

CRAIG GROSS

Contact and Other Information

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Work Address	Institute for Cyber-Enabled Research, Michigan State University 567 Wilson Road Room 400, Biomedical and Physical Sciences Building East Lansing, MI 48824

Education

May 2023	Ph.D. Applied Mathematics, Michigan State University, East Lansing, Advisor: Mark Iwen, Thesis: Sparsity in the Spectrum: Sparse Fourier Transforms and Spectral Methods for Functions of Many Dimensions
May 2017	B.S. Mathematics & Computer Science, summa cum laude, University of Arizona, Tucson, Advisor: Andrew Gillette

Professional Experience

January 2023 – Present	Research Computing Facilitator , Institute for Cyber-Enabled Research, Michigan State University
Fall 2019 – Spring 2020, Spring 2021 – Summer 2021, Spring 2022 – Summer 2022	Research Assistant , Michigan State University
Summer 2018 – Fall 2019, Fall 2020, Fall 2021, Fall 2022	Teaching Assistant , Michigan State University
Summer 2020	Data Science Student Intern , Lawrence Livermore National Laboratory. <ul style="list-style-type: none">– Investigation of vortex detection in large scale OpenFOAM fluid flow simulations in a high performance computing environment.– Machine learning approaches for biometric matching with MRI data.– Mini courses in graph theory, multivariate regression, deep learning, and computational design of experiments.
Spring 2014 – Fall 2016	Undergraduate Research Assistant , University of Arizona. <ul style="list-style-type: none">– Implementation of serendipity basis function generations for finite element method. Project received Excellence in Undergraduate Research for Department of Mathematics.

Research Interests

High performance computing, compressive sensing, high dimensional function approximation, uncertainty quantification, numerical partial differential equations.

Publications

Submitted

- C. Gross and M. Iwen. Sparse spectral methods for solving high-dimensional and multiscale elliptic PDEs. arXiv:2302.00752 [math.NA], 2023

Published journal articles

- C. Gross, M. Iwen, L. Kämmerer, and T. Volkmer. Sparse Fourier transforms on rank-1 lattices for the rapid and low-memory approximation of functions of many variables. *Sampling Theory, Signal Processing, and Data Analysis*, 20(1):1, Dec. 2021
- C. Gross, M. A. Iwen, L. Kämmerer, and T. Volkmer. A deterministic algorithm for constructing multiple rank-1 lattices of near-optimal size. *Advances in Computational Mathematics*, 47(6):86, Dec. 2021

Undergraduate

- A. Gillette, C. Gross, and K. Plackowski. Numerical studies of serendipity and tensor product elements for eigenvalue problems. *Involve*, 11(4):661–678, 2018
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Talks

Conference talks

- *Sparsifying high-dimensional, multiscale Fourier spectral methods*. Contributed talk, Great Lakes SIAM 2022 Annual Meeting. Wayne State University, Detroit, Michigan, September, 2022.
- *Sparsifying high-dimensional, multiscale Fourier spectral methods*. Contributed talk, Canadian Mathematical Society summer meeting. Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada, June, 2022.
- *A walk around the torus: SFTs in many dimensions*. Contributed talk, Online International Conference on Computational Harmonic Analysis, Online, September, 2021.

Invited talks and funded visits

- *Applications of compressive sensing and high-dimensional function approximation in uncertainty quantification*. Analysis research seminar, Technische Universität Chemnitz, Chemnitz, Germany, January, 2020.

Other talks

- Semester long graduate level lecture series on compressive sensing and PDE-based uncertainty quantification to prepare for comprehensive exam, Michigan State University, Fall 2019.
 - Various seminar talks, Michigan State University, 2017 - 2022.
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Workshops and Conferences

Workshops attended

- Data Science for Democracy. Johns Hopkins University, Baltimore, Maryland. June, 2022.
 - Worked with Baltimore Transit Equity Coalition to demonstrate impact of potential improvements to public transit system for disadvantaged areas in the city.

- Final product available at: <https://arcg.is/0SePnT>.
- AARMS CRG Scientific Machine Learning workshop. Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada. June, 2022.
- PDE-based uncertainty quantification. Argonne National Laboratory, Lemont, Illinois. May, 2019.
- Finite element method for eigenvalue problems. Michigan Technological University, Houghton, Michigan. July, 2016.

Conferences attended

- Great Lakes SIAM 2022 annual meeting. Wayne State University, Detroit, Michigan. September, 2022.
- Canadian Mathematical Society summer meeting. Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada. June, 2022.
- paraDIGMS (Diversity in Graduate Mathematical Sciences). Online. April, 2020 and 2022.
- Online International Conference on Computational Harmonic Analysis. Online. September, 2021.
- Concentration week in randomness and determinism in compressive data acquisition. Texas A&M, College Station, Texas. July, 2019.

