Jonathan Jaquette

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Education

Ph.D. Mathematics — May 2018
Advisor: Konstantin Mischaikow — Rutgers, The State University of New Jersey

B.A. with Honors — May 2011
Major: Mathematics, Minor: Physics — Swarthmore College

Research Interests

Nonlinear PDEs; Dynamical Systems & Differential Equations; Computer Assisted Proofs; Hamiltonian Systems; Topological Data Analysis; Mathematical Neuroscience.

Academic Employment History

- New Jersey Institute of Technology, *Assistant Professor* — Sept. 2023 – Present
- Boston University, *Postdoctoral Associate* — July 2020 – June 2023
- Brandeis University, *Postdoctoral Fellow* — Jan. 2019 – May 2020
- Mathematical Sciences Research Institute, *Postdoctoral Associate* — Aug. 2018 – Dec. 2018

Peer Reviewed Publications

1. "The Maslov Index, Degenerate Crossings and the Stability of Pulse Solutions to the Swift-Hohenberg equation." with M. Beck and H. Pieper; *Journal of Dynamics and Differential Equations* (2025): 1-55.
   DOI: https://doi.org/10.1007/s10884-025-10436-4 .
2. "Mechanisms of unstable blowup in a quadratic nonlinear Schrödinger equation." *Journal of Nonlinear Science* 35, no. 6 (2025): 114.
   DOI: https://doi.org/10.1007/s00332-025-10212-0 .
3. "Validated matrix multiplication transform for orthogonal polynomials with applications to computer-assisted proofs for PDEs." with M. Cadiot, J-P Lessard, and A. Takayasu; *Communications in Nonlinear Science and Numerical Simulation* (2025): 109063.
   DOI: https://doi.org/10.1016/j.cnsns.2025.109063 .
4. "Reliability and robustness of oscillations in some slow-fast chaotic systems" with S. Kedia, E. Sander, J. Touboul; *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 33 no. 10 (2023): 103135.
   DOI: https://doi.org/10.1063/5.0166846
5. "Validated Numerical Approximation of Stable Manifolds for Parabolic Partial Differential Equations" with J.B. van den Berg and J.D. Mireles James; *Journal of Dynamics and Differential Equations,* 35 (2023): 3589 - 3649.
   DOI: https://doi.org/10.1007/s10884-022-10146-1

6. "Rigorous numerics for nonlinear heat equations in the complex plane of time" with A. Takayasu, J.P. Lessard, and H. Okamoto; *Numerische Mathematik,* 151, no. 3 (2022): 693-750.
   DOI: https://doi.org/10.1007/s00211-022-01291-2
7. "Global dynamics in nonconservative nonlinear Schrödinger equations" with J.P. Lessard and A. Takayasu; *Advances in Mathematics,* 398 (2022): 108234.
   DOI: https://doi.org/10.1016/j.aim.2022.108234
8. "Quasiperiodicity and blowup in integrable subsystems of nonconservative nonlinear Schrödinger equations"; *Journal of Dynamics and Differential Equations,* (2022): 1-25.
   DOI: https://doi.org/10.1007/s10884-021-10112-3
9. "Validated spectral stability via conjugate points" with M. Beck; *SIAM Journal on Applied Dynamical Systems*, 21, no. 1 (2022): 366-404.
   DOI: https://doi.org/10.1137/21M1420095
10. "Singularities and heteroclinic connections in complex-valued evolutionary equations with a quadratic nonlinearity" with J.P. Lessard and A. Takayasu; *Commun Nonlinear Sci Numer Simulat*, 107 (2022): 106188.
    DOI: https://doi.org/10.1016/j.cnsns.2021.106188
11. "Fractal dimension estimation with persistent homology: A comparative study" with B. Schweinhart; *Commun Nonlinear Sci Numer Simulat*, 84 (2020): 105163.
    DOI: https://doi.org/10.1016/j.cnsns.2019.105163
12. "A proof of Jones' conjecture"; *Journal of Differential Equations*, 266 no. 6 (2019): 3818-3859.
    DOI: https://doi.org/10.1016/j.jde.2018.09.017
13. "A proof of Wright's conjecture" with J.B. van den Berg; *Journal of Differential Equations*, 264, no. 12 (2018): 7412-7462.
    DOI: https://doi.org/10.1016/j.jde.2018.02.018
14. "Stability and uniqueness of slowly oscillating periodic solutions to Wright's equation" with J.P. Lessard and K. Mischaikow; *Journal of Differential Equations*, 263, no. 11 (2017): 7263-7286.
    DOI: https://doi.org/10.1016/j.jde.2017.08.018
15. "On ε approximations of persistence diagrams" with M. Kramár; *Mathematics of Computation*, 86, no. 306 (2017): 1887-1912.
    DOI: https://dx.doi.org/10.1090/mcom/3137

