

Employment

- **2023 - present, Department of Mathematics, University of Wisconsin-Madison**
Assistant Professor
- **2020 - July 2022, Division of Applied Mathematics, Brown University**
Presidential Postdoctoral Fellow,
Prager Assistant Professor of Applied Mathematics

Education

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| 2019
<i>Houston, Texas</i> | Doctor of Philosophy, Computational And Applied Mathematics , Rice University
Concentration: High Performance Scientific Computing, Numerical Analysis |
| 2014
<i>Seattle, Washington</i> | Master of Science, Applied Mathematics , University of Washington |
| 2012
<i>Seattle, Washington</i> | Bachelor of Science, Mathematics , University of Washington
Concentration: Mathematical analysis. |

Awards

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| 2025- | MGB-SIAM Early Career Fellowship |
| 2023- | Fall research competition award, University of Wisconsin |
| 2019-2021 | Presidential Postdoctoral Fellow, Brown University |
| 2020 | NextProf Nexus Program |
| 2019-2020 | SIAM CSE19 Broader Engagement Program |
| 2018 | Alan Weiser Memorial Fund for Student Excellence |
| 2018 | Microsoft Travel Award for Academic Excellence |
| 2017-2018 | Ken Kennedy–ExxonMobil. Graduate Fellowship Endowment |
| 2016-2017 | XSEDE Scholar Award |
| 2016 | Blue Waters Scholar Award |
| 2015-2016 | Ken Kennedy–Cray Inc. Graduate Fellowship Endowment |
| 2014-2015 | Rice Graduate Education for Minorities (NSF AGEP) |
| 2013-2014 | Engineering Learning Communities Scholarship |
| 2010 | NSF (UW MATH REU: Inverse problems) |
| 2008 | Student Service Award, UW Engineering Advising & Diversity Center |

Selected Publications & Preprints

- M. S. Fabien, “Positivity-preserving discontinuous Galerkin scheme for linear hyperbolic equations”, in review, *Partial differential equations and applications*, 2025.
- M. S. Fabien, “A hybridizable discontinuous Galerkin method for three-phase flow in heterogeneous porous media”, in review, 2025.

- M. S. Fabien, “Positivity-preserving discontinuous Galerkin scheme for linear hyperbolic equations with characteristics-informed augmentation”, accepted, *Results in Applied Mathematics*, 2024.
- M. S. Fabien, “A non-overlapping spectral additive Schwarz method for interior penalty discontinuous Galerkin discretizations of anisotropic elliptic problems”, in revision, *SIAM Journal on Scientific Computing, Journal Special Section on Iterative Methods*, 2024.
- S. Orizaga, M. S. Fabien, and M. Millard, “Efficient numerical approaches with accelerated graphics processing unit computations for Poisson problems and Cahn-Hilliard equations”, *AIMS Mathematics, Applications of Partial Differential Equations to Science and Engineering Problems: Numerical Resolution*, 2024.
- G. Awanou, M. S. Fabien, J. Guzman, and A. Stern. “Hybridization and postprocessing in finite element exterior calculus”, *Mathematics of Computation*, 2024.
- A. C. Salazar Coariti and M. S. Fabien, and J. Guzman and J. A. McGuire, R. De Vita and K. C. Toussaint. “Fluid mechanics approach to analyzing collagen fiber organization”, *Journal of Biomedical Optics* 27 (1), 016503-016503, 2023.
- M. S. Fabien. “Numerical error analysis for an energy-stable HDG method for the Allen-Cahn equation”, *Journal of Computational and Applied Mathematics*, 2022.
- M. S. Fabien. “A high-order implicit hybridizable discontinuous Galerkin method for the Benjamin-Bona-Mahony equation”, *International Journal for Numerical Methods in Fluids*, 2021.
- A. C. Salazar Coariti and M. S. Fabien, and J. Guzman and K. C. Toussaint. “Quantitative second-harmonic generation imaging analysis based on fluid-dynamics measures”, *Frontiers in Optics, FW5E. 1*, 2020.
- M. S. Fabien, M. G. Knepley, and B. M. Riviere. “Families of interior penalty hybridizable discontinuous Galerkin methods for second order elliptic problems”, *Journal of Numerical Mathematics*, 28(3):161-174, 2020.
- M. S. Fabien, M. G. Knepley, and B. M. Riviere. “A high order hybridizable discontinuous Galerkin method for incompressible miscible displacement in heterogeneous media”, *Results in Applied Mathematics*, 8:100089, 2020.
- M. S. Fabien. “A GPU-accelerated hybridizable discontinuous Galerkin method for linear elasticity”, *Communications in Computational Physics*, 27(2):513-545, 2019.
- J. Chang, M. S. Fabien, M. G. Knepley, and R. T. Mills. “Comparative study of finite element methods using the Time-Accuracy-Size (TAS) spectrum analysis”, *SIAM Journal on Scientific Computing*, 40(6):C779-C802, 2018.
- M. S. Fabien, M. G. Knepley, and B. M. Riviere. “A hybridizable discontinuous Galerkin method for two-phase flow in heterogeneous porous media”, *International Journal for Numerical Methods in Engineering*, 116(3):161-177, 2018.
- M. S. Fabien, M. G. Knepley, R. T. Mills, and B. M. Riviere. “Manycore Parallel Computing for a Hybridizable Discontinuous Galerkin Nested Multigrid Method”, *SIAM Journal on Scientific Computing*, 41(2):C73-C96, 2019.
- M. S. Fabien. “A Radial Basis Function (RBF) Method for the Fully Nonlinear 1D Serre Green-Naghdi Equations”, Preprint, 2014.

