Yuri Ximenes Martins

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Academic Interest

Interested in abstraction in its many instances and applied to different fields, mainly Mathematics, Physics and Philosophy. Act in different areas, including Category Theory, Algebraic Topology, Gauge Theory, Gravitation, Astrophysics and in formal aspects of Philosophy of Science.

Education

- PhD in Mathematics - 2018-2022
    - Department Mathematics, UFMG, Brazil
    - *Pursuing Abstraction: Problems and Ideas on Mathematics and Physics*
    - (link, pdf, slides, rec)
- Master of Mathematics - 2016-2018
    - Department of Mathematics, UFMG, Brazil
    - *Categorical and Geometrical Methods in Physics*
    - ([pdf](pdf), slides)
- Bachelor of Physics - 2010-2016
    - Department of Physics, UFLA, Brazil
    - *Teoria das Categorias em Topologia Algébrica*
    - (arxiv, [pdf](pdf)), slides)

Publications

- Fábio Dadam and Yuri X. Martins
    - *Topologia, Geometria e Buracos Negros*
    - NEA, 2016, 264 pages. ISBN-13: 978-3841718242
    - ([pdf](pdf), [HAL](HAL), HAL, bib).
- Yuri X. Martins
    - *Categorical and Geometrical Methods in Physics*
    - Master's thesis, 2018, UFMG
    - ([pdf](pdf), slides)
- Yuri X. Martins
    - *Introdução à Teoria da Homotopia Abstrata*
    - NEA, 2018, 216 pages. ISBN-13: 978-620-2-18220-1
    - ([pdf](pdf), arxiv, HAL)
- Yuri X. Martins and Rodney J. Biezuner
    - *Topological and geometric obstructions on Einstein-Hilbert-Palatini theories*
    - Journal of Geometry and Physics, v. 142, p. 229, 2019.
    - (link, arxiv, [HAL](HAL))
- Yuri X. Martins, Luiz Felipe A. Campos, Daniel S.P. Teixeira and Rodney J. Biezuner
    - *Existence and classification of pseudo-asymptotic solutions for Tolman-Oppenheimer-Volkoff systems*
    - Annals of Physics, v. 409, p. 167929, 2019
    - (link, arxiv, [HAL](HAL))
- Yuri X. Martins, Daniel S.P. Teixeira, Luiz Felipe A. Campos, Rodney J. Biezuner
    - *Constraints between equations of state and mass-radius relations in general clusters of stellar systems*
    - Physical Review D, v. 99, p. 023007, 2019
    - (link, arxiv, [HAL](HAL))
- Yuri X. Martins
    - *Introdução à Mecânica Racional: Dos Números Reais à Dinâmica nas Vizinhanças da Terra*
    - NEA, 2021, 48 pages, ISBN-13: 978-620-2-80833-0
    - (pdf, HAL)
- Yuri X. Martins and Rodney J. Biezuner

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- *Existence of $B_{\alpha,\beta}^k$-Structures on C^k-Manifolds*
    - São Paulo Journal of Mathematical Sciences, 2021.
    - ([link](), [arxiv](), [HAL]()).
- Yuri X. Martins and Rodney J. Biezuner
    - *Geometric Regularity Results on $B_{\alpha,\beta}^k$-Manifolds, I: Affine Connections*
    - Methods of Functional Analysis and Topology, Vol. 27, no. 3, 2021.
    - ([link](), [arxiv](), [HAL]()).
- Yuri X. Martins
    - *Pursuing Abstraction: Problems and Ideas on Mathematics and Physics*
    - PhD thesis, 2022, UFMG
    - (link, pdf, slides, rec)

