Farjana Siddiqua

Visiting Assistant Professor · School of Mathematics

Georgia Institute of Technology, 686 Cherry St NW, Atlanta, GA, 30332, USA.

fsiddiqua3@gatech.edu | fas41.github.io | 786-413-0784

Research Interests

My research interests and experiences span a wide range of topics in numerical analysis of partial differential equations, computational fluid dynamics, data science, machine learning, deep learning, mathematical & stochastic modeling, optimization, quantum computing and large eddy simulation of turbulent flows.

Education

University of Pittsburgh — *Pittsburgh, Pennsylvania, USA*

PhD in Mathematics — *Fall 2018 - Summer 2024*

- Thesis: Spurious Numerical Dissipation and Time Accuracy.
- Advisors: Dr. William J. Layton & Dr. Catalin Trenchea

Florida International University — *Miami, Florida, USA*

M.Sc. in Mathematical Science — *Fall 2015 - Spring 2017*

- Advisor: Dr. Zhongming Wang

University of Dhaka — *Dhaka, Bangladesh*

M.Sc. in Applied Mathematics — *2013 - 2014*

- Advisor: Dr. Mohammad Ferdows

University of Dhaka — *Dhaka, Bangladesh*

B.Sc. in Mathematics — *2008 - 2012*

- Undergraduate Project: A study of differential equations in population biology.
- Advisor: Dr. Sohel Rana

Awards, Fellowships, & Grants

2025	**Travel Grant,** The Third Joint SIAM/CAIMS Annual Meetings (AN25), Montreal, Canada.
2025	**Travel Grant,** AWM Research Symposium, University of Wisconsin-Madison.
2025	**Travel Grant,** NSF CompMath Meeting 2025, The University of Utah.
2024	**Winner of 3-Minutes Thesis Competition, Department of Mathematics,** University of Pittsburgh.
2023-2024	**Andrew W. Mellon Predoctoral Fellowship,** University of Pittsburgh.
2019	**Arts and Science Graduate Fellowship,** University of Pittsburgh.
2023	**Travel Grant,** American Institute of Mathematics Workshop, CALTECH, CA.
2023	**Travel Grant,** SIAM Conference on Optimization (OP23), Seattle, WA.
2022	**Travel Grant,** AWM Research Symposium, University of Minnesota.
2022	**Travel Grant,** SIAM Annual Meeting, Pittsburgh, PA.
2013	**Ruqayyah Hall Scholarship,** University of Dhaka.
2008-2012	**Technical Board Scholarship,** the Government of Bangladesh.
2005-2007	**Educational Board Scholarship,** the Government of Bangladesh.

Publications

[1] **F. Siddiqua**, and C. Trenchea, "A High-Accuracy Symplectic Scheme for a nonlinear transport problem"", Journal of Computational and Applied Mathematics, 2026 (Accepted).

[1] A. Pakzad, and **F. Siddiqua**, "Statistics in a Backscatter Eddy Viscosity Turbulence Model", Numerical Methods for Partial Differential Equations, Volume 41, Issue 5, 2025.

[2] A. Çıbık, R. Fang, W. Layton, and **F. Siddiqua**, "Adaptive parameter selection in nudging based data assimilation", Computer Methods in Applied Mechanics and Engineering, Volume 433, Part B, 2025.

[3] A. Çıbık, **F. Siddiqua**, and W. Layton, "A Hybrid Regularization for the Navier–Stokes Equations", Numerical Methods for Partial Differential Equations, Volume 41, Issue 2, 2025.

[4] **F. Siddiqua**, and W. Pei, "Variable Time Step Method of Dahlquist, Liniger, & Nevanlinna (DLN) for a Corrected Smagorinsky model", International Journal of Numerical Analysis & Modeling, pp. 879–909, Volume 21, Issue 6, 2024.

[5] **F. Siddiqua**, and X. Xie, "Numerical analysis of a corrected Smagorinsky model", Numerical Methods for Partial Differential Equations, pp. 256–382, Volume 39, Issue 1, 2023.

[6] **F. Siddiqua**, and C. Trenchea, "A second-order symplectic method for an advection-diffusion- reaction problem in Bioseparation", Technical Report, TR-MATH 22-03, University of Pittsburgh, 2022.

[7] **F. Siddiqua**, and C. Trenchea, "A high-accuracy symplectic scheme for advection-diffusion-reaction models in bioseparation", Technical Report, TR-MATH 25-01, University of Pittsburgh, 2025.

[8] M. Ferdows, N. I. Nima, and **F. Siddiqua**, "Similarity solution and numerical analysis of the steady nanofluid layer induced by gyrotactic microorganisms containing wall temperature variations", Computational Mathematics & Modeling, Volume 31, Issue 2, 2020.