Conference and Workshop Participation

- SIAM Annual Meeting 2025, Montreal, Canada.
- AMS Spring Sectional, Recent Advances in Numerical Methods for PDEs, April , 2024, Hartford, Connecticut.
- Oregon State University Applied Math Seminar, October 2024.
- UW-Madison Sustainability Research Visioning Event, September 2024.
- Workshop Data-Driven PDE-based inverse problem, in theory and practice, UW-Madison, August 2024.
- Empowering a Diverse Computational Mathematics Research Community, ICERM, July 2024.
- SIAM Annual Meeting 2024, MS7 Phase Field Models: Theoretical Results, Computational Advances and Applications.

- AMS Spring Sectional, Recent Advances in Numerical Methods for PDEs, April 15th - 16th, 2023, Cincinnati, Ohio.
- StemJazz Colloquium, April, 2022, Brown University.
- Mathematics Colloquium, Carnegie Mellon University, February, 2020.
- Mathematics Colloquium, University of Wisconsin-Madison, February, 2020.
- Structure Preserving Discretizations: FEMS, Splines, and IGA, May 31- June 1, 2019, Pittsburgh, Pennsylvania.
- Blackwell-Tapia Conference, November 9 - 11, 2018, Providence, Rhode Island.
- 15th Copper Mountain Conference On Iterative Methods, March 25 - 30, 2018, Copper Mountain, Colorado (invited by Dr. Raymond S. Tuminaro).
- 2018 Rice Oil & Gas HPC Conference, March 12 - 13, Houston, Texas.
- 2017 Rice Oil & Gas HPC Conference, March 15 - 16, Houston, Texas.
- 2017 Finite Element Rodeo, March 3 - 4, University of Houston, Texas.
- 18th Copper Mountain Conference On Multigrid Methods, March 26 - 30, 2017, Copper Mountain, Colorado.
- 2016 Rice Oil & Gas HPC Conference, March 2 - 3, Houston, Texas.
- Supercomputing 2016, November 14 -17, 2016, Salt Lake City, Utah.
- XSEDE16 Conference, July 17 - 21, 2016, Miami, Florida.
- Petascale Institute Blue Waters Workshop, May 10 - 31, 2016, University of Illinois Urbana Champaign, Illinois.
- 2015 Rice Oil & Gas HPC Conference, March 4 - 5, Houston, Texas.
- 2014 Blackwell-Tapia Conference, November 14 - 15, University of California, Los Angeles.

