Tomás S. R. Silva

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Introduction

I am a PhD candidate at the Institute of Mathematics, Statistics, and Scientific Computing (IMECC) at the University of Campinas (Unicamp). My research focuses on leveraging Machine Learning and Artificial Intelligence techniques to address challenges in Complex Differential and Algebraic Geometry.

Education

PhD – Mathematics Aug 2022 – (ongoing)
University of Campinas Campinas, São Paulo, Brazil
Supervisor: Professor Henrique N. Sá Earp

BSc – Computer Engineering Mar 2017 – Dec 2021
University of Campinas Campinas, São Paulo, Brazil
Supervisor: Professor Ricardo Dahab

Experience

Researching

City, University of London Jan 2024 – Jul 2024
Visiting research student
Supervisor: Professor Yang-Hui He (London Institute for Mathematical Sciences & Merton College, Oxford)

Laboratory of Gauge Theory and Algebraic Geometry Aug 2022 – (ongoing)
PhD student at the Gauge Theory and Algebraic Geometry Laboratory (GTAG) at IMECC – Unicamp.

Security and Cryptography Laboratory May 2018 – Dec 2021
Junior researcher at the Security and Cryptography Laboratory (LASCA) at Unicamp's Computing Institute.

Teaching

Teacher Assistant

- Linear Algebra (Unicamp) Aug 2025 – Dec 2025
- Calculus II (Unicamp) Feb 2025 – Jul 2025 & Feb 2026 – Jul 2026
- Analytic Geometry (Unicamp) Aug 2023 – Dec 2023 & Aug 2022 – Dec 2022

Volunteering

• Math tutor at "*Cursinho popular Zilda Arns*" Jan 2020 – Jan 2021

A non-profit preparatory school dedicated to supporting underprivileged young students in their preparation for Brazilian universities entrance exams.

Projects / Grants

Geometry, Topology and Data Science Sep 2022 – (ongoing)

Granted by São Paulo Research Foundation – FAPESP

Main investigator: Professor Henrique N. Sá Earp

Post-Quantum Cryptography Nov 2020 – Nov 2021

Granted by Samsung R&D Institute Brazil

Main investigators: Professor Ricardo Dahab & Professor Julio López (Unicamp)

Characterizing Lattices and Codes for Cryptography Nov 2019 – Oct 2020

Granted by São Paulo Research Foundation – FAPESP

Main investigator: Professor Ricardo Dahab

Characterizing Lattices for Cryptography

Granted by São Paulo Research Foundation – FAPESP May 2018 – Apr 2019

& National Council for Scientific and Technological Development - CNPq Aug 2019 – Nov 2019

Main investigator: Professor Ricardo Dahab

Preprints

• **Neural and numerical methods for G_2-structures on contact Calabi-Yau 7-manifolds** 2026

E. Heyes, E. Hirst, H. N. Sá Earp & T. Silva

arXiv: 2602.12438

• **The exterior derivative and the mean value equality in $\mathbb{R}^n$** 2025

D. Fadel, H. N. Sá Earp & T. Silva

arXiv: 2510.00999

Publications

• **Metaheuristic Generation of Brane Tilings** 2025

Y-H. He, V. Jejjala & T. Silva

Physics Letters B, Vol. 862, 2025 ◇ **arXiv: 2412.19313**

• **Machine learning topology of Calabi-Yau links** 2025

T. Silva & H. N. Sá Earp

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics, vol. 11, n. 1 (2025)

• Efficient isochronous fixed-weight sampling with applications to NTRU 2024

D. L. Gazzoni Filho, T. Silva & J. López

IACR Communications in Cryptology, 1 (2), Jul 08, 2024

• Machine-learning Sasakian and G2 topology on contact Calabi-Yau 7-manifolds 2024

