Mark Spanier — Curriculum Vitae

Contact Information

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Education

Ph.D., Mathematics (2015):	North Dakota State University Advisor: Dr. Friedrich Littmann Dissertation: L^1 Approximation in de Branges Spaces
College Teaching Certificate (2015):	North Dakota State University Emphasis: STEM Education
B.S., Mathematics (2010):	North Dakota State University Thesis Advisor: Dr. Marian Bocea Thesis: A Formal Derivation of the Aronsson Equations for Symmetrized Gradients

Research Interests

Approximation Theory, Cryptography, Security and Artificial Intelligence, Optimization Theory, Signal Processing, Analytic Number Theory, Computational Number Theory, Harmonic Analysis

Employment

2023 – Present:	Interim Dean, College of Arts and Sciences, DSU
2022 – Present:	Associate Professor, Beacom College of Computer and Cyber Sciences, DSU
2017 – 2022:	Assistant Professor, Dakota State University
2015 – 2017:	Instructor, Dakota State University
2014 – 2015:	Mathematics Department Teaching Fellow, North Dakota State University
2014 – 2015:	Curriculum Consultant, West Fargo Public School District
2013 – 2014:	College of Science and Mathematics Research Fellow, North Dakota State University
2012 – 2014:	GraSUS K-12 Teaching Fellow, West Fargo Public School District
2011 – 2012:	GraSUS K-12 Teaching Fellow, Fargo Public School District
2011 – 2014:	Graduate Mathematics Instructor, North Dakota State University
2010:	Teaching Assistant, Carnegie Mellon University
2007 – 2010:	Teaching Assistant, North Dakota State University

Grant Activity

1. *South Dakota CyberNET CTE Academy*
   Funding Organization: Department of Education (DoE)
   Role: Co-Primary Investigator (CoPI)
   Years: 2022 – 2023
   Amount: $50,000
2. *Educational Pathways National Center (EPNC)/Educational Pathway Institute (EPI)*
   Funding Organization: National Security Agency (NSA), Sub-award through Moraine Valley Community College
   Role: Primary Investigator (PI)
   Years: 2022 – 2024

Amount: $125,000

Publications - Appeared/Accepted

1. *Weighted Uniform Convergence of Entire Grünwald Operators on the Real Line.* Comput. Methods Funct. Theory (2021). https://doi.org/10.1007/s40315-021-00408-2
2. *Extremal Signatures*, with F. Littmann, Constr. Approx. **47**, no. 2 (2018), 339–356. https://doi.org/10.1007/s00365-017-9373-7
3. *Extremal Functions with Vanishing Condition*, with F. Littmann, Constr. Approx. **42**, no. 2 (2015), 209–229. https://doi.org/10.1007/s00365-015-9304-4
4. *L1 Approximation in de Branges Spaces*, Ph.D. Dissertation, North Dakota State University, 2015.
5. *The Geometry of Tetris*, with L. Mitzel, The Mathematics Teacher, **108**, no. 1 (2014), 58–63.
6. *A Formal Derivation of the Aronsson Equations for Symmetrized Gradients.* Siuro, **3**, no. 1 (2010), 112–119.

Publications - In Preparation

1. *Detection and Prevention Against Poisoning Attacks in Federated Learning*
2. *Residuals and Sign Changes of Extremal Signatures*
3. *Extremal Functions in de Branges Spaces – Poisson and Conjugate Poisson Kernels*

Undergraduate Students (Formal Research Projects)

1. **Emily Ortmann**
   B.S. Mathematics for Information Systems and Computer Science – Fall 2018
   Honors Thesis: Simulations and Queueing Theory: The Effects of Randomly Bypassing Security
   2nd place at DSU's 2018 Research Symposium Poster Session (with Laura Schuck)
2. **Laura Schuck**
   B.S. Mathematics for Information Systems and Computer Science – Fall 2018
   Honors Thesis: Simulations and Queueing Theory: The Effects of Priority and VIP Thresholds
   2nd place at DSU's 2018 Research Symposium Poster Session (with Emily Ortmann)
3. **Madison Krell**
   B.S. Mathematics and Computer Science – Fall 2020
   Research Project (2019): Mastermind with a Deceptive Code-Maker
   3rd place at DSU's 2019 Research Symposium Poster Session
4. **Alexis VanderWilt**
   B.S. Mathematics and Computer Science – Spring 2020
   Research Project (2019): Impact of Social Networks on the Spread of Disease
   Research Project (2020): Effects of 'Super Territories' on Population Dynamics
   Co-advisor: Dr. Jeffery Palmer
   1st place at DSU's 2019 Research Symposium Poster Session
5. **Aaron Oakland**
   B.S. Mathematics for Information Systems and Computer Science – Fall 2020
   Research Project (2020): Sieving and Factorization Algorithms/Implementations
6. **Jaron Burnett and Aaron Steele**
   B.S. Computer Science – Fall 2020