Teaching Experience

Carpentries

- Certified Carpentries instructor
 - Trained in delivering Software, Data, and Library Carpentries curricula via live coding and active learning strategies with emphasis on managing cognitive load, inclusive practices, and formative assessment.
 - Contributed revisions to "R for Social Sciences" curriculum.
- Workshops taught

October 2022 (upcoming)	Introduction to Unix Shell, Using Git, and Programming with Python. Carnegie Mellon University, online.
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Michigan State University

- Teaching assistant

Fall 2022	Matrix Algebra with Computational Applications (Instructor of record)
Fall 2021	Standards based graded college algebra (Instructor of record)
Fall 2020	Calculus II (Recitation instructor)
Fall 2019	Differential equations (Recitation instructor)
Spring 2019	Differential equations (Recitation instructor)
Fall 2018	Survey of calculus (Instructor of record)
Summer 2018	Calculus I (Exam writing, live-streaming review sessions, compiling supplemental instructional material)
When teaching	Math learning center tutor
- Other projects

Summer 2019	MATLAB-based Calculus II labs. <ul style="list-style-type: none"> - Producing screen-cast video introductions and recaps of MATLAB-based programming labs for application focused sections of Calculus II.
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- Professional development

Spring 2022	Facilitating Accessible and Inclusive Mathematics Learning Environments <ul style="list-style-type: none"> – Semester-long workshop pilot run by Program in Mathematics Education at MSU. – Covered topics such as building student relationships and safe spaces for anti-deficit learning environments, student supports, legal theory and practice of mathematics accommodations, and universal design.
2017 – 2018	Introductory teaching workshop from MSU Center for Instructional Mentoring. <ul style="list-style-type: none"> – Covered topics such as inclusive teaching, formative assessment, active learning, effective group work strategies, and lesson planning.

University of Arizona

- Undergraduate teaching assistant

Spring 2014	Calculus I
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Scholarships and Awards

2022	TA Award for Excellence in Teaching in the Department of Mathematics, Michigan State University
2022	Douglass A. Spragg Endowed Fellowship, Michigan State University
2020	Dr. Paul and Wilma Dressel Endowed Scholarship, Michigan State University
2017	Department of mathematics recruiting fellowship, Michigan State University
2017	Early start fellowship, Michigan State University
2017	Excellence in undergraduate research for Mathematics Department and finalist for College of Science, University of Arizona
2013 – 2017	Arizona wildcat excellence scholarship, University of Arizona
2013 – 2016	Worth and Dot Howard Foundation Scholarship
2015	Galileo Scholar, University of Arizona

Service

Mentoring

- Mentoring MSU undergraduate students
 - Undergraduate research mentor (in progress): Led research group of two undergraduate students in researching data pre-processing techniques with applications to social vulnerability datasets.
 - Advanced track student mentor (in progress): Led mentoring pod of five undergraduate mathematics students new to MSU.
 - Project mentor: Collaborated with and supervised undergraduate assistant in producing programming resources for MATLAB-based Calculus II labs.
- Teaching
 - Lead TA, Calculus II: Observing, holding meetings with, and mentoring new teaching assistants and assisting in implementation of MATLAB-based programming labs.
 - Teaching mentor to first year graduate students

Seminars

- **Organizer**, MSU Student Applied Math Seminar, Spring 2021 – Present.

Organization membership

- Student organizations
 - **President**, MSU AMS Graduate Student Chapter, Fall 2020 – Spring 2021.
 - **Member**, MSU AWM Student Chapter, Fall 2020 – Present.
 - **Member**, MSU AMS Graduate Student Chapter, Fall 2019 – Present.
- Professional organizations
 - **Member**, Canadian Mathematical Society (CMS), Spring 2022 – Present.
 - **Member**, United States Research Software Engineer Association (USRSE), Fall 2021 – Present.
 - **Member**, American Mathematical Society (AMS), Fall 2017 – Present.
 - **Member**, Society for Industrial and Applied Mathematics (SIAM), Fall 2017 – Present.

Selected Graduate Coursework

- Measure theory
- Complex analysis
- Numerical linear algebra
- Numerical ODE
- Introduction to PDE (two semesters)
- Elliptic regularity
- Numerical PDE
- Probability
- Applied harmonic analysis: compressive sensing
- Machine learning
- Optimization
- Spectral graph theory
- Project-based study in industrial mathematics

Computational Skills

Expertise	Tools
Expert (use every day)	Git, L ^A T _E X, MATLAB, Python, Unix/Linux environments, HPCC environments, shell scripting.
Proficient (use confidently when consulting documentation)	C/C++, Mathematica, R, OpenMP, MPI.
Familiar (have experience, but need extended refresh)	Java, OpenFOAM, Selenium.