[9] **F. Siddiqua**, Z. Wang, and S. Zhou, "A modified Poisson–Nernst–Planck model with excluded volume effect: theory and numerical implementation", Communications in Mathematical Sciences, pp. 251-271, Volume 16, Issue 1, 2018.

Submitted for Publication (Currently under review)

[1] A. Çıbık, R. Fang, W. Layton, and **F. Siddiqua**, "Data Assimilation with model errors", submitted to the journal of Computers and Mathematics with Applications, arXiv: 2504.16291[math.NA], 2025.

[2] **F. Siddiqua**, and C. Trenchea, "A High-Accuracy Symplectic Scheme for Advection–Diffusion–Reaction Models in Bioseparation", Submited to the journal of Computational and Applied Mathematics, arXiv:2505.22022 [math.NA], 2025.

[3] N. Hurl, **F. Siddiqua**, and S. Xu, "Stability and accuracy analysis of the θ method and 3-Point time filter", Submited to the journal of BIT Numerical Mathematics, arXiv:2310.1771 [math.NA], 2024.

Papers in Preparation

[1] **F. Siddiqua**, W. Ding, H. Huang, H. Sun, and Y. Liu, "Neural Networks with Local Converging Inputs (NNLCI) for solving the Stokes Equations", 2025-.

[2] J. Reyes and **F. Siddiqua**, "Corrected Ladyzhenskaya Model", 2025-.

[3] A. Pakzad and **F. Siddiqua**, "Data Assimilation method to Baldwin-Lomax model", 2025-.

Research Talks

[1] "Adaptive parameter selection in nudging based data assimilation"", NSF CompMath Meeting 2025, The University of Utah, Summer 2025.

[2] [**INVITED**] "Numerical Analysis of a corrected Smagorisky model", Pitt AWM Seminar (online), University of Pittsburgh, Fall 2024.

[3] "Spurious Numerical Dissipation and Time Accuracy", Three minutes thesis competition, University of Pittsburgh, Pittsburgh, PA, Spring 2024.

[4] "The Ramshaw-Mesina Hybrid Algorithm applied to the Navier Stokes Equations", Finite Element Circus, Brown University, Providence, RI, Spring 2024.

[5] "Variable Time Step Method of Dahlquist, Liniger, and Nevanlinna (DLN) for a Corrected Smagorinsky model", Finite Element Circus, Carnegie Mellon University, Pittsburgh, PA, Fall 2022.

[6] "A second-order symplectic method for an advection-diffusion-reaction problem in Bioseparation", Sayas Numerics Day, University of Maryland, Baltimore County, MD, Fall 2022.

[7] [**INVITED**] "A second-order symplectic method for an advection-diffusion-reaction problem in Bioseparation", SIAM Annual Meeting (AN22), Pittsburgh, PA, Summer 2022.

[8] "Numerical analysis of a modified Smagorinsky model", Finite Element Circus, Penn State University, PA, Fall 2021.

Poster Presentations

[1] "Data Assimilation with model errors", The Third Joint SIAM/CAIMS Annual Meetings (AN25), Montreal, Canada, Summer 2025.

[2] "Adaptive parameter selection in nudging based data assimilation"", AWM Research Symposium, University of Wisconsin-Madison, Summer 2025.

[3] "Variable Time Step Method of Dahlquist, Liniger, and Nevanlinna (DLN) for a Corrected Smagorinsky model", Conference on Mathematical Models and Numerical Methods for Multiphysics Systems, University of Pittsburgh, Pittsburgh, PA, Summer 2024.

[4] "Variable Time Step Method of Dahlquist, Liniger, and Nevanlinna (DLN) for a Corrected Smagorinsky model", SIAM Conference on Optimization (OP23), Seattle, WA, Summer 2023.

[5] "Numerical Analysis of a Drug Designing Model", AWM Research Symposium, University of Minnesota, MN, Summer 2022.

Academic and Research Appointments

Georgia Institute of Technology (2024-Present)	**Visiting Assistant Professor**, The primary responsibility of this position is to conduct research in collaboration with faculties in the school of Mathematics and to teach undergraduate students. I teach classes with an average of 100 students per class
University of Pittsburgh (2023-2024)	**Andrew W. Mellon Predoctoral Fellow**, Conducted my Ph.D. research towards the completion of thesis under the supervision of my advisors Dr. William Layton and Dr. Catalin Trenchea.
University of Pittsburgh (2019-2024)	**Graduate Research Assistant**, Assisted Dr. William Layton during the summer of each year (2019-2024) on the projects "Accurate Prediction of Fluid Motion" and "Time Accurate Prediction of Fluid Motion". Projects were funded by NSF (DMS 1817542) and NSF (DMS 2110379).
University of Pittsburgh (2018-2023)	**Graduate Teaching Assistant**, I delivered class lectures as a primary instructor for two courses along with preparing question papers, setting up quizzes, checking answer scripts, and grading. I also conducted recitations which are mostly problem solving sessions with students. I helped primary instructors of the courses in grading. As a part of my TA duty, I also worked as tutor in the Mathematics Assistant Center (MAC), University of Pittsburgh.
Florida International University (2017 - 2018)	**Adjunct Faculty**, The primary responsibility of this position was teaching undergraduate courses as primary instructor. I taught classes with an average of 50 students per class.
Miami Dade College (2017 - 2018)	**Adjunct Faculty**, The primary responsibility of this position was teaching undergraduate courses as primary instructor. I taught classes with an average of 65 students per class.
Florida International University (2015 - 2017)	**Graduate Teaching Assistant**, I conducted recitations which are mostly problem solving sessions with students. I also helped primary instructors of the courses in grading. In summer 2016 and 2017, I also worked as tutor in the Center for Academic Success, Florida International University.

