Brian Lins

Department of Math and Computer Science   home: (804) 601-0806
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Research Interests

Nonlinear functional analysis, nonlinear Perron-Frobenius theory, nonexpansive maps, matrix analysis, numerical ranges

Education

Ph.D. in Mathematics, received October 2007; advisor: Roger D. Nussbaum
     Rutgers University, New Brunswick, New Jersey
     Dissertation title: **Asymptotic behavior and Denjoy-Wolff theorems for Hilbert metric nonexpansive maps**

B.S. in Mathematics, received May 2001
     College of William & Mary, Williamsburg, Virginia
     Minor in physics; Graduated with highest honors

Positions Held

Professor, Department of Math and Computer Science,
     Hampden-Sydney College, *Fall 2021 - present*

Associate Professor, Department of Math and Computer Science,
     Hampden-Sydney College, *Fall 2014 - Spring 2021*

Assistant Professor, Department of Math and Computer Science,
     Hampden-Sydney College, *Fall 2008 - Spring 2014*

Visiting Assistant Professor, Department of Math and Computer Science,
     Dickinson College, *Fall 2007 - Spring 2008*

Instructor and Teaching Assistant, Department of Mathematics,
     Rutgers University, New Brunswick, New Jersey, *Fall 2003 - Spring 2007*

Publications

Brian Lins. Real analytic nonexpansive maps on polyhedral normed spaces. *submitted.*

Brian Lins and Aljoša Peperko. Inequalities on the essential joint and essential generalized spectral radius. *Accepted to appear in J. Math. Inequal.*

Brian Lins. Bounded fixed point sets and Krasnoselskii iterates of Thompson metric nonexpansive maps. *Accepted to appear in J. Korean Math. Soc.*

Brian Lins. Convergence of iterates in nonlinear Perron-Frobenius theory. *Discrete Contin. Dyn. Syst. Ser. B*, 28(7):3868–3886, 2023

Brian Lins. A unified approach to nonlinear Perron-Frobenius theory. *Linear Algebra Appl.*, 675:48–89, 2023

Brian Lins. Nonexpansive maps with surjective displacement. *J. Fixed Point Theory Appl.*, 24(1), 2022

Brian Lins. The essential numerical range and a theorem of Simon on the absorption of eigenvalues. *ArXiv preprint*

Brian Lins. Numerical ranges encircled by analytic curves. *Oper. Matrices*, 15(1):381–386, 2021

Brian Lins and Ilya M. Spitkovsky. Inverse continuity of the numerical range map for Hilbert space operators. *Oper. Matrices*, 14(1):77–90, 2020

Brian Lins, Ilya M. Spitkovsky, and Siyu Zhong. The normalized numerical range and the Davis-Wielandt shell. *Linear Algebra Appl.*, 546:187–209, 2018

Bas Lemmens, Brian Lins, and Roger Nussbaum. Detecting fixed points of nonexpansive maps by illuminating the unit ball. *Israel J. Math.*, 224(1):231–262, 2018

Brian Lins. Whose turn is it to drive today? *Math Horiz.*, 23(2):16–19, 2015

Brian Lins and Parth Parihar. Continuous selections of the inverse numerical range map. *Linear Multilinear Algebra*, 64(1):87–99, 2016

Bas Lemmens, Brian Lins, Roger Nussbaum, and Marten Wortel. Denjoy-Wolff theorems for Hilbert's and Thompson's metric spaces. *J. Anal. Math.*, 134(2):671–718, 2018

Charles R. Johnson, Brian Lins, Victor Luo, and Sean Meehan. Ordering graphs in a normalized singular value measure. *Involve*, 8(2):263–273, 2015

Timothy Leake, Brian Lins, and Ilya M. Spitkovsky. Inverse continuity on the boundary of the numerical range. *Linear Multilinear Algebra*, 62(10):1335–1345, 2014

Timothy Leake, Brian Lins, and Ilya M. Spitkovsky. Pre-images of boundary points of the numerical range. *Oper. Matrices*, 8(3):699–724, 2014

Craig Larson, Brian Lins, and Lon Mitchell. Graphs of unitary matrices and positive semidefinite zero forcing. *Rep. Math. Phys.*, 72(3):311–320, 2013

Dan Corey, Charles R. Johnson, Ryan Kirk, Brian Lins, and Ilya Spitkovsky. Continuity properties of vectors realizing points in the classical field of values. *Linear Multilinear Algebra*, 61(10):1329–1338, 2013

Philip Chodrow, Cole Franks, and Brian Lins. Upper and lower bounds for the iterates of order-preserving homogeneous maps on cones. *Linear Algebra Appl.*, 439(4):999–1005, 2013

