesis defense**, Laboratoire de Mathématiques d'Orsay
Topological inference from measures and vector bundles
[Slides](#) — [video](#)
- 06/2020 **Symposium on Computational Geometry**, Young Researchers Forum, online
Recovering the homology of immersed manifolds
[Slides](#) — [video](#)
- 03/2020 **Datashape Seminar**, Inria Saclay
Introduction to characteristic classes
[Notes](#)
- 10/2019 **Datashape Seminar**, Inria Saclay, Orsay
Recovering the homology of immersed manifolds
[Slides](#)
- 04/2019 **Symposium on Computational Geometry**, Portland, Oregon
DTM-based filtrations
[Slides](#)
- 04/2019 **Séminaire de l'équipe Topologie-Dynamique**, Laboratoire de Mathématiques d'Orsay
DTM-filtrations
- 11/2018 **Datashape Seminar**, Inria Saclay
DTM-filtrations

Dissemination of TDA

- 06/2024 **Minicurso CCMN**, Universidade Federal do Rio de Janeiro (UFRJ)
Análise Topológica de Dados e suas aplicações II
[Slides](#)
- 06/2024 **Minicurso CCMN**, Universidade Federal do Rio de Janeiro (UFRJ)
Análise Topológica de Dados e suas aplicações I
[Slides](#)
- 10/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis IV: Python tutorial
[Notebook](#) — [video](#)
- 10/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis III: Persistent Homology
[Slides](#) — [video](#)
- 09/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis II: Homological inference
[Slides](#) — [video](#)
- 09/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis I: Topological invariants
[Slides](#) — [video](#)

- 01/2023 **Summer School on Data Science**, FGV EMap
TDA Minicourse III: Persistent Homology
[Slides](#) — [video](#)
- 01/2023 **Summer School on Data Science**, FGV EMap
TDA Minicourse II: Homological inference
[Slides](#):
[Slides](#) — [video](#)
- 01/2023 **Summer School on Data Science**, FGV EMap
TDA Minicourse I: From Topology to Data Analysis
[Slides](#) — [video](#)
- 11/2022 **ICMC Seminário**, Universidade de São Paulo (USP), São Carlos
Análise Topológica de Dados e suas aplicações
[Slides](#) — [video](#)
- 06/2021 **Séminaire des étudiants**, EMINES, online
Analyse Topologique des Données II/II : Homologie persistante
[Slides](#) — [video](#)
- 05/2021 **Séminaire des étudiants**, EMINES, online
Analyse Topologique des Données I/II : Invariants topologiques
[Slides](#) — [video](#)
- 04/2021 **EMAp Seminário**, FGV EMap, online
Topological inference in Topological Data Analysis II: Persistence barcodes
[Slides](#) — [video](#)
- 04/2021 **EMAp Seminário**, FGV EMap, online
Topological inference in Topological Data Analysis I: Topology in datasets
[Slides](#) — [video](#)
- 12/2020 **Modelling, Analysis and Scientific Computing**, UMPA Lyon, online
Introduction to Persistent Homology
[Slides](#)
- 05/2020 **Séminaire des doctorants**, Laboratoire de Mathématiques d'Orsay, online
Introduction to Persistent Homology
[Slides](#) — [video](#)
- 02/2019 **Séminaire des doctorants**, LAMFA Amiens, France
Introduction to Persistent Homology
- 12/2018 **Séminaire des doctorants**, IMJ-PRG Jussieu, France
Introduction to Persistent Homology
- 12/2018 **Séminaire des doctorants**, Laboratoire de Mathématiques d'Orsay
Introduction to Persistent Homology

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