

Raphaël Tinarrage

Curriculum vitae

Born 09/06/1993

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Google Scholar <https://scholar.google.com/citations?user=bkIa2aYAAAAJ>
GitHub <https://github.com/raphaeltinarrage>
YouTube <https://www.youtube.com/channel/UCE50LOmBR7vDfYpL9p9LAPw>
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>

Academic positions

- 2024-on **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, supervised by Frédéric Chazal and Marc Glisse
Manuscript: https://raphaeltinarrage.github.io/files/Tinarrage_Dissertation.pdf
Slides: https://raphaeltinarrage.github.io/files/Slides_Dissertation.pdf
Reports: https://raphaeltinarrage.github.io/files/Reports_Dissertation.pdf
- 2016–2017 **Graduate degree (MSc)**, Université Paris-Saclay
M2 research – Mathematics for life sciences
- 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
- 2013–2014 **Undergraduate degree**, Université Paris-Saclay
L3 – Fundamental and applied mathematics & Magistère de mathématiques 1st year
- 2011–2013 **Classes préparatoires**, Lycée Camille Pissaro, Pontoise
MPSI & MP

Examinations & competitions

- 2023 **Assistant professor competition**, Universidade do Estado do Rio de Janeiro (UERJ)
1st place (https://prossim.uerj.br/selecoes/selecao_598/pontuacao_e_resultados_598_1699645975.pdf)
- 2016 **Agrégation externe de mathématiques**, French teaching diploma
National rank 68th (https://perso.crans.org/besson/notebooks/agreg/TP_SQL/donnees_html/ResultatsMerite2016.html)

Teaching

- 2024 **Vector calculus**, FGV EMap, Rio de Janeiro
2nd year undergraduate course (30 hours)
Webpage: <https://raphaeltinarrage.github.io/EMaPCalculoVetorial.html>
Notes: original document, 180 pages, in Portuguese, <https://raphaeltinarrage.github.io/files/EMaPCalculoVetorial/CalculoVetorial.pdf>
- 2023 **General and Combinatorial Topology**, FGV EMap, Rio de Janeiro
Summer course for undergraduate and master students (26 hours)
Webpage: <https://raphaeltinarrage.github.io/EMaPTopology.html>
Notes: original document, 95 pages, in English, <https://raphaeltinarrage.github.io/files/EMaPTopology/SummerCourseTopology.pdf>

- 2021 **Topological Data Analysis with Persistent Homology**, FGV EMap, Rio de Janeiro
 Summer course for undergraduate and master students (22 hours)
 Webpage: <https://raphaeltinarrage.github.io/EMAp.html>
 Notes: original document, 97 pages, in English, <https://raphaeltinarrage.github.io/files/EMAp/SummerCourseTDA.pdf>
 Videos: https://www.youtube.com/playlist?list=PL_FkltNTtklB221BEq6zwb_FX5bIr7dvvx
- 2017-2020 **Statistical interpretation of data**, *UE M331, L3 MINT*, Université Paris-Saclay, Orsay
 Assistant professor, for undergraduate students
- 2017-2020 **Modelisation project**, *UE M326, L3 MINT*, Université Paris-Saclay, Orsay
 Assistant professor, for undergraduate students
- 2017-2019 **Ordinary differential equations**, *UE M257, L2 BC*, Université Paris-Saclay, Orsay
 Assistant professor, for undergraduate students
 Webpage: <https://raphaeltinarrage.github.io/M257.html>
- 2017-2020 **Workshop MATH.en.JEANS**, Collège Alain Fournier, Orsay
 Popularization of mathematics in middle school
 Webpage: <https://raphaeltinarrage.github.io/MEJ.html>

Advisorship

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

Journal articles

- 04/2023 **Recovering the homology of immersed manifolds**
 Published in *Discrete and Computational Geometry* (<https://link.springer.com/article/10.1007/s00454-022-00409-5>)
 86 pages, in English
- 03/2022 **Computing persistent Stiefel-Whitney classes of line bundles**
 Published in *Journal of Applied and Computational Topology* (<https://link.springer.com/article/10.1007/s41468-021-00080-4>)
 61 pages, in English
- 06/2020 **DTM-based filtrations**, with Hirokazu Anai, Frédéric Chazal, Marc Glisse, Yuichi Ike, Hiroya Inakoshi and Yuhei Umeda
 Published in *Symposium Abel proceedings* (https://link.springer.com/chapter/10.1007/978-3-030-43408-3_2) and *SoCG conference 2019* (<https://drops.dagstuhl.de/opus/volltexte/2019/10462/>)
 30 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 S. Chagas and Carla M. Damian
 Presented at *XI Encontro Internacional do CONPEDI* (<http://site.conpedi.org.br/publicacoes/129by0v5/gg2as8t1/0d71WWx2sWUgr61q.pdf>)
 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 M. Jaccoud and Pedro B. de Oliveira
 Presented at *XI Encontro Internacional do CONPEDI* (<http://site.conpedi.org.br/publicacoes/129by0v5/502849so/6o53sVpwaxV5352U.pdf>)
 29 pages, in Portuguese