Daniel Corey, Charles R. Johnson, Ryan Kirk, Brian Lins, and Ilya Spitkovsky. The product field of values. *Linear Algebra Appl.*, 438(5):2155–2173, 2013

Charles R. Johnson, Brian Lins, and Olivia Walch. The critical exponent for continuous conventional powers of doubly nonnegative matrices. *Linear Algebra Appl.*, 435(9):2175–2182, 2011

Eduard Einstein, Charles R. Johnson, Brian Lins, and Ilya Spitkovsky. The ratio field of values. *Linear Algebra Appl.*, 434(4):1119–1136, 2011

Brian Lins. Asymptotic behavior of nonexpansive mappings in finite dimensional normed spaces. *Proc. Amer. Math. Soc.*, 137(7):2387–2392, 2009

Brian Lins and Roger Nussbaum. Denjoy-Wolff theorems, Hilbert metric nonexpansive maps and reproduction-decimation operators. *J. Funct. Anal.*, 254(9):2365–2386, 2008

Brian Lins. A Denjoy-Wolff theorem for Hilbert metric nonexpansive maps on polyhedral domains. *Math. Proc. Cambridge Philos. Soc.*, 143(1):157–164, 2007

Brian Lins and Roger Nussbaum. Iterated linear maps on a cone and Denjoy-Wolff theorems. *Linear Algebra Appl.*, 416(2-3):615–626, 2006

Jeremy Brandman, James Fowler, Brian Lins, Ilya Spitkovsky, and Nahum Zobin. Convex hulls of Coxeter groups. In *Function spaces, interpolation theory and related topics (Lund, 2000)*, pages 213–240. de Gruyter, Berlin, 2002

Brian Lins, Patrick Meade, Christian Mehl, and Leiba Rodman. Research problem: indefinite inner product normal matrices. *Linear and Multilinear Algebra*, 49(3):261–268, 2001

Brian Lins, Patrick Meade, Christian Mehl, and Leiba Rodman. Normal matrices and polar decompositions in indefinite inner products. *Linear and Multilinear Algebra*, 49(1):45–89, 2001

Awards and Honors

John Peter Mettauer excellence in research award, *Spring 2021*

Six-year Elliott professorship, *Fall 2016 - Spring 2022*

Three-year Elliott professorship, *Fall 2011 - Spring 2014*

BIRS Research in Teams participant, *Fall 2012*

Sectional Project NExT fellow, *Fall 2008*

National Project NExT fellow, *Summer 2008*

Rutgers Math Department TA teaching excellence award, *Spring 2004*

VIGRE fellowship, *Fall 2001 - Spring 2003*

William & Mary prize in mathematics, *Spring 2001*

James Monroe scholar, awarded $2000 research grant, *Summer 2000*

Teaching Experience

Hampden-Sydney College
Courses taught: advanced topics in computer science (machine learning), algebraic structures, calculus I & II, calculus for economics, complex analysis, graph theory, intermediate analysis, introduction to computer science I, linear algebra, math and society, matrix analysis, measure theory, multivariable calculus, numerical analysis, prep for calculus, probability I & II, proofs and abstraction, quantum computing, statistics, statistical methods, theory of computing, topology

Dickinson College
Courses taught: calculus I & II, differential equations

Rutgers University, New Brunswick
Courses taught: advanced math for engineers, calculus I, linear algebra, multivariable calculus

Presentations

Recent developments in nonlinear Perron-Frobenius theory, VCU discrete math seminar, *Fall 2024*

Recent developments in nonlinear Perron-Frobenius theory, Positivity conference, *Summer 2023*

The geothmetic meandian and other topical functions, MD-DC-VA MAA section meeting, *Spring 2023*

Nonexpansive maps with surjective displacement, Invited talk, VOTCAM, *Fall 2021*

Detecting fixed points of nonexpansive maps by illuminating the unit ball, Special session on order-preserving operators on cones and applications, IWOTA Lisbon, *Summer 2019*

e in a box of cereal, Invited address, MD-DC-VA MAA section meeting, *Spring 2019*

Inverse continuity of the numerical range map for Hilbert space operators, AMS Special Session on Advances in Operator Theory, Operator Algebras, and Operator Semigroups, Joint AMS/MAA Meeting, Baltimore, *Winter 2019*

Nonexpansive maps and the illumination conjecture, UVA operator theory seminar, *Fall 2017*

Eigenvalue crossings in Hermitian pencils and the boundary of the numerical range, ILAS conference, *Summer 2017*

Nonexpansive maps and the illumination conjecture, VCU discrete math seminar, *Spring 2017*

Continuous selections of the inverse numerical range map, ILAS conference, *Summer 2016*

