

# Nurul Raihen

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**CONTACT INFORMATION** Department of Mathematics & Computer Science (313) 378-7353  
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**RESEARCH INTERESTS** **Theory:** Partial Differential Equations, Differential Equations, Calculus of Variation.  
**Applications:** Machine Learning, Data Analysis, Statistics, Artificial Intelligence & Deep Learning.  
**Specific Research Areas:** Optimization in Numerical Analysis, Free Boundary Problems, Mean-Value Property for Poly-harmonic Functions.

**CURRENT POSITION** **Tenure-Track Assistant Professor, Fontbonne University** Aug 2023 - continue  
Mentor: Dr. Kathleen Roy

**EDUCATION** **Ph.D. in Mathematics, Wayne State University, Detroit, MI** Aug 2017 - May 2022

- Dissertation Topic: A Bifurcation Phenomenon of Regularized Free Boundary Problems of Two-Phase Elliptic-Parabolic Type
- Advisor: Professor Pei-Yong Wang
- Advisor: Professor Fernando Charro

**M.A. in Mathematical Statistics, Wayne State University, Detroit, MI** May 2020

- 32 Credits of Coursework with an Oral Final Exam.
- Advisor: Professor Pei-Yong Wang

**M.S. in Applied Mathematics, The University of Toledo, Toledo, OH** May 2017

- Thesis Topic: Convergence Rates for Hestenes Gram Schmidt Conjugate Direction Methods without Derivatives in Numerical Optimization
- Advisor: Professor Ivie Stein

**B.S. in Mathematics University of Dhaka, Dhaka, Bangladesh** December 2012

- Minors: Computer Science, Statistics, and Physics

**ACADEMIC APPOINTMENTS** **Visiting Assistant Professor** August 2022 - May 2023

Department of Mathematics & Statistics, Stephen F. Austin State University (USA)  
Mentor: Dr. Lesa Beverly

**Researcher Fellow** May 2022 - August 2022

Department of Mathematics, Wayne State University (USA)  
Mentor: Prof. Fernando Charro

**Primary Instructor with full responsibility** August 2017 - May 2022

Department of Mathematics, Wayne State University (USA)

**Graduate Teaching Assistant** August 2015 - 2017

Department of Mathematics & Statistics, The University of Toledo (USA)

**Graduate Teaching Assistant** January 2015 - May 2015

Department of Mathematics, Lamar University (USA)

**Lecturer** January 2014 - December 2014

College of Natural Science, Cantonment College Jessore (Bangladesh)