Preprints

- 01/2024 **Empirical analysis of Binding Precedent efficiency in the Brazilian Supreme Court via Similar Case Retrieval**, with Henrique Ennes, Lucas E. Resck, Lucas T. Gomes, Jean R. Ponciano and Jorge Poco
 arXiv: <https://arxiv.org/abs/2407.07004>
 54 pages, in English

- 01/2024 **Train-Free Segmentation in MRI with Cubical Persistent Homology**, with Anton François
 arXiv: <https://arxiv.org/abs/2401.01160>
 17 double column pages, in English
- 06/2023 **LieDetect: Detection of representation orbits of compact Lie groups from point clouds**,
 with Henrique Ennes
 arXiv: <https://arxiv.org/abs/2309.03086>
 84 pages, in English
- 04/2023 **TDANetVis: Suggesting temporal resolutions for graph visualization using zigzag PH**, with
 Jorge Poco, Agma J. M. Traina, Jean Roberto Ponciano and Cláudio Linhares
 arXiv: <https://arxiv.org/abs/2304.03828>
 18 double column pages, in English
- 09/2022 **Simplicial approximation to CW complexes in practice**
 arXiv: <https://arxiv.org/abs/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: https://raphaeltinarrage.github.io/files/Poster_ATMCS_2022.pdf
- 06/2018 **DTM-filtrations**, Algebraic Topology: Methods, Computation and Science, IST Austria
 Poster: https://raphaeltinarrage.github.io/files/Poster_ATMCS.pdf

Talks

- 10/2024 **Seminário de análise**, Universidade Federal Fluminense (UFF)
 LieDetect: Detecção de órbitas de representações de grupos de Lie
 Slides: https://raphaeltinarrage.github.io/files/Slides_UFF2024.pdf
- 10/2024 **Colóquio de Matemática Aplicada**, Universidade Federal do Rio de Janeiro (UFRJ)
 LieDetect: Detecção de órbitas de representações de grupos de Lie
 Slides: https://raphaeltinarrage.github.io/files/Slides_UFRJ2024.pdf
 Video: https://www.youtube.com/watch?v=_HdBDMfJ5yU
- 07/2024 **XXIII Encontro Brasileiro De Topologia**, Universidade Federal da Bahia (UFBA)
 Classifying spaces in TDA
 Slides: https://raphaeltinarrage.github.io/files/Slides_EBT2024.pdf
 Program: https://xxiiiebt.ime.ufba.br/abstract__EBT__2024.pdf
- 06/2024 **Minicurso CCMN**, Universidade Federal do Rio de Janeiro (UFRJ)
 Análise Topológica de Dados e suas aplicações II
 Slides: https://raphaeltinarrage.github.io/files/Slides_CCMN2024_II.pdf
- 06/2024 **Minicurso CCMN**, Universidade Federal do Rio de Janeiro (UFRJ)
 Análise Topológica de Dados e suas aplicações I
 Slides: https://raphaeltinarrage.github.io/files/Slides_CCMN2024_I.pdf
- 05/2024 **Seminário PMA**, Universidade Estadual de Maringá (UEM), Online
 LieDetect: Detection of representation orbits of compact Lie groups from point clouds
 Slides: https://raphaeltinarrage.github.io/files/Slides_PMA2024.pdf
- 04/2024 **EMAp Seminar**, FGV EMap
 Simplicial approximation in practice
 Slides: https://raphaeltinarrage.github.io/files/Slides_EMAp2024.pdf
- 03/2024 **Brazilian Workshop on Continuous Optimization**, FGV EMap
 LieDetect: Detection of representation orbits of compact Lie groups from point clouds
 Slides: https://raphaeltinarrage.github.io/files/Slides_BrazOpt2024_LieDetect.pdf
- 01/2024 **Datashape Seminar**, Université Paris-Saclay, Online
 LieDetect: Detection of representation orbits of compact Lie groups from point clouds
 Slides: https://raphaeltinarrage.github.io/files/Slides_Datashape2024_LieDetect.pdf
 Video: <https://bbb2.imo.universite-paris-saclay.fr/playback/presentation/2.3/4d92ce5fca02f144429b20fd491d9b9ef7a5c31b-1706693242588>
- 10/2023 **International School on Dynamical Systems & Applications**, Online
 An introduction to Topological Data Analysis IV: Python tutorial
 Notebook: https://raphaeltinarrage.github.io/files/Tutorial_DSA.zip
 Video: <https://www.youtube.com/watch?v=xXGaz6AvAKY>

