

Wellington Santos

Department of Mathematics, Statistics and Computer Science

University of Wisconsin Stout, Menomonie, WI 54751

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Summary

Dedicated mathematician and educator with expertise in Algebra, Number Theory, Coding Theory, and Cryptography. Adept at designing innovative teaching methodologies and contributing to academic research. Seeking to advance knowledge and inspire the next generation of mathematicians through impactful teaching and research.

Research Interests

Algebra, Number Theory, Combinatorics, Communication, Coding theory, Poset metric codes, Matroid theory, Polynomial invariant theory, Collaborative decoding, Fractional decoding.

Positions Held

Assistant Professor (on tenure-track) <i>University of Wisconsin Stout, Menomonie, WI</i>	Aug. 2023 – Present
Postdoctoral Associate <i>Virginia Tech, Blacksburg, VA</i>	Nov. 2021 – Aug. 2023
Substitute Professor <i>Universidade Estadual do Centro-oeste do Paraná, Brazil</i>	Jul. 2021 – Nov. 2021
Substitute Professor <i>Federal Institute of Santa Catarina, Brazil</i>	Jan. 2021 – Jul. 2021
Assistant Professor <i>Positivo University, Brazil</i>	Apr. 2019 – Aug. 2020
High School Teacher <i>Colegio Sagrada Familia, Brazil</i>	Feb. 2013 – Apr. 2013

Education

Ph.D. in Mathematics <i>Federal University of Paraná, Brazil</i>	Aug. 2019
Dissertation: <i>Codes in the NRT Metric, Polynomial Invariant Theory, and Fractional Decoding</i>	
Advisors: Marcelo Muniz Silva Alves and Alexander Barg	
M.Sc. in Mathematics <i>Federal University of Paraná, Brazil</i>	Jul. 2015
Thesis: <i>Error Correcting Codes in Metric Niederreiter-Rosenbloom-Tsfasman</i>	
Advisors: Marcelo Muniz Silva Alves	

Complementary Education

Doctorate Internship Program
University of Maryland, USA
Advisor: Alexander Barg

Aug. 2018 - Feb. 2019

Doctorate Internship Program
State University of Campinas, Brazil
Advisor: Marcelo Firer

Aug. 2016 - Dec. 2016

Publications

Peer-Reviewed Journal and Conference Articles

8. **Fractional decoding and the Rosenbloom-Tsfasman metric**
Advances in Mathematics of Communications, 19(1): pp. 304-318, 2025.
7. **Error correction from partial information via Norm-Trace codes**
with E.C. Moreno, G. L. Matthews, 2024 IEEE International Symposium on Information Theory (ISIT), Athens, Greece, pp. 2814-2819, 2024.
6. **Fractional decoding of r-Hermitian codes**
with G. L. Matthews, and A. W. Murphy, Finite Fields and Their Applications, 2023.
5. **HerA scheme: Secure distributed matrix multiplication via Hermitian codes**
with R.A. Machado, G.L. Matthews, 2023 IEEE International Symposium on Information Theory (ISIT), Taipei, Taiwan, pp. 1729-1734, 2023.
4. **Fractional decoding of codes from the Hermitian curve**
with G.L. Matthews, A.W. Murphy, 2021 IEEE International Symposium on Information Theory (ISIT), Melbourne, Australia, pp. 515-520, 2021.
3. **Polynomial invariant theory and the shape enumerator of self-dual codes in the NRT-metric**
with M.M.S Alves, IEEE Transactions on Information Theory, pp. 4061-4074, 2020.
2. **On fractional decoding of Reed-Solomon codes**
2019 IEEE International Symposium on Information Theory (ISIT), Paris, France, pp. 1552-1556, 2019.
1. **On matroids and linearly independent set families**
with G.G. La Guardia, L. Grossi, International Journal of Pure and Applied Mathematics, pp. 381-387, 2016

Books

1. **Matemática Discreta (Discrete Math)**
IESDE Brasil S.A., 136p. 2021.
ISBN 978-65-5821-012-2

Under Review

1. **Matrix multiplication when you can't share the data and can't trust everyone** with G.L. Matthews, C. Brock, M. Durisheti, C. Hinds