PAPERS IN  
PUBLICATIONS

1. F. Charro, A. Haj Ali, **N. Raihen**, M. Torres, P. Wang; *A Bifurcation Phenomenon in a Singularly Perturbed Two-Phase Free Boundary Problem of Phase Transition* Journal of Nonlinear Analysis: Real World Applications, 73 (2023), 103911.
2. I. Stein, **N. Raihen\***; *Convergence Rates for Hestenes' Gram-Schmidt Conjugate Direction Method without Derivatives in Numerical Optimization*, Journal of Applied Math, vol. 6 (2023), no. 1, pp. 1-30. doi.org/10.3390/appliedmath1010000.
3. **N. Raihen\***, S. Akter, M. Sardar; *Food Satisfaction among Students: A Study of Present Public University Students in Bangladesh*, Journal of Mathematics and Statistics Studies, vol. 4 (2023), no. 1, pp. 1-18. doi.org/10.32996/jmss.2023.4.1.1.
4. **N. Raihen\***, S. Akter; *Forecasting Breast Cancer: A Study of Classifying Patients Post-Surgical Survival Rates with Breast Cancer*, Journal of Mathematics and Statistics Studies, vol. 4 (2023), no. 2, pp. 70-78. doi.org/10.32996/jmss.2023.4.2.8.
5. **N. Raihen\***, S. Akter, M. Sardar; *Women's Career Challenges & Opportunities: A Study of Career & Job Satisfaction among Bangladeshi Women*, Academic Journal of Research & Scientific Publishing, vol. 5 (2023) no. 51, pp. 5-22, doi:10.52132/Ajrsp.en.2023.51.1.
6. **N. Raihen\***, S. Akter, F. Tabassum, F. Jahan, M. Sardar; *A Statistical Analysis of Positive Excess Mortality at Covid-19 in 2020-2021*, Journal of Mathematics & Statistics Studies, vol. 4 (2023) no. 3, pp. 7-17, doi.org/10.32996/jmss.2023.4.3.2.
7. **N. Raihen\***, S. Akter, F. Tabassum, F. Jahan, M. Sardar; *Intimate Partner Violence and Reproductive Coercion: The use of Contraception and Power Dynamics of Patriarchal Society*, Journal of Humanities and Social Sciences Studies, vol. 5 (2023) no. 8, pp. 19-26, doi.org/10.32996/jhsss.2023.5.8.3.
8. **N. Raihen\***, S. Akter; *Prediction Modeling using Deep Learning for the Classification of Grape-Type Dried Fruits (Accepted)* (International Journal of Mathematics and Computer in Engineering) .
9. **N. Raihen\***, S. Akter, F. Tabassum, F. Jahan, M. Sardar; *A Statistical Analysis of Total Excess Mortality at Covid-19 in 2020-2021*, Computational Journal of Mathematical & Statistical Sciences, vol. 2 (2023) no. 2, pp. 223-239, doi:10.21608/CJMSS.2023.229207.1014.
10. F. Charro, **N. Raihen**; *New Mean Value Formulas for Polyharmonic Functions* (Submitted, 2023) (**Under Review**) (Funded by NSF) (Journal: Annales de l'Institut Henri Poincaré).
11. **N. Raihen\***; *Comparison of Conjugate Gram Schimdt Algorithms to Other Algorithms for Numerical Optimization.* (Submitted 2023)(**Under Review**) (Egyptian Journal of Pure and Applied Science).

PAPERS IN  
PREPARATION

1. Y. Li, N. Raihen; *How Fractional Derivatives Affect the Shape of Graphs*, Partial Differential Equations Project, May 2022 - Present

EDITORIAL  
BOARD

1. Science Journal of Applied Mathematics and Statistics, **Science Publishing Group**
2. Journal of Mathematics Research, **Canadian Center of Science and Education**
3. International Journal of Scientific Development and Research, **Open Access Journal**
4. International Journal of Mathematical, Engineering, Biological and Applied Computing, **Scientific Publications**

JOURNAL  
REVIEWER

1. Journal of qualitative Theory of Dynamical Systems, **Springer Nature**
2. Journal of Mathematics Research, **Canadian Center of Science and Education**
3. American Journal of Mathematics and Statistics, **Scientific & Academic Publishing**
4. International Journal of Research and Innovation in Social Science, **Mathematics Education**
5. Applied Mathematics, **Scientific Research Publishing**
6. European Journal of Pure and Applied Mathematics, **Open Access Journal**
7. Journal of Statistics and Mathematics Concepts, **GPR Journals**

