Raphaël Tinarrage

Curriculum vitae

Born 09/06/1993
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Klosterneuburg, Austria

ORCiD https://orcid.org/0000-0002-1404-1095
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
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 Glisse

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 2^{nd} 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 1^{st} 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)
Two-year fellowship

11/2023 **Assistant Professor competition**, Universidade do Estado do Rio de Janeiro (UERJ)
Rank: 1^{st} (out of 10 participants)

07/2016 **Agrégation externe de mathématiques**, French teaching diploma
Rank: 68^{th} (out of 1896 participants)

Teaching

2024 **Vector Calculus**, FGV EMAp, Rio de Janeiro
2^{nd} 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

Mentoring

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 visits

10/2022 **Grupo de Bases de Dados e de Imagens (GBdI)**, Instituto de Ciências Matemáticas e de Computação (ICMC), Universidade de São Paulo (USP), São Carlos
Visualization of temporal graphs with zigzag persistent homology
Host: Agma Juci Machado Traina. Duration: 1one week.

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

(to appear) **LieDetect: Detection of representation orbits of compact Lie groups from point clouds**
Henrique Ennes, **Raphaël Tinarrage**
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**
Raphaël Tinarrage, 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**
Raphaël Tinarrage, 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 (supplementary) double column pages, in English

02/2023 **Recovering the homology of immersed manifolds**
Discrete & Computational Geometry **69**, 659–744 (2023)
Raphaël Tinarrage
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)
Raphaël Tinarrage
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**
Beatriz Sabdin Chagas, Carla Marcondes Damian, **Raphaël Tinarrage**
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**
Ana Clara Macedo Jaccoud, Pedro Burlini de Oliveira, **Raphaël Tinarrage**
XI Encontro Internacional do CONPEDI Chile, 399–418 (2022)
ISBN:978-65-5648-569-0
29 pages, in Portuguese

06/2020 **DTM-based filtrations**
Hirokazu Anai, Frédéric Chazal, Marc Glisse, Yuichi Ike, Hiroya Inakoshi, **Raphaël Tinarrage**, 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**
Anton François, **Raphaël Tinarrage**
arXiv:2401.01160
17 double column pages, in English

09/2022 **Simplicial approximation to CW complexes in practice**
arXiv:2112.07573
Raphaël Tinarrage
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 — 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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