Preprints

- Yuri X. Martins and Rodney J. Biezuner
    - *Geometric Obstructions on Gravity*, 2019.
    - ([arxiv](), [HAL]())
- Yuri X. Martins and Rodney J. Biezuner
    - *Graph Reconstruction, Functorial Feynman Rules and Superposition Principles*, 2019.
    - ([arxiv](), [HAL]()).
- Yuri X. Martins and Rodney J. Biezuner
    - *Towards Axiomatization and General Results on Strong Emergence Phenomena Between Lagrangian Field Theories*, 2020
    - ([arxiv](), [HAL]()).
- Yuri X. Martins and Rodney J. Biezuner
    - *An Axiomatization Proposal and a Global Existence Theorem for Strong Emergence Between Parameterized Lagrangian Field Theories*, 2020
    - ([arxiv](), [HAL]()).
- Yuri X. Martins, Luiz Felipe A. Campos and Rodney J. Biezuner
    - *On Extensions of Yang-Mills-Type Theories, Their Spaces and Their Categories*, 2020
    - ([arxiv](), [HAL]())
- Yuri X. Martins, Luiz Felipe A. Campos and Rodney J. Biezuner
    - *On Maximal, Universal and Complete Extensions of Yang-Mills-Type Theories*, 2020
    - ([arxiv](), [HAL]())
- Yuri X. Martins and Rodney J. Biezuner
    - *Higher Category Theory and Hilbert's Sixth Problem*, 2020
    - ([HAL]()).

Advising Experience

Master's

- Luiz Felipe Andrade Campos
    - *On the Space and Category of Extensions of Yang-Mills-Type Theories*
    - Department of Mathematics, Federal University of Minas Gerais, Feb 2021
    - (link, pdf, slides)
- Mayk Alves de Andrade
    - *Categorical Logic and Type Theory: an Introduction to Mathematicians*
    - Department of Mathematics, Federal University of Minas Gerais, Aug 2021
    - (link, pdf, slides)
- Pedro Brunialti Lima
    - *Comparing Models for $(\infty, 1)$-categories: The Quillen Equivalence between Simplicial Sets and Simplicially Enriched Categories*
    - Department of Mathematics, Federal University of Minas Gerais, Feb 2022
    - (link, pdf, slides, rec)
- Daniel de Souza Plácido Teixeira
    - *From model to quasi-categories*
    - Department of Mathematics, Federal University of Minas Gerais, Feb 2022
    - (link, pdf, slides, rec)

Undergraduate

- Luiz Felipe Andrade Campos and Breno Martins dos Anjos
  - *Geometric and Topological Aspects of Nonabelian Yang-Mills Theories*
  - Department of Mathematics, Federal University of Minas Gerais, 2017
- Vítor Assunsão Moreira Lima
  - *Deformation Quantization of Poisson Manifolds*
  - Department of Mathematics, Federal University of Minas Gerais, 2018
- Luiz Felipe Andrade Campos
  - *Reductive Gauge Theories with Gauge Symmetry Breaking and Stellar Systems*
  - Department of Mathematics, Federal University of Minas Gerais, 2018
- Daniel de Souza Plácido Teixeira
  - *Algebraic Aspects of Perturbative Quantum Field Theories and Stellar Systems*
  - Department of Mathematics, Federal University of Minas Gerais, 2018
- Cyro Barros Murgulo, Rafael Grossi e Fonseca, Vinicius Noronha Almeida, Douglas Vilela de Paiva Silva and Mayk Alves de Andrade
  - *Singularity Theorems in General Relativity*
  - Department of Mathematics, Federal University of Minas Gerais, 2019
- Douglas Vilela de Paiva Silva
  - *Basic Category Theory*
  - Department of Mathematics, Federal University of Minas Gerais, 2020
- Cyro Barros Murgulo
  - *Geodesically Complete Black Holes*
  - Department of Mathematics, Federal University of Minas Gerais, 2021
- Douglas Vilela de Paiva Silva
  - *Algebra-Valued Gauge Theories*
  - Department of Mathematics, Federal University of Minas Gerais, 2021
- César da Silva Júnior
  - *Categorical Aspects of Functional Analysis*
  - Faculty of Computation and Informatics, Mackenzie, 2022.