Posters

- “GPU-accelerated hybridizable discontinuous Galerkin method for linear elasticity”, 2018 Blackwell-Tapia Conference, November 9, ICERM , Rhode Island.
- “Efficient Discontinuous Galerkin methods for flow and transport”, 2018 Rice Oil & Gas HPC Conference, March 13, Houston, Texas.
- “Comparative Study of Finite Element Methods using the Time-Accuracy-Size Spectrum Analysis”, 2018 Rice Oil & Gas HPC Conference, March 12 - 13, Houston, Texas (joint poster with Dr. Justin Chang).
- “Massively Parallel Computing for Multigrid Methods”, 2017 Rice Oil & Gas HPC Conference, March 16, Houston, Texas.
- “Discontinuous Galerkin Geometric Multigrid Methods”, 2016 Rice Oil & Gas HPC Conference, March 3, Houston, Texas.

Outreach Conferences, Presentations, Workshops

Conferences and Workshop Participation

- Empowering a Diverse Computational Mathematics Research Community, ICERM, July 2024.
- Conference for African-American Researchers in the Mathematical Sciences (CAARMS), July, 2023.
- Latinx mathematicians research community (LMRC, NSF & AIM), 2021 - 2022.
- SIAM CSE Broader Engagement Program, 2021.
- NextProf Nexus, September 8-11, 2020.

- EDGE 2020, Enhancing Diversity in Graduate Education, June 1 - July 10, 2020, Providence, Rhode Island, USA. (Recruitment and outreach for women in mathematics, fully online, hosted by Brown University)
- ACM Richard Tapia Celebration of Diversity in Computing, September 19 - 22, 2018, Orlando, Florida, USA. (Recruitment and outreach for underrepresented minorities)
- Noyce teacher professional development workshop, June 15, 2018, Houston, Texas.
- ACM Richard Tapia Celebration of Diversity in Computing, September 20 - 23, 2017, Atlanta, Georgia, USA. (Recruitment and outreach for underrepresented minorities)
- Supercomputing 2016, November 14 - 17, 2016, Salt Lake City, Utah, USA. (Advanced computing for social change)
- NSF Research Experience and Mentoring Program for incoming University of Washington freshmen from underrepresented and underserved populations. June 28 - August 22, 2012, Seattle, Washington, USA.
- Mathematics Academy, July - August, 2013, Seattle, Washington, USA.
- Mathematics Academy, July 8 - August 3, 2012, Seattle, Washington, USA.
- STEM Bridge, August, 2011, Seattle, Washington, USA.
- Mathematics Academy, August - September, 2011, Seattle, Washington, USA.
- Mathematics Academy, August - September, 2010, Seattle, Washington, USA.

Presentations

- “Fast solvers for flows in porous media”, Applied Mathematics and Computation Seminar, October 2024.
- “Machine learning enforced compatible discretizations for nonlinear optics”, ICREM, August 2024.
- “Solving real-world problems with computation” SIAM CSE Broader Engagement Program, 2021.
- “Careers in STEM”, Drew Academy: Rice Science Days, November 30, 2018, Houston, Texas.
- “Obstacles and support issues underrepresented minorities face in STEM & higher education”, June 15, 2018, Noyce teacher professional development workshop, Houston, Texas.
- “Advanced Computing for Social Change”, Supercomputing 2016, November 16, 2016, Salt Lake City, Utah, USA.
- “Learning in the mathematical sciences”, Mathematics Academy (University of Washington), July 12, 2013, Seattle, Washington, USA.
- “The importance of communication in the mathematical sciences”, Washington State Academic RedShirt (University of Washington), September 26, 2013, Seattle, Washington, USA.
- “Homework vs. Problem sets”, NSF-REM, August 2, 2012, Seattle, WA.
- “Fundamental tools for excellence in higher education”, Mathematics Academy (University of Washington), July 13, 2012, Seattle, Washington, USA.
- “How I use \LaTeX ”, Engineering Academic Center (University of Washington), February 3, 2012, Seattle, WA.
- “Learning in the mathematical sciences”, Mathematics Study Center (University of Washington), July 15, 2011, Seattle, Washington, USA.
- “Homework vs Problem sets”, STEM Bridge program (University of Washington), September 9, 2011, Seattle, WA.
- “Homework vs Problem sets”, Mathematics Academy (University of Washington), July 30, 2010, Seattle, WA.
- “LATEX tutorial”, Mathematics Academy (University of Washington), July 24, 2009, Seattle, WA.

