Raphaël Tinarrage

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Catete, Rio de Janeiro, Brazil

Academic Positions

2021-2024 **Postdoc**, FGV EMAp, Rio de Janeiro
Theory and applications of Topological Data Analysis

Education

2017-2020 **Graduate degree (PhD)**, Inria Saclay and Laboratoire de Mathématiques d'Orsay, France
Thesis: Topological inference from measures and vector bundles
Advisors: Frédéric Chazal and Marc Glisse
Manuscript: `https://raphaeltinarrage.github.io/files/Tinarrage_Dissertation.pdf`
Reports: `https://raphaeltinarrage.github.io/files/Reports_Dissertation.pdf`

2016–2017 **Graduate degree (MSc)**, École Normale Supérieure Paris-Saclay, France
M2R mathematics for life sciences

2015–2016 **Graduate degree (MSc)**, École Normale Supérieure Paris-Saclay, France
M2 Preparation to the Agregation degree

2014–2015 **Graduate degree (MSc)**, Paris-Saclay University, Orsay, France
M1 Fundamental and applied mathematics, Magistère de mathématiques 2^{nd} year

2013–2014 **Undergraduate degree**, Paris-Saclay University, Orsay, France
L3 Fundamental and applied mathematics, Magistère de mathématiques 1^{st} year

Research

Google Scholar: `https://scholar.google.com/citations?user=bkIa2aYAAAAJ&hl=en`

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
Preprint. arXiv: `https://arxiv.org/abs/2407.07004`

01/2024 **Train-Free Segmentation in MRI with Cubical Persistent Homology**, with Anton François
Preprint. arXiv: `https://arxiv.org/abs/2401.01160`

06/2023 **LieDetect: Detection of representation orbits of compact Lie groups from point clouds**, with Henrique Ennes
Preprint. arXiv: `https://arxiv.org/abs/2309.03086`

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
Preprint. arXiv: `https://arxiv.org/abs/2304.03828`

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`)

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
Conference article at XI Encontro Internacional do CONPEDI (`http://site.conpedi.org.br/publicacoes/129by0v5/gg2as8tl/0d71WWx2sWUgr61q.pdf`)

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
Conference article at XI Encontro Internacional do CONPEDI (`http://site.conpedi.org.br/publicacoes/129by0v5/502849so/6o53sVpwaxV5352U.pdf`)

09/2022 **Simplicial approximation to CW complexes in practice**
Preprint. arXiv: `https://arxiv.org/abs/2112.07573`

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)

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/)

Posters

06/2022 **Algebraic Topology: Methods, Computation and Science**, University of Oxford
Simplicial approximation to CW-complexes in practice
Poster: https://raphaeltinarrage.github.io/files/Poster_ATMCS_2022.pdf

06/2018 **Algebraic Topology: Methods, Computation and Science**, IST Austria
DTM-filtrations
Poster: https://raphaeltinarrage.github.io/files/Poster_ATMCS.pdf

Advisorship

Since 2021 **Data Analysis of Symmetries**, FGV EMAp, Rio de Janeiro
MSc student: Henrique Hennes
Adaptation of tools from Lie geometry to Data Analysis

Since 2021 **Machine Learning and Súmulas Vinculantes**, FGV EMAp, Rio de Janeiro
Undergraduate students: Beatriz S. Chagas, Ana C. M. Jaccoud, Carla M. Damian and Pedro B. de Oliveira
Development of Data Analysis techniques for Brazilian legal documents.

Teaching

2024 **Cálculo Vetorial**, FGV EMAp, Rio de Janeiro
2nd year undergraduate course
Course website: https://raphaeltinarrage.github.io/EMApCalculoVetorial.html
Notes: https://raphaeltinarrage.github.io/files/EMApCalculoVetorial/C%C3%A1lculoVetorial.pdf

2023 **General and Combinatorial Topology**, FGV EMAp, Rio de Janeiro
Summer course for undergraduate and master's students
Course website: https://raphaeltinarrage.github.io/EMApTopology.html
Notes: 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
Course website: https://raphaeltinarrage.github.io/EMAp.html
Course notes: 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 **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
Notes: https://raphaeltinarrage.github.io/M257.html

2017-2020 **Organization of atelier MATh.en.JEANS**, Collège Alain Fournier, Orsay
Popularization of mathematics in middle school
Notes: https://raphaeltinarrage.github.io/MEJ.html

Exams, grants, fellowships

2024 **Postdoctoral fellowship**, Institute of Science and Technology Austria

2023 **Competition for professorship**, Universidade do Estado do Rio de Janeiro
Rank 1st, https://prossim.uerj.br/selecoes/selecao_598/pontuacao_e_resultados_598_1699645975.pdf

2016 **Agrégation degree**, French teaching diploma
National rank 68th, https://perso.crans.org/besson/notebooks/agreg/TP_SQL/donnees_html/ResultatsMerite2016.html

Talks

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
Programme: 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=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=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

Last update: October 7, 2024