Preprints

1. "Resonant vector bundles, conjugate points, and the stability of pulse solutions to the Swift-Hohenberg equation using validated numerics: Part I." with M. Beck and H. Pieper. *Submitted (2025): 1-67.*
   URL: https://arxiv.org/abs/2510.24417 .

Other Publications

1. "A Novel Method for Computing Spectral Stability of Standing Waves"; *The Dynamical Systems Web*, (2021, Oct): https://dsweb.siam.org/.

PhD Student Mentoring

- Michael Storm (NJIT, expected PhD in 2029)

- Co-mentor for PhD student Hannah Pieper (Boston University, received PhD in 2024)

Teaching Experience: (NJIT)

2026	Spring	Math 335: Vector Analysis	Instructor
2025	Fall	Math 211: Calculus III	Instructor
2025	Fall	Math 613: Advanced Applied Mathematics I: Modeling	Instructor
2025	Spring	Math 111: Calculus I	Instructor
2024	Fall	Math 676: Advanced Ordinary Differential Equations	Instructor
2024	Spring	Math 213: Calculus III	Instructor
2023	Fall	Math 613: Advanced Applied Mathematics I: Modeling	Instructor

Teaching Experience: (Boston University)

2023	Spring	Math 876: Graduate PDE Seminar	Instructor
2022	Fall	Math 226: Differential Equations	Instructor
2022	Spring	Math 876: Graduate PDE Seminar	Instructor
2021	Fall	Math 775: Graduate Ordinary Differential Equations	Instructor
2021	Spring	Math 226: Differential Equations	Instructor
2020	Fall	Math 775: Graduate Ordinary Differential Equations	Instructor

Teaching Experience: (Brandeis University)

2019	Fall	Math 037a: Differential Equations	Instructor

Teaching Experience: (Rutgers University)

2018	Spring	Math 421: Advanced Differential Equations	Teaching Assistant
2017	Fall	Math 244: Differential Equations	Teaching Assistant
2017	Spring	Math 152: Calculus II	Teaching Assistant
2016	Fall	Math 151: Calculus I	Teaching Assistant
2016	Spring	Math 252: Differential Equations	Teaching Assistant
2015	Summer	Math 252: Differential Equations	Instructor
2014	Fall	Math 135: Calculus I	Teaching Assistant
2014	Spring	Math 152: Calculus II	Teaching Assistant

Research Support, Fellowships, and Awards

'25-'27 *American Chemical Society:* ($125k) Co-PI. Seed grant on "Correlating flow through porous rock with the pore network topology"

2024 *Grace Hopper AI Research Institute Seed Grant:* ($50k) Co-PI. Grant to support undergraduate research in complex fluids, topological data analysis and machine learning.

2024 *Institute for Teaching Excellence at NJIT:* Award to develop active learning methods for graduate mathematics curriculum.

2024 *SLMath Graduate Summer School:* Award to teach graduate summer school at SLMath in 2025 on Computer Assisted Proofs in Applied Mathematics.

2023 *SIAM ICIAM 2023 Travel Award:* Awarded by SIAM to attend the 10th International Congress on Industrial and Applied Mathematics in Tokyo, Japan.