Experience

<i>Fall 2024</i> <i>Madison, WI</i>	Instructor , MATH 222 Instructor for a calculus course (400 students).
<i>Spring 2024</i> <i>Madison, WI</i>	Instructor , MATH 715 Instructor for a graduate course on numerical methods for differential equations.
<i>Fall 2023</i> <i>Madison, WI</i>	Instructor , MATH 222 Instructor for a calculus course (300 students).
<i>Spring 2023</i> <i>Madison, WI</i>	Instructor , MATH 715 Instructor for a graduate course on numerical methods for differential equations.
<i>Fall 2022</i> <i>Madison, WI</i>	Instructor , MATH 320(!) Instructor for a honors liner algebra and differential equations course.
<i>Summer 2020</i> <i>MATLAB course instructor</i> <i>Providence, Rhode Island</i>	Instructor , EDGE 2020, Enhancing Diversity in Graduate Education Instructor for a MATLAB course. <ul style="list-style-type: none">• Designed a dynamic and interactive MATLAB course. Due to the smaller class size (consisting of 14 women), I was able to conduct the course in an interactive way. In addition to taking notes, students were able to input commands and complete codes to obtain immediate feedback from the programming language (in real-time).
<i>APMA 1180, Spring 2022</i> <i>Providence, Rhode Island</i>	Instructor , Brown University, Division of Applied Mathematics Instructor for a course on numerical methods for ordinary differential equations. <ul style="list-style-type: none">• Prepared and delivered lectures, designed the curriculum, assignments, quizzes, and final project.• Grading, holding office hours, and managed duties for a teaching assistant
<i>APMA 1170, Fall 2021</i> <i>Providence, Rhode Island</i>	Instructor , Brown University, Division of Applied Mathematics Instructor for a course on numerical linear algebra. <ul style="list-style-type: none">• Prepared and delivered lectures, designed the curriculum, assignments, quizzes, and final project.• Grading, holding office hours, and managed duties for a teaching assistant
<i>APMA 0160, Summer 2021</i> <i>Providence, Rhode Island</i>	Instructor , Brown University, Division of Applied Mathematics Instructor for a MATLAB course. <ul style="list-style-type: none">• Course was fully remote due to Covid 19.• Prepared and delivered lectures, designed the curriculum, assignments, quizzes, and final project.• Grading, holding office hours, and managed duties for a teaching assistant
<i>APMA 0160, Fall 2020</i> <i>Providence, Rhode Island</i>	Instructor , Brown University, Division of Applied Mathematics Instructor for a MATLAB course. <ul style="list-style-type: none">• Prepared and delivered lectures, designed the curriculum, assignments, quizzes, and final project.• Grading, holding office hours, and managed duties for a teaching assistant

2015-2019
Houston, Texas

Research assistant, Rice University, Department of Computational and Applied Mathematics

Research being conducted for my doctoral work focuses on applying state of the art techniques to model and simulate complex flow and transport phenomena that are commonly found in multiphase problems. These techniques include high order finite element discretizations, optimal multilevel linear solvers, and their efficient implementation via many-core devices (GPUs, Xeon Phi, etc.).

2013
Seattle, Washington

Mathematics Instructor, University of Washington, College of Engineering

STARS PROGRAM

Co-Instructor for the Washington State Academic RedShirt – (STARS) program provides highly motivated students who are eligible for financial aid with a specialized first-year curriculum designed to build learning skills and academic preparation.