Teaching Experience

Graduate level

- *Categorical and Geometric Methods in Physics*
  - Expository Seminars, 60h
  - Department of Mathematics, UFMG, 2016
- *Cohomological Aspects of Classical Field Theories*
  - Expository Seminars, 30h
  - Department of Mathematics, UFMG, 2017
- *Invariants on the Moduli Space of Field Theories*
  - Expository Seminars, 30h
  - Department of Mathematics, UFMG, 2017
- *Extended Topological Quantum Field Theories*
  - Expository Seminars, 30h
  - Department of Mathematics, UFMG, 2018
- *Perturbative Gauge Theories*
  - Expository Seminars, 30h
  - Department of Mathematics, UFMG, 2018
- *Introduction to Topological Quantum Field Theories*,
  - Summer School, 25h
  - Department of Mathematics, UFMG, Feb 2018
- *Topics in Axiomatic Quantum Field Theories: Feynman Functors*
  - Summer School, 25h
  - Department of Mathematics, UFMG, Feb 2019
- *Aspectos Categóricos e Homotópicos das Teorias de Gauge*
  - with Daniel Teixeira
  - Summer School, 25h

– Department of Mathematics, UFMG, Feb 2020

Undergraduate level

- *Introduction to Manifolds*
  – Short Course, 25h
  – Department of Exact Sciences, UFLA, 2014
- *Introduction to Formal Aspects of Quantum Mechanics*
  – Short Course, 25h
  – Department of Exact Sciences, UFLA, 2014
- *Introduction to Category Theory and Algebraic Topology*
  – Short Course, 25h
  – Department of Exact Sciences, UFLA, 2015
- *Introduction to Formal Aspects of General Relativity*
  – Short Course, 25h
  – Department of Exact Sciences, UFLA, 2015
- *Global Results in Lorentzian Geometry*
  – Short Course, 25h
  – Department of Exact Sciences, UFLA, 2015
- *Introduction to Topological Methods in Physics*
  – Winter School, 25h
  – Department of Exact Sciences, UFLA, 2016
- *Calculus III*
  – teaching assistant, 60h
  – Department of Mathematics, UFMG, 2019

Selected Talks

- *Topological and Geometric Obstructions on Einstein-Hilbert-Palatini Theories*
  – talk, Group for Fundamental Physics Seminars,
  – Department of Physics, UFMG, 2019
- Lie Algebroidal Categories and Lie Algebroids
  – short talk, Encontro de Jovens Algebristas
  – Department of Mathematics, UFMG, Feb 2020
  – (pdf, slides, HAL)
- *Category theory and Hilbert's Sixth Problem*,
  – plenary talk, I Brazilian Meeting in Category Theory
  – Department of Mathematics, UFES, Jan 2021
  – (slides, HAL, rec).
- Geometric Regularity on Regular Manifolds
  – talk, I Brazilian Meeting in Category Theory
  – Department of Mathematics, UFES, Jan 2021
  – (slides, HAL, video)
- On Existence and Transport of Functorial Invariants
  – online talk, Math-Phys-Cat Seminars, 2021
  – (slides, HAL, video)
- Geometric Algebra-Valued Cohomology
  – online short talk, I Reunião Mineira de Matemática, Sept 2021
  – (pdf, slides, HAL, record)

Community Services

- Idealizer and co-founder of the Math-Phys-Cat.
- Idealizer, creator and contributor to the Math-Phys-Cat Wiki.
- Reviewer

- – *Classical and Quantum Gravity*
  - – ISSN: 0264-9381,
  - – since 2022

- Reviewer
  - – *Latin American Journal of Mathematics*
  - – ISSN: 2965-0798, link
  - – since 2022

- Organizing Committee
  - – *I Brazilian Meeting in Category Theory*
  - – DMAT-UFES
  - – Feb 2021

- Organizing Committee
  - – *II Brazilian Meeting in Category Theory*
  - – IME-USP
  - – Mar 2023

Additional Information

- Affiliate member
  - – *American Mathematical Society*
  - – since 2021
- Affiliate member
  - – *European Mathematical Society*
  - – since 2021
- Owner of the domain `math-phys.group`.

List of Unpublished Notes

- Most are in a draft stage. If you want some of them, just contact me.