- 10/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis III: Persistent Homology
Slides: https://raphaeltinarrage.github.io/files/Slides_DSA_III.pdf
Video: <https://www.youtube.com/watch?v=ONJooSU3w1k>
- 09/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis II: Homological inference
Slides: https://raphaeltinarrage.github.io/files/Slides_DSA_II.pdf
Video: https://www.youtube.com/watch?v=Ts_xbpzoX3s
- 09/2023 **International School on Dynamical Systems & Applications**, Online
An introduction to Topological Data Analysis I: Topological invariants
Slides: https://raphaeltinarrage.github.io/files/Slides_DSA_I.pdf
Video: <https://www.youtube.com/watch?v=Tr2xbhTyRLY>
- 01/2023 **Summer School on Data Science**, FGV EMAp
TDA Minicourse III: Persistent Homology
Slides: https://raphaeltinarrage.github.io/files/Slides_SSDS_III.pdf
Video: <https://www.youtube.com/watch?v=fjvXZFGHgrg>
- 01/2023 **Summer School on Data Science**, FGV EMAp
TDA Minicourse II: Homological inference
Slides: https://raphaeltinarrage.github.io/files/Slides_SSDS_II.pdf
Video: <https://www.youtube.com/watch?v=OEC7zzQpCNk>
- 01/2023 **Summer School on Data Science**, FGV EMAp
TDA Minicourse I: From Topology to Data Analysis
Slides: https://raphaeltinarrage.github.io/files/Slides_SSDS_I.pdf
Video: <https://www.youtube.com/watch?v=bvDzJF9j8Cc>
- 01/2023 **Workshop On Legal Digital Intelligence**, FGV EMAp
TDA and Súmulas Vinculantes
Slides: https://raphaeltinarrage.github.io/files/Slides_LDA2023.pdf
- 11/2022 **ICMC Seminário**, Universidade de São Paulo (USP), São Carlos
Análise Topológica de Dados e suas aplicações
Slides: https://raphaeltinarrage.github.io/files/Slides_ICMCII2022.pdf
Video: <https://www.youtube.com/watch?v=qsHP02WrRzY>
- 11/2022 **ICMC Seminário**, Universidade de São Paulo (USP), São Carlos
TDA para escolha de resolução temporal na visualização de grafos
Slides: https://raphaeltinarrage.github.io/files/Slides_ICMCI2022.pdf
- 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: https://raphaeltinarrage.github.io/files/Slides_SoCG2021.pdf
Video: <https://www.youtube.com/watch?v=PaKkzcMZC70>
- 04/2021 **EMAp Seminário**, FGV EMAp, online
Topological inference in Topological Data Analysis II: Persistence barcodes
Slides: https://raphaeltinarrage.github.io/files/Slides_EMApII2021.pdf
Video: <https://www.youtube.com/watch?v=HfkuIqxhjGY>
- 04/2021 **EMAp Seminário**, FGV EMAp, online
Topological inference in Topological Data Analysis I: Topology in datasets
Slides: https://raphaeltinarrage.github.io/files/Slides_EMApI2021.pdf
Video: <https://www.youtube.com/watch?v=fqeazsBn3RE>
- 12/2020 **Modelling, Analysis and Scientific Computing**, UMPA Lyon, online
Introduction to Persistent Homology
Slides: https://raphaeltinarrage.github.io/files/Slides_UMPA2020.pdf
- 12/2020 **Applied Algebraic Topology Network**, online
Persistent Stiefel-Whitney classes
Slides: https://raphaeltinarrage.github.io/files/Slides_AATRn2020.pdf
Video: <https://www.youtube.com/watch?v=xnQdGRvWenw>
- 11/2020 **Applied Topology Seminar**, EPFL Lausanne, online
Persistent Stiefel-Whitney classes
Slides: https://raphaeltinarrage.github.io/files/Slides_EPFL2020.pdf
Video: <https://www.youtube.com/watch?v=-AGpfIo8RsA>

- 10/2020 **Thesis defense**, Laboratoire de Mathématiques d'Orsay
 Topological inference from measures and vector bundles
Slides: https://raphaeltinarrage.github.io/files/Slides_Dissertation.pdf
Video: <https://youtu.be/kHGv8BfeHho>
- 06/2020 **Symposium on Computational Geometry**, Young Researchers Forum, online
 Recovering the homology of immersed manifolds
Slides: https://raphaeltinarrage.github.io/files/Slides_SoCG2020.pdf
Video: <https://www.youtube.com/watch?v=mXRjvwJJ8m8>
- 05/2020 **Séminaire des doctorants**, Laboratoire de Mathématiques d'Orsay, online
 Introduction to Persistent Homology
Slides: https://raphaeltinarrage.github.io/files/Slides_seminaire_informel.pdf
Video: <https://www.youtube.com/watch?v=uDb3kV3Sf0>
- 03/2020 **Datashape Seminar**, Inria Saclay
 Introduction to characteristic classes
Notes: https://raphaeltinarrage.github.io/files/Notes_Datashape2020.pdf
- 10/2019 **Datashape Seminar**, Inria Saclay, Orsay
 Recovering the homology of immersed manifolds
Slides: https://raphaeltinarrage.github.io/files/Slides_Datashape2019.pdf
- 04/2019 **Symposium on Computational Geometry**, Portland, Oregon
 DTM-based filtrations
Slides: https://raphaeltinarrage.github.io/files/Slides_SoCG2019.pdf
- 04/2019 **Séminaire de l'équipe Topologie-Dynamique**, Laboratoire de Mathématiques d'Orsay
 DTM-filtrations
- 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
- 11/2018 **Datashape Seminar**, Inria Saclay
 DTM-filtrations