International University of Business Agriculture & Technology (2014-2015)	**Lecturer,** I delivered class lectures as a primary instructor along with preparing question papers, setting up quizzes, checking answer scripts, & grading. I taught classes with an average of 70 students per class.

Teaching Experience

2024-2026	**Math 1554: Linear Algebra, Math 1552: Integral Calculus.** Visiting Assistant Professor, Georgia Institute of Technology, USA.
Summer 2021	**Math 0230: Analytic Geometry & Calculus 2.** Primary Instructor, Department of Mathematics, University of Pittsburgh, USA.
Fall 2019	**Math 0280: Introduction to Matrices & Linear Algebra.** Primary Instructor, Department of Mathematics, University of Pittsburgh, USA.
2018-2023	**Math 0240: Analytic Geometry & Calculus 3, Math 0290: Differential Equations, Math 1080: Numerical Linear Algebra, Math 1550: Vector Analysis & Applications, Math 1180: Linear Algebra 1, Math 1185: Honors Linear Algebra, Math 0031: Algebra, Math 0400: Finite Mathematics.** Graduate Teaching Assistant, Department of Mathematics, University of Pittsburgh, USA.
2017-2018	**MAC 2233: Business Calculus, MGF 1100: Exploration of Mathematics and Quantitative Reasoning, MAC 1114: Trigonometry, MAC 1140: Pre-Calculus Algebra.** Adjunct Faculty, Department of Mathematics, Florida International University, USA.
2017-2018	**MAT 1033: Intermediate Algebra, MAC 1147: Pre-Calculus Algebra & Trigonometry MGF 1106: Mathematics for liberal Arts 1, MGF 1107: Mathematics for liberal Arts 2.** Adjunct Faculty, Department of Mathematics, Miami Dade College, USA.
2015-2017	**MAC 2311: Calculus 1, MAC 2312: Calculus 2, MAC 2313: Multivariable Calculus, MAP 2302: Differential Equations.** Graduate Teaching Assistant, Department of Mathematics, University of Pittsburgh, USA.
2014-2015	**MAT 147: Applied Calculus, MAT 219: Linear Algebra, MAT 237: Calculus III, MAT 197: Calculus II, MAT 167: Calculus I, MAT 107: Mathematics.** Lecturer, International University of Business Agriculture & Technology, Bangladesh.

Mentoring

- **Annika Sandholm** is a high school student at Shady Side Academy at Pittsburgh. I have mentored her on a project "Culturally expansive AI Music Recommender System" arranged by Pittsburgh Technical Council's program named L.A.U.N.C.H. (Learn, Aspire, Understand, Navigate, Connect, and Highlight).

Outreach & Professional Development

Research Workshop

Fall 2023	**Title: Small scale dynamics in incompressible fluid flows.** This workshop was organized by the American Institute of Mathematics, California Institute of Technology, Pasadena, CA. This was devoted to the study of hydrodynamics, which leads to a variety of challenging mathematical issues touching on different areas of mathematics, such as partial differential equations, harmonic analysis, and dynamical systems.

Conference Participation

Fall 2024	**Reduced Order Modeling and Machine Learning for Large Eddy Simulation and Related Topics, Emory University, Atlanta, GA.** Large eddy simulation (LES), Reduced Order Modeling (ROM), and Machine Learning (ML) experts gathered to discuss and identify innovative strategies in computational mechanics and related fields of Engineering and Science.
Spring 2019	**Finite Element Circus, Virginia Tech, Blacksburg, VA.** It is a regular conference devoted to the theory and applications of the finite element method and related areas of numerical analysis and partial differential equations

Pedagogical Training

Spring 2025	**Coursework on Fundamentals in Teaching and Learning for Post-Docs, Georgia Institute of Technology.** This 10-week course introduces pedagogy theories, learner-centered teaching, and backward design for effective course planning and engaging learning experiences. It emphasizes research-based teaching strategies to enhance student learning and classroom effectiveness.
Fall 2018	**Coursework on Teaching Orientation, Department of Mathematics, University of Pittsburgh.** The coursework emphasized techniques, procedures, and discussions, which prepare the TA to successfully manage recitations and teach classes in Mathematics. It also focused on integrated course design principles to develop syllabi and course assessments based on effective learning goals for semester-long courses.
2018	**Certification in Tutor Training, Center for Academic Success, Florida International University.** It focused on developing strategies to explain complex ideas in a way that is accessible and understandable to students.
2015	**Certification in Training on Strengthening Pedagogical Skills of Teachers, USAID, Winrock International.** It focused on developing teaching strategies and skills based on how students learn.