2022 *SIAM Early Career Travel Award:* Awarded by SIAM to attend the SIAM Conference on Nonlinear Waves and Coherent Structures (NWCS22).
2021 *SIAM Early Career Travel Award:* Awarded by SIAM to attend the SIAM Conference on Applications of Dynamical Systems (DS21).
2020 *Seal of Excellence:* Awarded by the European Commission, managing the Horizon 2020 Marie Skłodowska-Curie actions, for submitting a high-quality grant proposal.
2019 *Susan Lindquist Award:* Awarded by Brandeis University for professional development of young scientists.
2019 *SIAM Early Career Travel Award:* Awarded by SIAM to attend the SIAM Conference on Applications of Dynamical Systems (DS19).
2018 *TA/GA Professional Development Fund Award:* Awarded by the Rutgers University Graduate School for summer research support.
2017 *TA/GA Professional Development Fund Award:* Awarded by the Rutgers University Graduate School for summer research support.
2017 *SIAM Student Travel Award:* Awarded by SIAM to attend the SIAM Conference on Applications of Dynamical Systems (DS17).
2016 *Special Study Award:* Awarded by the Rutgers University Graduate School for conference travel.
2012 *Lockwood Fellow:* Awarded by Swarthmore College for graduate study.

Colloquium, Conference, and Seminar Presentations

- AMS Fall Southeastern Sectional Meeting; New Orleans, Louisiana 10/05/2025
- Swarthmore College; Swarthmore, Pennsylvania 09/30/2025
- SIAM Conference on Applications of Dynamical Systems; Denver, Colorado 05/11/2025
- George Mason University; Fairfax, Virginia 04/11/2025
- Conference on Fluids and Computer Assisted Proofs; Princeton, New Jersey ... 03/15/2025
- Fluid Dynamics, Geometry and Computer Science in Interaction; Barcelona, ES 09/18/2024
- Université de Montréal; Montréal, Canada 09/09/2024
- Durham University; Durham, UK 07/23/2024
- International Congress on Mathematical Software 2024; Durham, UK 07/22/2024
- Piotrfest: From Topology to Computations in Dyn. Sys.; Krakow, Poland 06/25/2024
- Equadiff Conference; Karlstad, Sweden 06/13/2024
- Rutgers University; New Brunswick, New Jersey 03/06/2024
- University of Iowa; Iowa City, Iowa (Online) 02/26/2024
- New York University; New York, New York 10/18/2023
- ICERM; Providence, Rhode Island 09/19/2023
- ICIAM; Tokyo, Japan 08/24/2023
- American Institute of Mathematics Workshop; San Jose, California 06/05/2023
- SIAM Conference on Applications of Dynamical Systems; Portland, Oregon 05/18/2023
- Georgia Institute of Technology; Atlanta, Georgia 02/24/2023
- Brown University; Providence, Rhode Island 02/10/2023
- Joint Math Meetings; Boston, Massachusetts 01/04/2023
- Temple University; Philadelphia, Pennsylvania 12/05/2022
- AMS Fall Eastern Sectional Meeting; Amherst, Massachusetts 10/01/2022
- Brandeis University; Waltham, Massachusetts 09/28/2022
- SIAM Conference on Nonlinear Waves & Coherent Structures; Bremen, Germany 09/01/2022
- Universitat de Barcelona; Barcelona, Spain 07/20/2022