1. A Crash Course on General Relativity and Stellar Structure,
2. Calculus on $\mathbb{R}^n$, ~15 pages.
3. Categorical and Homotopical Aspects of Gauge Theories, with D. Teixeira, ~20 pages.
4. de Rham Cohomology: Short Notes, Physics and Problems, ~10 pages
5. Enrichment and Internalization, ~40 pages.
6. From Categories to Fubini Theorem ~30 pages.
7. Geometry of Vector Bundles, ~50 pages.
8. Homotopy in the Complex Plane, ~10 pages.
9. Introduction to Category Theory and Algebraic Topology, ~60 pages.
10. Introduction to Formal Aspects of Classical and Quantum Mechanics, ~60 pages.
11. Introduction to Formal Aspects of General Relativity, ~50 pages.
12. Introduction to Manifolds, ~60 pages.
13. Introduction to Topological Methods in Physics, ~50 pages.
14. Introduction to Topological Quantum Field Theories
15. Notes on Differentiable Manifolds, ~40 pages.
16. Notes on Topological Manifolds, ~30 pages.
17. Perturbative Gauge Theories, ~70 pages.
18. The Abelian Category of Abelian Sheaves, ~10 pages.
19. Topics in Differential Topology: Brower Degree and Morse Theory, ~30 pages.
20. Topics in Metric Spaces, ~30 pages.
21. Topological Terms in Classical Field Theories, ~30 pages.
22. Topology and Homotopy of Metric Spaces, ~55 pages.
23. Relativistic Stars, ~40 pages.
24. Stellar Structure: Towards a Formal Theory, ~40 pages.

Expanded List of Presentations

1. talk, *Altruism in Science and Teaching: A Reflection For All of Us*, V Semana da Matemática, UFLA, Sept 2021
2. short talk, *Geometric Algebra-Valued Cohomology*, I Reunião Mineira de Matemática, Sept 2021
3. lecture, *Foundations of Mathematics and Physics*, Math-Phys-Cat Seminars, May 2021
4. lecture, *Axiomatic Frameworks to Classical Mechanics*, Math-Phys-Cat Seminars, May 2021
5. lecture, *Axiomatic Frameworks to Quantum Mechanics*, Math-Phys-Cat Seminars, May 2021
6. double lecture, *Algebraic Topology: Beyond Singular Cohomology*, Seminário de Topologia Algébrica, UFMG, May 2021.
7. talk, *On Existence and Transport of Functorial Invariants*, Math-Phys-Cat Seminars, March 2021
8. talk, *Geometric Regularity on Regular Manifolds*, I Encontro Brasileiro em Teoria das Categorias, UFES, 2021
9. plenary talk, *Teoria das Categorias e o Sexto Problema de Hilbert*, I Encontro Brasileiro em Teoria das Categorias, UFES, Jan 2021
10. short talk, *Lie Algebroidal Categories and Lie Algebroids*, Encontro de Jovens Algebristas, UFMG, Feb 2020
11. talk, *Topological and Geometric Obstructions on Einstein-Hilbert-Palatini Theories*, Group for Fundamental Physics Seminars, UFMG, 2019
12. talk, *The Mathematical Foundations of Physics*, Colóquio da Matemática, UFLA, Sep 2018
13. talk, *The Cobordism Hypothesis*, Group for Fundamental Physics Seminars, UFMG, 2018
14. double lecture, *Towards an Approach to Hilbert's Sixth Problem*, I SEMAT, UFLA, Sep 2017
15. talk, *Teoria das Categorias nos Fundamentos da Física*, Colóquio da Matemática, UFLA, 2016
16. talk, *Basic Topics in Ring Theory*, Advanced Algebra Seminars, UFMG, 2016
17. talk, *Teorema da Singularidade de Hawking:Um Início Para o Universo*, Colóquio da Matemática, UFLA, 2015
18. poster, *Categories With Weak Equivalences and $(\infty, 1)$-Categories*, I WMMA, UFLA, Oct 2015
19. poster *CW-Complex Decompositions via Morse Theory*, I WMMA, UFLA, Oct 2015