Organizer Role

2023-2026	**Executive Member, AWM (Association for women in mathematics) Membership and Community Portfolio Committee.** I am responsible for overseeing and assisting in the recruitment and retention of members, maintaining and strengthening relationships with AWM members including student chapters and nominee members, & reviewing and making recommendations concerning individual, institutional, corporate memberships, sponsorships, including membership fees and benefits.
2023-	**Mentor, L.A.U.N.C.H. (Learn, Aspire, Understand, Navigate, Connect, and Highlight).** It is a dynamic program empowering participants to stay on their STEM path through mentorship, networking, and industry insights. Engaging with women professionals, it offers workshops, tours, and career exploration opportunities in STEM.
2021-2024	**President, University of Pittsburgh chapter of the Association for Women in Mathematics (AWM).** I conducted different activities of the chapter such as arranging monthly Pitt AWM Student Seminar Series, Undergraduate Mentoring Program, Coffee meets with professionals to discuss career goals, etc. Our chapter earned an award in the category of scientific excellence at 2023 MathFest.

2020, 2021 **Coordinator, Mathematics Assistant Center (MAC), University of Pittsburgh.** In addition to my regular teaching duties, I was responsible for scheduling office hours of tutors, supervising students & tutors, and administrating many activities of MAC.

2021-2024 **Treasurer, University of Pittsburgh Chapter of the Society for Industrial and Applied Mathematics (SIAM).** I hosted various events including industry talks, career panels, graduate and post-doc panels, computer workshops, as well as social events like movie nights & field trips, etc.

2021-2024 **Executive Committee Member, Mathematics Graduate Student Organization, University of Pittsburgh.** I was graduate student representative in the departmental budget committee and gave important inputs regarding issues of graduate students. I also arranged various events including student orientation, social events like picnics, game nights, semester-end party, etc.

2021-2023 **President, Krishnachura: Bangladeshi Student Association of Pittsburgh.** It was established to create cultural diversity at the University of Pittsburgh. This organization shares Bangladeshi culture and ideas with other cultures in Pittsburgh. The sole purpose of this organization is to arrange cultural programs, make a connection with alumni, and offer helpful suggestions and support to an incoming student.

Media Coverages

[M1] "Graduation Award Winners"", 2023. URL: University of Pittsburgh Mathematics Newsletter.

[M2] "Association for Women in Mathematics: University of Pittsburgh Student Chapter", Student News, 2023. URL: Student News.

[M3] "AWM 2023 Student Chapter Awards", AWM News, 2023. URL: AWM News.

[M4] "Pitt's Association for Women in Mathematics won an award for scientific excellence", Pitt Wire, 2023. URL: Pitt Wire.

[M5] "Women in Mathematics and the activities of AWM Pittsburgh Chapter", Interview in Campus Radio Station, University of Pittsburgh, September 20, 2023.

[M6] "SIAM student chapter activities at 2022 SIAM Annual Metting (AN22)", SIAM News, 2022. URL: SIAM News.

Other Certifications

[1] "Data Basics Workshop (Python)", Research Computing Education (RCE), University of Pittsburgh, 2022.

[2] "Professional Graphic Design", Bangladesh Hi-Tech Park Authority, 2014.

References

- Dr. William Layton
Professor,
Department of Mathematics,
University of Pittsburgh,
603 Thackeray Hall,
Pittsburgh, PA, 15213.
Phone: +1-412-624-8312
Email: wjl@pitt.edu

- [**Teaching**] Dr. Evgeni Trofimov
Teaching Associate Professor,
Department of Mathematics,
University of Pittsburgh,
619 Thackeray Hall,
Pittsburgh, PA, 15213.
Phone: +1-412-624-8306
Email:evt3@pitt.edu

- Dr. Catalin Trenchea
Professor,
Department of Mathematics,
University of Pittsburgh,
606 Thackeray Hall,
Pittsburgh, PA, 15213.
Phone: +1-412-624-5681
Email: trenchea@pitt.edu

- Dr. Zhongming Wang
Associate Professor,
Department of Mathematics,
Florida International University,
11200 SW 8th Street, DM 410A,
Miami, FL, 33199.
Phone: +1-305-348-1754
Email: zwang6@fiu.edu