In Preparation

4. **Bounds and construction of Niederreiter-Rosenbloom-Tsfasman LCD codes**
3. **Fractional decoding of algebraic geometry codes over extension fields** with E.C. Moreno, G.L. Matthews
2. **On the automorphism group of the tensor product of Reed-Solomon codes** with E.C. Moreno, H.H. Lopez, J.B. Lau
1. **Hermitian Rosenbloom-Tsfasman metric codes and duality**

Grants and Awards

- **AMS Primarily Undergraduate Institution (PUI) Faculty Travel Grant (2024)** for Joint Mathematics Meetings, American Mathematical Society, USA
- **2024 CSTEMM Professional Development Funding Requests (2024)** for conferences participation, University of Wisconsin-Stout, Menomonie, WI
- **Travel Funding (2023)** for conferences in Europe, Virginia Tech Department of Mathematics, Blacksburg, VA
- **Early Career Travel Award (2023)** in connection with the SIAM AG Conference
- **Early Career Travel Award (2022)** in connection with the SIAM Conference on Discrete Mathematics (Declined)
- **Best Doctoral Thesis Award (2019)** Curta Ciencia 2019 award, Federal University of Paraná.
- **Doctoral Fellowship (2015 - 2019)** Coordination of Improvement of Personal Higher (CAPES), Federal University of Parana, Curitiba-PR, Brazil
- **Internship Fellowship at the University of Maryland (2018)** Coordination of Improvement of Personal Higher (CAPES), Brazil
- **Internship Fellowship at the State University of Campinas (2016)** Coordination of Improvement of Personal Higher (CAPES), Brazil
- **Master Fellowship (2013 - 2015)** Coordination of Improvement of Personal Higher (CAPES), Federal University of Parana, Curitiba-PR, Brazil
- **Research Initiation Fellowship (2010 - 2012)** Fundacao Araucaria, State University of Ponta Grossa, Ponta Grossa-PR, Brazil

Research Talks

24. **Permutation Group of Reed-Solomon Codes and Their Tensor Product**, Joint Mathematics Meetings, Jan. 2025, Seattle, WA.
23. **Bound on Niederreiter-Rosenbloom-Tsfasman LCD Codes**, Joint Mathematics Meetings, Jan. 2025, Seattle, WA.
22. **Codes for Secure Distributed Matrix Multiplication**, Canadian Mathematical Society Winter Meeting, Dec. 2024, Richmond, BC.
21. **Unmasking Deceitful Servers: Ensuring Integrity in SDMM**, Joint Mathematics Meetings, Jan. 2024, San Francisco, CA.
20. **Error Correction of Norm-Trace Codes Using Fewer Bits**, SIAM Applied Algebraic Geometry Conference, Jul. 2023, Eindhoven, Netherlands.
19. **Coding for SDMM**, Coding Theory & Cryptography Workshop, Jul. 2023, Riva San Vitale, Switzerland.
18. **Secure Distributed Matrix Multiplication via Hermitian Codes**, IEEE International Symposium on Information Theory, Jun. 2023, Taipei, Taiwan.
17. **Fractional Decoding of Reed-Solomon Codes and Some Relatives**, Mini-ACTiV Workshop, May 2023, Blacksburg, VA.
16. **Secure Distributed Matrix Multiplication via Hermitian Codes**, Seminarios Continuos do PPGM, Mar. 2023, Curitiba, Brazil.
15. **Gleason-Pierce-Ward Theorem for NRT Metric Codes**, Joint Mathematics Meetings, Jan. 2023, Boston, MA.
14. **Fractional Decoding of Algebraic Geometry Codes**, ACTiV(T) Week, Nov. 2022, Blacksburg, VA.
13. **Duality Theory for Ordered Hamming Metric Spaces**, PICS Seminar, Nov. 2022.
12. **An Application of Polynomial Invariant Theory in Coding Theory**, Discrete Seminar, Nov. 2022, University of Nebraska-Lincoln, NE.
11. **Polynomial Invariant Theory and Coding Theory**, Algebra Seminar, Nov. 2022, Virginia Tech, VA.
10. **NRT-metric Codes and Dually Theory**, AARG Seminar, Oct. 2022, Virginia Tech, VA.
9. **Fractional decoding of Hermitian codes via interleaved Hermitian codes**, 2022 Joint Mathematics Meetings, Apr. 2022, Seattle, WA (Virtual).
8. **Fractional decoding of codes from the Hermitian curve**, Special Session on Coding, Storage, and Related Applications, AMS Fall Central Sectional Meeting, Oct. 2021, Virtual.
7. **Fractional Decoding of Codes from Hermitian Curves**, IEEE International Symposium on Information Theory, Jul. 2021, Melbourne, Australia (Virtual).
6. **On Fractional Decoding of Reed-Solomon Codes**, IEEE International Symposium on Information Theory, Jul. 2019, Paris, France.