Research Project (2020): Computational Graph Theory Algorithms/Implementations

Graduate Students (Formal Research Projects)

1. **Kyle Korman**
   Ph.D. Computer Science – Expected Fall 2024
2. **Chinyere Isaac-Heslop**
   Ph.D. Cyber Operations – Expected Spring 2024
   Dissertation: Potential Pre/Post Quantum Cryptography Mirror: Does Added Complexity Diminish Security?
3. **Madeleine Englund, Nikolaos Kakouros, Jason Mixon, Charles Novak, Viktor Valadi**
   DSU/AI Sweden Industrial Immersion Project Advisor (2023)
   Research Project: Detection and Prevention Against Poisoning Attacks in Federated Learning
4. **David Hovstadius, Subash Mahat, Stephanie DeAmelia**
   DSU/AI Sweden Industrial Immersion Project Advisor (2023)
   Research Project: CAN We Secure It?
   Industrial Partner: Case New Holland
5. **Jesper Bergquist, Bitnoori Lee, Juste Lokossou**
   DSU/AI Sweden Industrial Immersion Project Advisor (2023)
   Research Project: Federated Learning and Foundational Models
   Industrial Partner: Intel and HPE
6. **Gustav Kalander, Sonakshi Garg, Jonathan Lancelot, Hugo Jonsson, Axel Nilsson, Bhhaanu Pirange**
   DSU/AI Sweden Industrial Immersion Project Advisor (2023)
   Research Project: Evaluation of Poisoning Attacks on Federated Learning Systems: Neural Networks in Automotive Technology
   Industrial Partners: Volvo Cars and Zenseact

GenCyber Summer Camps

CoEd 9-12 Camp Instructor:	Su19, Su21, Su22, Su23
Teacher's Camp Instructor:	Su19, Su21, Su22, Su23
CybHER 6-8 Girl's Camp Instructor:	Su23

Courses taught at Dakota State University

CSC 898:	Dissertation
CSC 792:	ST: Artificial Intelligence Research - Su22, Su23
CSC 591:	IS: Computational Graph Theory - Su20
CSC 404:	Foundations of Computation - S20 (x2), S21 (x2), S22 (x3), S23 (x3), S24
CSC 404:	Foundations of Computation (Online) - S20, S21 (x2), Su21, S22 (x2), Su22, S23 (x2), Su23
CSC (4|5)02:	Math Foundations of Artificial Intelligence - F20, F21, F22, F23
CSC (4|5)02:	Math Foundations of Artificial Intelligence (Online) - F20, F21, F22, F23
Math 492:	Signals and Systems - F19
Math 491:	IS: Cryptography and Codes II - F20
Math 491:	IS: Queueing Theory - S18
Math 488:	Math Capstone - F17, F18

Math 475:	Operations Research - F17
Math 475:	Operations Research (Online) - F17
Math (4|5)37:	Cryptography and Codes - F19, F20, F21, F22, F23
Math (4|5)37:	Cryptography and Codes (Online) - F19, F20, F21, F22, F23
Math (4|5)36:	Number Theory and Cryptography - S19, S20, S21, S22, S23, S24
Math (4|5)36:	Number Theory and Cryptography (Online) - S19, S20, S21, S22, S23, S24
Math 201:	Intro to Discrete Math - S17, F17, S18, F18 (x2), F19, F20, S21, F21, F22
Math 201:	Intro to Discrete Math (Online) - Su17, F17, S18 (x2), Su18, F18 (x2), Su19, F19, S20 (x2), Su20, F20, Su21
Math 123:	Calculus I - S17, S18, Su18, S19, Su19
Math 123:	Calculus I (Online) - S17, Su17, S18, Su18, S19, Su19, Su20, Su21
Math 120:	Trigonometry - F15, S16, F16, F17, F18
Math 120:	Trigonometry (Online) - S16, Su16, Su17, Su18, Su19
Math 104:	Finite Mathematics - F16
Math 102:	College Algebra - F15 (x3), S16 (x2), F16 (x3)
Math 095:	Pre-College Algebra - F15, S16, F16