D. Aggarwal, Y-H. He, E. Heyes, E. Hirst, H.N. Sá Earp & T. Silva

Physics Letters B, Vol. 850, 2024 ◇ **arXiv: 2310.03064**

Events

Organisation

XXII Escola de Geometria Diferencial 2025

AI meets Geometry Workshop

https://egd.ufpi.edu.br

Invited talks

São Paulo Meeting on Geometry 2025

at Instituto de Matemática, Estatística e Ciência da Computação (IME) at University of São Paulo (USP)

"Machine Learning Ricci-Flat Metrics"

Geometry, algebra, and combinatorics seminar 2025

at Unicamp

"From Theory to Computation: Unraveling Hyperplane Arrangements"

Geometry seminar 2025

at Instituto de Ciências Matemáticas e de Computação (ICMC) at University of São Paulo (USP)

"Machine Learning Ricci-Flat Metrics"

Machine Learning and Mathematics 2025

at Korea Institute for Advanced Studies

"Machine Learning Riemannian Metrics with Special Holonomy"

AI+Math Seminar 2025

at Brazilian Institute of Data Science – BI0S

"Machine Learning Ricci-Flat Metrics"

Seminar on Commutative Algebra and Algebraic Geometry 2024

at Federal University of Pernambuco

"From Theory to Computation: Unraveling Hyperplane Arrangements"

AI+Math Seminar 2023
at Brazilian Institute of Data Science – BI0S
"Learning Geometry and Topology of Algebraic Varieties"

Attendance

- **Vector Bundles and their applications in Algebraic Geometry and related topics (Bandoleros) - Unicamp** 2025
- **Machine Learning and Mathematics - Korea Institute for Advanced Studies** 2025
- **Harvard CMSA Mathematics and Machine Learning Program** 2024
- **43rd National Congress of Applied and Computational Mathematics** 2024
- **London Geometry and Machine Learning (LOGML)** 2024
- **BRIDGES MEETING ON SPECIAL GEOMETRIES AND STABILITY** 2024
- **Hybrid conference on AI-Mathematics** 2024
- **MATH-AmSud School on Geometry Group actions, symmetries, moduli and beyond** 2023
- **EnCoRi - Encounter on Codes, Lattices and Information Theory** 2023
- **15th ALGA – Commutative Algebra and Algebraic Geometry** 2023
- **XVI Thesis, Dissertation and Undergraduate Research Workshop** 2021
- **XV Thesis, Dissertation and Scientific Undergraduate Research** 2020
- **I Journey of Undergraduate Research in Codes, Cryptography and Information Theory** 2019
- **Metric and Combinatorial Problems Related to Error Correcting Codes** 2019
- **XIV Thesis, Dissertation and Undergraduate Research Workshop** 2019
- **XXVII Congress of Undergraduate Research of Unicamp** 2019
- **I Latin American Week on Coding and Information** 2018

Honours & Awards

Academic Distinction 2022
Granted by the Computing Institute of Unicamp for excellence during the undergraduate program.

Best Undergraduate Research Project 2021
Granted by the Computing Institute of Unicamp for the work "Characterizing Lattices for Cryptography," whose results were recognized as a significant contribution to scientific and technological research in Computing that year.

2nd best video talk at XV Theses, Dissertations and Undergraduate Research Workshop (WTD) 2020
Granted by WTD committee and Unicamp's Computing Institute for the talk *"A Study on Lattices and its parameters"*.

Best poster presentation at XIV Theses, Dissertations and Undergraduate Research Workshop (WTD) 2019

Granted by WTD committee and Unicamp's Computing Institute for the poster *"Characterizing lattices for cryptography"*.

Further skills

Languages: Portuguese (native), English (advanced), Spanish (advanced), Hebrew (intermediary), French (intermediary).

Programming: C, C++, Python, Wolfram Mathematica, SageMath, Julia, SQL, Haskell, Linux/Bash, ARM Assembly.

Document Creation: LaTeX, Microsoft Office Suite, Markdown.