5. **Invariant Theory and Self-Dual Codes in the NRT Metric**, Latin American Week on Coding and Information, Jul. 2018, Campinas, Brazil.
4. **Invariant Theory and Self-dual Codes in the NRT-metric**, VII Journey of Information Theory, Nov. 2017, State University of Campinas, Campinas-SP, Brazil.
3. **MDS Codes in Niederreiter-Rosenbloom-Tsfsman Metric**, II Brazilian Congress of Young Researchers in Pure and Applied Mathematics, Dec. 2016, State University of Campinas, Campinas-SP, Brazil.
2. **A Study of Cyclic Codes, BCH Codes and Reed-Solomon Codes**, School of Advanced Science on Coding and Information Theory, Jan. 2015, State University of Campinas, Campinas-SP, Brazil.
1. **Relations Between Matroids and Families of Linearly Independent Sets**, XXI annual meeting of scientific initiation and II annual meeting of technological initiation and innovation, Oct. 2012, State University of Maringá, Maringá-PR, Brazil.

Teaching Experience

University of Wisconsin-Stout

- MATH-150: Calculus with Precalculus A (F24-Two sections)
- MATH-151: Calculus with Precalculus B (F23)
- MATH-153: Calculus I (S24-Two sections, F23)
- MATH-270: Discrete Mathematics (F23)
- CS-480: Introduction to Computer Security (F24)
- MSCS-396: Applied Cryptography (S24)

Virginia Tech

- MATH-5114: Specialized Topics in Algebra (Graduate Level)
 - Teaching effectiveness rating on students' perception of teaching: 5.00 out of 6 (department average 4.72 out of 6)
- MATH-4175: Cryptography
- MATH-2114: Introduction to Linear Algebra
 - Teaching effectiveness rating on students' perception of teaching: 5.17 out of 6 (department average 4.72 out of 6)

Positivo University (Brazil)

- Euclidean and Non-Euclidean Geometries
- Mathematical Logic
- Mathematics Applied to Business
- Financial Mathematics
- Bio-Statistics
- Matrix Theory
- Set Theory
- Numerical Calculus
- Statistics
- Differential and Integral Calculus
- Introduction to Numerical Analysis
- Linear Algebra
- Discrete Mathematics

Other Institutions (Brazil)

Federal Institute of Santa Catarina and Universidade Estadual do Centro-oeste do Paraná

- Ordinary Differential Equations
- Probability and Statistics
- History of Mathematics
- Applied Calculus
- Analytic Geometry
- Elementary Algebra (Rings and Groups)

Short Courses Taught

Coding Theory (8 hours) University Extension - SIGMAT <i>State University of Ponta Grossa, Brazil</i>	Sept. 2019
Linear Algebra (40 hours) Summer Course, University Extension - Community Mathematics <i>State University of Ponta Grossa, Brazil</i>	Fev. 2011
Elementary Mathematics (68 hours) University Extension - Community Mathematics <i>State University of Ponta Grossa, Brazil</i>	May. 2011
The Gold Number (10 hours) University Extension - Community Mathematics <i>State University of Ponta Grossa, Brazil</i>	Sept. 2011
Non-Euclidean Geometry (4 hours) University Extension - Integrated Center for Mathematical Education <i>State University of Ponta Grossa, Brazil</i>	Oct. 2010
Factoring Workshop (8 hours) University Extension - Integrated Center for Mathematical Education <i>State University of Ponta Grossa, Brazil</i>	Nov. 2009

Mentoring Experience

Sure Initiative Feb. - Jul. 2023
Mentored, jointly with G.L. Matthews, a group of **four** undergraduate students as part of the SURE initiative. This program aims to develop students' skills to be more successful in their mathematical pursuits. Some of the students are from underrepresented groups in STEM. The main topic of this project was coding theory for distributed computation.
Virginia Tech

Sejal Gupta 2022
Virginia Tech undergrad student in CMDA with math double major
Topic: Introduction to coding theory
Virginia Tech

Carlos H.V. Ronchi 2016 - 2017
Federal University of Parana math undergrad student
Topic: Introduction to algebraic geometry
Federal Univeristy of Parana