Courses taught at North Dakota State University

Math 790:	Graduate Analysis Seminar 'Analysis Preliminary Exam Bootcamp' - Su11
Math 265:	Calculus III - Su12
Math 259:	Multivariate Calculus - Su12
Math 144:	Mathematics for Business - Su15
Math 129:	Basic Linear Algebra - F14 (x2)
Math 128:	Introductory Linear Algebra - F14, S15
Math 104:	Finite Mathematics - S15
Math 103:	College Algebra - Su14
Math 102:	Intermediate Algebra - Su13

Courses assisted as K-12 Teaching Fellow in West Fargo Public School District

Algebra II:	F12, S13, F13, S14
Geometry:	F12, S13, F13, S14
Algebra I:	F12, S13, F13, S14
Math 8:	F12, S13, F13, S14
Math 7:	F12, S13, F13, S14
Math 6:	F13, S14

Courses assisted as K-12 Teaching Fellow in Fargo Public School District

Algebra II:	F11, S12
Geometry:	F11, S12

Recitations taught as Teaching Assistant at Carnegie Mellon University

Math 21-259:	Calculus in 3D - F10 (x2)

Recitations taught as Teaching Assistant at North Dakota State University

Math 259:	Multivariate Calculus - S11 (x2)
Math 265:	Calculus III - F09 (x2), S10 (x2)
Math 165:	Calculus I - S09 (x2)
Math 166:	Calculus II - F08 (x2)
Math 105:	Trigonometry - S08 (x2)

Math 103: College Algebra - F07
Math 146: Applied Calculus - F07

Faculty Development Workshops – Lead Instructor

1. **AI and Cybersecurity** May 2023
   Location: Palm Desert campus of Cal State San Bernadino
   Partnering Colleges/Universities: Dakota State University and Cal State San Bernardino
2. **AI and Cybersecurity** May 2023
   Location: San Antonio College
   Partnering Colleges/Universities: Dakota State University and San Antonio College
3. **AI and Cybersecurity** August 2023
   Location: Las Vegas, NV
   Partnering College/University: Dakota State University

Conference and Seminar Talks

2022: *Wordle – A MinMax Approach*, NESeSD MAA Spring Sectional Meetings, Dakota State University, Madison, SD

2019: *Cryptography and Codes*, Sioux Falls STEM Circle, Augustana University, SD
Mastermind with a Deceptive Code-Maker, NESeSD MAA Spring Sectional Meetings, College of Saint Mary, Omaha, NE
Attacks on Cryptosystems, DSU Offensive Network Security (Computer Club), DSU

2018: *I Prefer Pi: Mathematical Palindromes*, DSU Undergraduate Math Seminar Series, DSU
PRIMES: I have the biggest and best primes. (These primes are going to be Yuge), DSU Undergraduate Math Seminar Series, DSU
Mathematics of the card game SET, DSU Undergraduate Math Seminar Series, DSU

2015: *Extremal Signatures and Best $L^1(\mu)$-Approximations*, AMS-MAA Joint Mathematics Meetings, San Antonio, TX

2014: *Interpolations at Zeros of Laguerre-Pólya Functions and L^1-approximations*, Analysis Seminar, North Dakota State University, Fargo, ND
Beurling-Selberg Extremal Problems in de Branges Spaces, AMS-MAA Joint Mathematics Meetings, Baltimore, MD

2013: *The Beurling-Selberg Extremal Problem and Applications*, Graduate Colloquium, North Dakota State University, Fargo, ND
The Mathematics of Mastermind, Sonia Kovalevsky Mathematics High School Day, North Dakota State University, Fargo, ND

2012: *The Geometry of Tetris*, Sonia Kovalevsky Mathematics High School Day, North Dakota State University, Fargo, ND

2011: *Some Interesting sinc Integrals*, Graduate Colloquium, North Dakota State University, Fargo, ND

2010: *The Aronsson Equations for Symmetrized Gradients*, Mathematics on the Northern Plains, Morningside College, Sioux City, IA

2009: *The Aronsson Equations for Symmetrized Gradients*, Senior Seminar, North Dakota State University, Fargo, ND
Preference Relations and Utility Functions, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

Algorithms and Applications for Discrete Ricci Flow, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

2008: *Priority Queue Simulations*, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

Refereeing

Referee for: Manning Publications, Communications on Applied Nonlinear Analysis (CANA), Journal of Function Spaces

Professional Organization

MAA: **M**athematical **A**ssociation of **A**merica

2022 – Present: Communication Co-Officer (Nebraska/SE South Dakota Section). Elected position charged with updating section website and sending section information

2021 – 2022: Section Chair (Nebraska/SE South Dakota Section). Elected position charged with hosting, planning, and running the spring sectional meeting.