Whose turn is it to drive today? MD-DC-VA MAA section meeting, *Spring 2015*

Continuous selections of the inverse numerical range map NYU - Abu Dhabi math seminar, *Spring 2015*

Inverse continuity of the numerical range map University of Kent colloquium, *Spring 2015*

Inverse continuity of the numerical range map UVA operator theory seminar, *Fall 2013*

Life in the matrix, Hampden-Sydney College Phi Beta Kappa lecture, *Fall 2013*

Denjoy-Wolff type theorems on cones, ILAS conference, *Summer 2013*

e in a box of cereal, MD-DC-VA MAA section meeting, *Spring 2013*

Nonexpansive maps and the horofunction boundary, UVA operator theory seminar, *Fall 2011*

Upper bounds for order-preserving homogeneous maps, ILAS conference, *Summer 2011*

Liberal arts mathematics on a logarithmic scale, MD-DC-VA MAA section meeting, *Spring 2011*

Formal eigenvectors of order-preserving homogeneous maps, AMS Southeastern sectional meeting, *Fall 2010*

Nonexpansive maps and the horofunction boundary, W&M math colloquium, *Fall 2009*

The 2^n conjecture, VCU analysis seminar, *Fall 2009*

Nonexpansive maps and the horofunction boundary, VCU analysis seminar, *Spring 2008*

Nonnegative matrices, Longwood University math colloquium, *Fall 2008*

Open source math software, Dickinson College Pi Mu Epsilon address, *Spring 2008*

Checkers and game theory, Dickinson math & computer science chat, *Fall 2007*

Denjoy-Wolff theorems for Hilbert metric nonexpansive maps on polyhedral domains, AMS Session on Dynamical Systems, Joint AMS/MAA Meeting, New Orleans, *Winter 2007*

The history of logarithms and slide rules, Graduate student pizza seminar, *Fall 2005*

The Birkhoff-Hopf bifurcation theorem, Graduate student nonlinear analysis seminar, *Spring 2005*

A proof of the Brouwer fixed point theorem using differential forms, Graduate student nonlinear analysis seminar, *Spring 2005*

The Hilbert metric on cones, Graduate student nonlinear analysis seminar, *Fall 2004*

The fundamental theorem of algebra with linear algebra, Graduate student pizza seminar, *Fall 2003*

The geometry of Coxeter groups, Graduate student pizza seminar, *Fall 2002*

Gerschgorin discs, Graduate student pizza seminar, *Spring 2002*

Professional Service

Associate editor, MAA Classroom Resource Materials, *Spring 2014 - Fall 2019*

Treasurer MD-DC-VA section MAA, *Fall 2011 - Spring 2017*

Faculty Advisor, William & Mary REU program, *Summers, 2009-2013*

Mentor, DIMACS Research Experiences for Undergraduates program, *Summer 2002*

College Service

Hampden-Sydney College data analytics task force chair, *Fall 2024*

Department chair, Department of Math and Computer Science, *Fall 2023 - present*

Hampden-Sydney College benefits committee, *Fall 2023 - present*

Hampden-Sydney College grievance committee, *Fall 2022 - present*

Hampden-Sydney College faculty affairs committee, *Fall 2022*

Hampden-Sydney College assessment committee, *Fall 2018 - Spring 2021*

Hampden-Sydney College human research committee, *Fall 2016 - Spring 2018*

Summer research project with Reuben Retnam '17 on the critical curves of matrices, *Summer 2016*

Department chair, Department of Math and Computer Science, *Fall 2015 - Spring 2021*

Hampden-Sydney College professional development committee, *Fall 2015 - Spring 2018*

Hampden-Sydney College athletics committee, *Fall 2013 - Spring 2017*

Hampden-Sydney College technology advisory committee, *Fall 2011 - Spring 2013*

Hampden-Sydney College international studies committee, *Fall 2011 - Spring 2013*

Hampden-Sydney College admissions committee, *Fall 2009 - Spring 2011*

Putnam exam coach, Hampden-Sydney College, *Fall 2009 - Fall 2015*

Co-organizer, Panel discussion of free and open source mathematics software and textbooks at the MD-DC-VA MAA section meeting, *Fall 2009*

Co-organizer, Hampden-Sydney faculty LaTeX/Beamer seminar, *Fall 2009*

Putnam exam coach, Dickinson College, *Fall 2007*

Co-organizer, Rutgers graduate student nonlinear analysis seminar, *Fall 2004 - Spring 2005*

Computer Skills

- Advanced: HTML, Javascript, LaTeX, Python.
- Proficient: C, Julia, Matlab, R.

Affiliations

International Linear Algebra Society (ILAS)

Mathematical Association of America (MAA)

Citizenship United States citizen