- Conference on Dynamics, Topology and Computation; Bedlewo, Poland 06/24/2022
- The 12^{th} IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena; Athens, Georgia 03/30/2022
- International Workshop on Reliable Computing and Computer-Assisted Proofs (ReCAP 2022); Japan (Online) 03/14/2022
- Conference on Mathematics of Wave Phenomena; Karlsruhe, Germany (Online) 02/16/2022
- Oberwolfach Workshop; Germany (Online) 08/11/2021
- VU Amsterdam; the Netherlands (Online) 06/23/2021
- SIAM Conference on Applications of Dynamical Systems; USA (Online) 05/26/2021
- Centre de Recherches Mathématiques; Montréal, Canada (Online) 05/11/2021
- Centre de Recherches Mathématiques; Montréal, Canada (Online) 06/30/2020
- Foundations of Computational Mathematics; Vancouver, BC *(canceled due to COVID-19)* 06/20/2020
- 13^{th} AIMS conference on dynamical systems, differential equations, and applications; Atlanta, Georgia *(canceled due to COVID-19)* 06/07/2020
- Banff International Research Station; Banff, Canada (Online) 05/18/2020
- INVA2020 Workshop on Numerical Verification; Iriomote Island, Japan *(canceled due to COVID-19)* 03/12/2020
- 16^{th} JSIAM Research Group Joint Presentation; Tokyo, Japan *(canceled due to COVID-19)* 03/05/2020
- George Mason University; Fairfax, Virgina 01/24/2020
- University of Tsukuba; Tsukuba, Japan 01/16/2020
- Waseda University; Tokyo, Japan 01/10/2020
- McGill University; Montréal, Canada 11/11/2019
- Equadiff Conference; Leiden, the Netherlands 07/12/2019
- Universitat de Barcelona; Barcelona, Spain 07/03/2019
- 11^{th} Colloquium on the Qualitative Theory of Differential Equations; Szeged, Hungary 06/21/2019
- SIAM Conference on Applications of Dynamical Systems; Snowbird, Utah 05/20/2019
- Brown/BU/UMass joint Seminar; Boston, Massachusetts 05/03/2019
- Centre de Recherches Mathématiques; Montréal, Canada 04/05/2019
- Boston University; Boston, Massachusetts 03/18/2019
- Brown University; Providence, Rhode Island 02/11/2019
- Mathematical Sciences Research Institute; Berkeley, California 11/14/2018
- Conference on Algebraic Topology in Data and Dynamics; Bozeman, Montana . 07/10/2018
- Conference on Dynamics, Topology and Computation; Bedlewo, Poland 06/22/2018
- Universitat de Barcelona; Barcelona, Spain 05/23/2018
- Jagiellonian University; Krakow, Poland 01/05/2018
- The XI Americas Conference on Differential Equations and Nonlinear Analysis; Edmonton, Canada 08/18/2017
- SIAM Conference on Applications of Dynamical Systems; Snowbird, Utah 05/21/2017
- Banff International Research Station; Banff, Canada 05/08/2017
- 11^{th} AIMS conference on dynamical systems, differential equations, and applications; Orlando, Florida 07/03/2016
- Florida Atlantic University; Boca Raton, Florida 06/28/2016
- Lorentz Center; Leiden, the Netherlands 06/07/2016
- Universitat de Barcelona; Barcelona, Spain 11/18/2015
- VU Amsterdam; Amsterdam, the Netherlands 09/23/2015

- Florida Atlantic University; Boca Raton, Florida 04/03/2015
- Banff International Research Station; Alberta, Canada 09/22/2014

Poster Presentations

- Frontiers in Applied & Computational Mathematics; Newark, New Jersey 05/26/2023
- Second Drexel Waves Workshop; Philadelphia, Pennsylvania 03/30/2023
- GLADS: Global and local aspects in Dynamical Systems; Barcelona, Spain 07/05/2022
- ICERM: Numerics, Modeling, and Experiments in Wave Phenomena; Providence, Rhode Island 09/21/2021
- Llavefest: A broad perspective on finite and infinite dimensional dynamical systems; Barcelona, Spain 06/13/2017
- The 11th AIMS conference on dynamical systems, differential equations, and applications; Orlando, Florida 07/03/2016
- Centre International de Rencontres Mathématiques; Marseille, France 03/23/2016
- Institute for Mathematics and its Applications; Minneapolis, Minnesota 02/12/2014

Education and Outreach

2025 Organized panel discussion on active learning in mathematics courses ..... Nov.

2025 Lead organizer on 2-week graduate summer school on *Computer-assisted proofs in applied mathematics* at SLMath (Berkeley, CA), co-developed with Evelyn Sander (GMU). ... July

2025 Presented on active learning in graduate courses, at the NJIT - Center for Educational Innovation and Excellence Newark, New Jersey ..... April

2024 Volunteered at *STEM for Success*, an integrated program to broaden participation in STEM, especially for those in traditionally underrepresented groups. ..... Feb.

