Raphaël Tinarrage

Curriculum vitae

Born 09/06/1993
+33 7 45 25 04 13
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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 https://www.youtube.com/channel/UCE5OLOmBR7vDfYpL9p9LAPw

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, 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 2^{nd} year

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)
2-year award

11/2023 **Assistant Professor competition**, Universidade do Estado do Rio de Janeiro (UERJ)
Rank: 1^{st} (https://prossim.uerj.br/selecoes/selecao_598/pontuacao_e_resultados_598_1699645975.pdf)

07/2016 **Agrégation externe de mathématiques**, French teaching diploma
National rank: 68^{th} (https://perso.crans.org/besson/notebooks/agreg/TP_SQL/donnees_html/ResultatsMerite2016.html)

Teaching

2024 **Vector Calculus**, FGV EMAp, Rio de Janeiro
2^{nd} 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's 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's 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_FX5bIr7dvx

2017-2020 **Statistical Interpretation of Data**, *UE M331, L3 MINT*, Université Paris-Saclay, Orsay
Assistant professor, for undergraduate students

2017-2020 **Modeling 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
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 (https://direitorio.fgv.br/en/event/workshop-transforming-role-international-courts-and-tribunals-new-era-adjudication)

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 (https://arxiv.org/abs/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 (https://doi.org/10.1007/s10506-025-09458-6)
arXiv:2407.07004 (https://arxiv.org/abs/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, and Jorge Poco)
IEEE Transactions on Visualization and Computer Graphics **31**, 1–18 (2025)
doi:10.1109/TVCG.2025.3528197 (https://doi.org/10.1109/TVCG.2025.3528197)
arXiv:2304.03828 (https://arxiv.org/abs/2304.03828)
18+7 double column pages, in English

02/2023 **Recovering the homology of immersed manifolds**
Discrete & Computational Geometry **69**, 659–744 (2023)
doi:10.1007/s00454-022-00409-5 (https://doi.org/10.1007/s00454-022-00409-5)
arXiv:1912.03033 (https://arxiv.org/abs/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 (https://doi.org/10.1007/s41468-021-00080-4)
arXiv:2005.12543 (https://arxiv.org/abs/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 (https://site.conpedi.org.br/publicacoes/129by0v5/gg2as8tl/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 Macedo Jaccoud, Pedro Burlini de Oliveira)
XI Encontro Internacional do CONPEDI Chile, 399–418 (2022)
ISBN:978-65-5648-569-0 (https://site.conpedi.org.br/publicacoes/129by0v5/502849so/6o53sVpwaxV5352U.pdf)
29 pages, in Portuguese

06/2020 **DTM-based filtrations**
(with Hirokazu Anai, Frédéric Chazal, Marc Glisse, Yuichi Ike, Hiroya Inakoshi and Yuhei Umeda)
Symposium on Computational Geometry (2019)
doi:LIPIcs.SoCG.2019.58 (https://doi.org/10.4230/LIPIcs.SoCG.2019.58)
Abel Symposia 15, Springer, Cham. (2020)
doi:10.1007/978-3-030-43408-3_2 (https://doi.org/10.1007/978-3-030-43408-3_2)
arXiv:1811.04757 (https://arxiv.org/abs/1811.04757)
33 pages, in English

Preprints

01/2024 **Train-Free Segmentation in MRI with Cubical Persistent Homology**, with Anton François
arXiv:2401.01160 (https://arxiv.org/abs/2401.01160)
17 double column pages, in English

09/2022 **Simplicial approximation to CW complexes in practice**
arXiv:2112.07573 (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

06/2025 **AATRN Seminar**, Online
Detection of representation orbits of compact Lie groups from point clouds
Slides: https://raphaeltinarrage.github.io/files/Slides_AATRN2025.pdf
Video: https://www.youtube.com/watch?v=XnXcgRlafZw

02/2025 **Infinite-dimensional Geometry Conference**, Erwin Schrödinger Institute (ESI)
Train-Free Segmentation in MRI with Cubical PH
Slides: https://raphaeltinarrage.github.io/files/Slides_ESI2025_Segmentation.pdf

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
Video: https://www.youtube.com/watch?v=AbpG5XuFb7c

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=qsHPO2WrRzY

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=PaKkzcMZC7O

06/2021 **Séminaire des étudiants**, EMINES, online
Analyse Topologique des Données II/II : Homologie persistante
Slides: https://raphaeltinarrage.github.io/files/Slides_EMINESII2021.pdf
Video: https://www.youtube.com/watch?v=v5dKt_39smo

05/2021 **Séminaire des étudiants**, EMINES, online
Analyse Topologique des Données I/II : Invariants topologiques
Slides: https://raphaeltinarrage.github.io/files/Slides_EMINESI2021.pdf
Video: https://www.youtube.com/watch?v=GQk-OHNiM7Q

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=uDba3kV3Sf0

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

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