2019 – 2021: Section Chair Elect (Nebraska/SE South Dakota Section). Elected position charged with assisting the Section Chair to plan and run sectional meeting.

SINE COMMIT: **S**outh **D**akota, **I**owa, and **NE**braska (SINE) **COM**munity for **M**athematics **I**nquiry in **T**eaching (COMMIT)

2022 – Present: Communication Officer. Elected position charged with updating section website and sending section information

2021 – Present: Leader. Elected position charged with planning and developing SINE COMMIT events

University Service - Dakota State University

2022 – Present: Artificial Intelligence (AI) Club Advisor

2019 – Present: Honors Committee

2019 – Present: Gaming Club Advisor

2019 – Present: Title IX Investigator

2018 – Present: Faculty Development Committee

2022 – 2023: Shared Governance Committee

2022 – 2023: General Faculty President

2022 – 2023: Faculty Advisory Committee

2022 – 2023: Implementation Council

2022: Faculty Search Committee - Assistant Professor(s) of Computer Science (AI Focused)

2021 – 2022: Faculty Search Committee - Assistant Professor of Mathematics

2021: Faculty Search Committee - Assistant Professor(s) of Computer Science

2021: Faculty Search Committee - Instructor(s) of Computer Science

2021: Faculty Search Committee - Assistant Professor of Mathematics

2020: Faculty Search Committee - Assistant Professor(s) of Computer Science

2020: Faculty Search Committee - Instructor(s) of Computer Science

2016 – 2020: Student Success Committee

2019 – 2020: Faculty Game Producer - Expedition

2018 – 2020: Organizer for Mathematics Seminar and Speaker Series

2018 – 2019: Faculty Game Producer - Kingdom Cleanup

2017 – 2019: Curriculum Committee

2019: Faculty Search Committee - Assistant Professor of Mathematics

2018: Quality Assurance (Online) Reviewer

2018: Faculty Search Committee - Visiting Assistant Professor of Biology
2018: General Education Math Summit
2017: Faculty Search Committee - Assistant Professor of Mathematics

University Service - North Dakota State University

2015: NDSU Math Fair
2013 – 2015: NDSU Department of Mathematics Chair's Student Advisory Board
2014: Sonia Kovalevsky Math Day for Young Women in High School
2014: Expanding Your Horizons Conference
2014: Tri-College Mathematics Tournament
2013: Sonia Kovalevsky Math Day for Young Women in High School
2013: North Dakota Science Olympiad Co-Facilitator
2012: NDSU Department of Mathematics Teaching Mentor
2012: Sonia Kovalevsky Math Day for Young Women in High School
2011 – 2012: Applied Mathematics Search Committee - Student Member
2011: Sullivan Middle School Science Fair Judge
2007 – 2010: NDSU College of Science and Mathematics Ambassador
President: 2007–2008 *Congress of Student Organizations Officer:* 2007
2007 – 2015: NDSU Mathematics Club Math-In

Honors and Awards

2023: Dr. Ernest Teagarden Award for Excellence in Teaching
2015: NDSU Mathematics Department Graduate Student Teaching Award
2015: NDSU College of Science and Mathematics Graduate Student Travel Grant
2014: NDSU Mathematics Department Graduate Student Research Award
2014: NDSU College of Science and Mathematics Graduate Student Travel Grant
2012: AMS Student Travel Grant
2009: Joyce Gackle Johnston Scholarship, NDSU
2008 – 2010: Mathematics Scholarship, NDSU
2008: Rao Mathematics Exam Champion, NDSU
2007: Anderson/Hill Math Scholarship, NDSU
2007: Mathematics Emerging Talent Scholarship, NDSU
2006 – 2010: Presidential Honor Scholarship, NDSU