2023 Taught a course on chaos in neural models in the "Topology and Dynamical Systems in Action - Summer school 2023" hosted by the Gdańsk University of Technology. ..... Jun.

2022 Faculty Advisor for BU's Student Chapter of the Society for Industrial and Applied Mathematics (SIAM) ..... Sep.–Jun.'23

2022 Judge for SCUDEM VII 2022; Evaluate and provide feedback on students' team projects in the "SIMIODE Challenge Using Differential Equations Modeling"; Online; ..... Dec.

2021 Judge for SCUDEM VI 2021; Evaluate and provide feedback on students' team projects in the "SIMIODE Challenge Using Differential Equations Modeling"; Online; ..... Dec.

2020 Judge for SCUDEM V 2020; Evaluate and provide feedback on students' team projects in the "SIMIODE Challenge Using Differential Equations Modeling"; Online; ..... Nov.

2020 Academic Career Panel; shared advice and experiences about the academic job finding processes; Waltham, Massachusetts; ..... Apr.

2019 "Wright's Conjecture and the Prime Number Theorem"; Math Grad Program open house for prospective students; Waltham, Massachusetts; ..... Nov.

2018 Graduate Math Panel participant; shared advice and experiences about the graduation and job-finding processes; Piscataway, New Jersey; ..... May.

2016 Developed a set of MATLAB assignments for the Math 252 differential equations course at Rutgers University; Piscataway, New Jersey; ..... January-May.

2015 "Applied and Computational Algebraic Topology" Graduate student research glimpses; Rutgers University; Piscataway, New Jersey; ..... August.

2014 "An Introduction to Applied Algebraic Topology" Bozovic Lab Group Meeting (Biophysics), University of California, Los Angeles; Los Angeles, California; ..... May.

Minisymposiums, Special Sessions and Seminars Organized

2025 *Minisymposium on Computer-Assisted Mathematical Proofs in Dynamics*: Co-organized with L. van der Aalst, & J. Mireles James; SIAM Conference on Applications of Dynamical Systems; Denver, Colorado; May 11-15.

2025 *19th Annual Conference on Frontiers in Applied and Computational Mathematics (FACM'25)*: Organizing Committee Member; Newark, New Jersey; June 05-06.

2023 *Minisymposium on Computer-Assisted Mathematical Proofs in Dynamics*: Co-organized with J.B. van den Berg, & M. Breden; SIAM Conference on Applications of Dynamical Systems; Portland, Oregon; May 14-18.

2022 *Minisymposium on Computer Assisted Theorems in Dynamics*: Co-organized with J.B. van den Berg & M. Breden; SIAM Conference on Nonlinear Waves & Coherent Structures; Bremen, Germany; Aug 30 - Sept 02.

2022 *BU Dynamics Seminar*: Co-organizer from 2022-2023.

2021 *Brown/BU/UMass Amherst Joint Dynamics/PDE Seminar*: Co-organizer from 2021-2023.

2021 *Minisymposium on Computer-Assisted Mathematical Proofs in Nonlinear Dynamics*: Co-organized with J.B. van den Berg, M. Breden, & J.P. Lessard; SIAM Conference on Applications of Dynamical Systems; Online; May 23-27.

2017 *Minisymposium on Computer Assisted Proofs in Dynamical Systems*: Co-organized with J.B. van den Berg; SIAM Conference on Applications of Dynamical Systems; Snowbird, Utah; July 1-5.

Professional Service

Journal Referee: *Communications in Nonlinear Science and Numerical Simulation; Forum of Mathematics, Pi; Frontiers in Physiology (Computational Physiology and Medicine section); Indagationes Mathematicae; International Journal of Bifurcation and Chaos; Inventiones Mathematicae; Journal of Dynamics and Differential Equations, Nonlinearity; Physica D: Nonlinear Phenomena; SIAM Journal on Applied Dynamical Systems; SIAM Journal on Mathematical Analysis*