Professional Development

Acquiring Talent Workshop University of Wisconsin Stout	Aug. 2024
Biographical Sketch Preparation Wisys Grant writing webinars	Feb. 2024
Common Grant Writing Pitfalls Wisys Grant writing webinars	Jan. 2024
Fall Workshop for STEM Educators UW alliance for inclusion, diversity, equity & advancement in STEM (IDEAS), Chula Vista Resort, Wisconsin Dells	Oct. 2023
New Instructor Workshop 2023 University of Wisconsin-Stout	Aug. 2023

Home Institution Service

Mathematics, Statistics and Computer Science Department Committees

Hiring Committee 2024
Served as a member of the hiring committee for the Assistant Professor position in Computer Science.
University of Wisconsin-Stout

Student Teaching Evaluation Form Committee 2024
Served as the chair for developing the new student teaching evaluation form.
University of Wisconsin-Stout

Student Mentorship and Academic Advising

- Applied Math & Computer Science Students	3 Students
- Cybersecurity Students	4 Students
- Computer Science Students	1 Student

Selected Service

Workshop on Coding Theory & Cryptography Organizer **Jul. 2023**
with G. Cotardo, J. LeGrow, H.H. Lopez, F. Manganiello, and G.L. Matthews co-organized a weeklong workshop with invited talks by visiting researchers and graduate students. Responsibilities include collaborating on the workshop proposal and the list of invited speakers, communicating with invited speakers, and helping to facilitate the session.
Riva San Vitale, Switzerland

Blacksburg Math Circle Session Leader

Apr. 2023

with D. Valvo co-leadereed a session on Reed-Solomon codes. The Blacksburg Math Circle runs sessions for kids (ages 8-13) to learn about engaging the real-world mathematics they will not see in a classroom. Including but not limited to cryptography and coding theory. Responsibilities include collabotating on the session proposal, creating hands-on activities and present and guide the students during the activities.

Virginia Tech

SIAM SEAS23 Conference Session Organizer

Mar. 2023

with G. Cotardo and G.L. Matthews co-organized the "Special Session on Coding Theory and Applications". Responsibilities include collabotating on the session proposal and the list of invited speakers (24 speakers), communicating with invited speakers, and helping to facilitate the session.

Virginia Tech

ACTiV(T)- Workshop Organizer

Nov. 2022

with G. Cotardo and G.L. Matthews co-organized the Algebraic Coding Theory in Virginia (Tech) weeklong workshop with invited talks by visiting researchers and graduate students. Responsibilities include collabotating on the workshop proposal and the list of invited speakers (20 speakers), communicating with invited speakers, and helping to facilitate the session.

Virginia Tech

Blacksburg Math Circle Session Leader

Nov. 2022

with G. Cotardo and D. Valvo co-leadereed a session on Coding Theory. The Blacksburg Math Circle runs sessions for kids (ages 8-13) to learn about engaging the real-world mathematics they will not see in a classroom. Including but not limited to cryptography and coding theory. Responsibilities include collaborating on the session proposal, creating hands-on activities and present and guide the students during the activities.

Virginia Tech

MORE Conference Organizer

Oct. 2022

with a group of Virginia Tech faculty members co-organized the Mathematics Opportunities in Research and Education conference. The purpose of this conference is to bring together undergraduate students interested in mathematics to learn about opportunities in research and education. Responsibilities include collabotating on the conference proposal and the list of invited speakers, communicating with invited speakers, and helping to facilitate the session.

Virginia Tech

RNT: Rethinking Number Theory Project Leader

Jul. 2022

with H.H. Lopez co-leader the researcher project Tensor product of Generalized Reed-Solomon codes. This project seeks to understand the groups of automorphisms of tensor product of generalized Reed-Solomon codes. Responsibilities include engage and coordinate graduate students during this summer research project.

Virtual

Reviewer

- *IEEE Transactions on Information Theory*
- *Designs, Codes and Cryptography*
- *Discrete Mathematics*
- *Journal of Algebra and its Applications*

Memberships

- *Bouchet Graduate Honor Society*, March 2023 - present
- *IEEE Information Theory Society*, 2020 - present
- *American Mathematical Society* 2023 - present

Languages and Skills

- **Languages:** Portuguese (native), English
- **Technical Skills:** Python, C, C++, LaTeX, MATLAB, and SAGE