- > Lead workshop 80 minute sessions two days a week, for a class size of 15. The workshop is dynamic, so the students are active participants in their learning.
- > Created specialized worksheets, problem sets, and quizzes. Adapting to the students is crucial, since in the STARS program we want the students to learn and succeed. Many of these documents were constructed on the fly. If the students were having difficulty, we slowed the pace down and focus on mastery of the material.
- > Emphasized problem solving and critical thinking - many high school students enter the UW lacking key skills and abilities necessary for success in engineering and the sciences.
- > Tended to instructor's duties: grading, office hours, encourage and foster a productive learning environment, update a database (git) with three other instructors.
- > Attended regular meetings with the STARS program coordinators, advisers, and instructors. This was done to insure that all the students are kept track of, and identify possibilities for improving our teaching approach.

2009-2014
Seattle, Washington

Mathematics Instructor, University of Washington, College of Engineering

ENGR 197

Instructor of record for official UW course ENGR 197 (five years continuously)

- > Worked directly with students three hours a week in class covering their course material. Emphasis is placed upon mastery of concepts covered in lectures.
- > Emphasized collaboration with other workshop participants, teaching and learning from each other. Material was covered more in-depth than in the related class.
- > In addition, I provided tips and guidance on how to prepare for exams, how to best study, and how to best use course books and materials.
- > As an instructor I have to: prepare worksheets, give lectures, hold office hours, grade assignments/quizzes.
- > Underlying focus: MATH 124-125-126 (Calculus with Analytic Geometry I-II-III), 307 (Introduction to Differential Equations), 308 (Matrix Algebra with Applications), 309 (Linear Analysis), 324 (Advanced Multivariable Calculus I), AMATH 301 (Beginning Scientific Computing), 351 (Introduction to Differential Equations and Applications), 352 (Applied Linear Algebra and Numerical Analysis), 353 (Fourier Analysis and Partial Differential Equations).

Summer 2013
Seattle, Washington

MATHEMATICS ACADEMY

Lead Mathematics Instructor, University of Washington, College of Engineering

High-achieving high school juniors from Washington State live on the Seattle UW campus for a four-week, intensive, summer session. Students engage in coursework created by UW math faculty and designed to develop the skills necessary to meet the high standards of college-level math and engineering. Students also have enrichment opportunities to explore the range of career opportunities available to engineers through lab tours, research projects, site visits and networking events.

- > Co-designed a curriculum intended to give high school juniors a glimpse of University level mathematics and engineering.
- > At the end of the program, we saw an average of 180% increase in students performance.
- > Program focused on under represented minorities in STEM fields.

Summer 2012
Seattle, Washington

NSF-REM PROGRAM

Lead Mathematics Instructor, University of Washington, College of Engineering

NSF Research Experience and Mentoring Program is an eight-week residential program for incoming University of Washington (UW) freshmen from underrepresented and underserved populations. Students spend 40 hours per week working on a research under the guidance of faculty and graduate students. In addition to conducting research, students strengthen their mathematics and problem solving skills in a math class, develop a community of peers and advisors at the UW, and have a lot of fun living on the UW campus for the summer.

- > Designed a curriculum intended to boost students problem solving and critical thinking skills. The resulting course was dynamic, that is, students solved problems in groups during class.
- > The resulting course was so effective that the students presented their work in Washington D.C.

Autumn 2007–2014
Seattle, Washington

MINORITY SCHOLARS ENGINEERING PROGRAM

Mathematics Tutor, University of Washington, College of Engineering

Served as a tutor, role model, mentor, and friend to countless students

- > For 7 years I had held a number of tutoring positions (paid and unpaid) affiliated with the College of Engineering. My specialization is all undergraduate level MATH/AMATH.
- > Programs include Student Academic Services (SAS), Engineering Advising Center (EAC), Alliances for Learning and Vision of Underrepresented Americans (ALVA), STEM Bridge Program, and Mathematics Academy

References

Details available on request