PROFESSIONAL MEMBERSHIPS	Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations ( <b>SIMIODE</b> )	Fall 2022 - present
	Society for Industry and Applied Mathematics ( <b>SIAM</b> )	Fall 2017 - present
	American Mathematical Society ( <b>AMS</b> )	Fall 2015 - present
	Pi Mu Epsilon, University of Toledo, Wayne State University	Fall 2015 - Summer 2022
	Delta X, received certification for helping students, University of Toledo	Fall 2016 - Spring 2017
FUNDING	University Research Grant ( <b>Simons Foundation</b> )	
	<ul style="list-style-type: none"> <li>• Title: Nonlocal curvatures, Mean-Value Property, and Partial Differential Equations</li> <li>• Co-PI: Nurul Raihen, Amount: \$5,000, Period: 11/01/2022 - 10/31/2023</li> </ul>	
	University Research Grant ( <b>Fontbonne University</b> )	
	<ul style="list-style-type: none"> <li>• Title: Differential Equations, and Numerical Optimization</li> <li>• PI: Nurul Raihen, Amount: \$1,200, Period: 08/01/2023 - 08/31/2024</li> </ul>	
	Grant writing (NSF, 2023-2024)	
	<ul style="list-style-type: none"> <li>• Emerging Mathematics in Biology (eMB) (Submitted to NSF)</li> </ul>	
AWARDS	<i>Graduate Teaching Assistance (GTA) and Fellowship Award</i> (\$28,000) Department of Mathematics, Wayne State University	2017 - 2022
	<i>Teaching Assistant (TA) Award</i> (\$18,000) Department of Mathematics and Statistics, The University of Toledo	2015 - 2017
	<i>Nichols Memorial and Brigham Scholarship</i> (\$2,000) Department of Mathematics and Statistics, The University of Toledo	2016
	<i>Bangladesh - Sweden Scholarship</i> (\$7,000) Financial Assistance of Government of Sweden	2016
	<i>Graduate Teaching Assistant (GTA) Scholarship</i> (\$10,000) Department of Mathematics, Lamar University	Spring 2015
	<i>Seventeenth Annual Texas Undergraduate Mathematics Conference travel Award</i> University of Texas, Austin	Fall 2022.
PROFESSIONAL TRAVEL AWARD	<i>Nonlocal School on Fractional Equations NSFE 2022 travel Award</i> Department of Mathematics, Iowa State University	Summer 2022.
	<i>Graduate Student Geometry and Topology Conference (GSTGC) travel Award</i> Department of Mathematics, University of Illinois, Urbana Champaign	Spring 2019
	<i>44<sup>th</sup> Annual Lecture Series Travel Support Award</i> Department of Mathematics and Statistics, University of Arkansas	Spring 2019
	<i>82<sup>th</sup> Midwest PDE seminar Travel Grant</i> Department of Mathematics, Purdue University	Summer 2016
	<i>Workshop in Applied and Computational Mathematics Travel Award</i> Department of Mathematics, University of Michigan	Spring 2018
	<i>Workshop on Conference of Texas Statistician (COTS) Conference Grant</i> Department of Statistics, University of Texas, Austin	Spring 2015

ORGANIZATION OF  
CONFERENCES AND  
SPECIAL SESSIONS

1. Special Session on “*Undergraduate Mathematical and Statistical Research*” at SATUM Conference, University of Texas - Austin, Fall 2022, Co-organized with other Faculties.
2. Special Session on “Fully Nonlinear Elliptic and Parabolic Partial Differential Equations, local and nonlocal” at the AMS Sectional Meeting at the University of Wisconsin-Milwaukee, Milwaukee, Wisconsin, April 20-21, 2024. Co-organized with Fernando Charro and Catherine Lebidzik.

TALKS IN  
CONFERENCES

1. *New Mean Value formulas for Polyharmonic Functions*, American Institute of Mathematical Sciences (AIMS), University of North Carolina Wilmington, May 31-June 4, 2023.
2. *New Mean Value formulas for Polyharmonic Functions*, Twelfth Ohio River Analysis Meeting (ORAM), University of Cincinnati, OH, March 18-19, 2023.
3. *A Bifurcation Phenomenon in a singularly perturbed two-phase free boundary problem of phase transition*, Graduate Research Symposium, Wayne State University, March 8-10, 2022.
4. *Hestenes’ Gram-Schmidt Conjugate Direction Method without Derivatives in Numerical Optimization*, Graduate Research Symposium, Wayne State University, March 6-8, 2018.

INVITED  
SEMINARS

1. *Mathematics Special Colloquium on Slope and First Derivative*, Department of Mathematics, University of New Mexico, Gallup, NM, USA. (February 10th, 2023).
2. *Modeling and Numerical Approximation Seminar*, Department of Mathematics and Computer Science, Fontbonne University, St. Louis, MO, USA. (February 6th, 2023).
3. *Game Theory and Partial Differential Equation Seminar*, Department of Mathematics, Morningside University, Sioux City, IA, USA. (November 20th, 2022).
4. *Partial Differential Equation Seminar*, Department of Mathematics and Statistics, Stephen F Austin State University, Nacogdoches, TX, USA. (October 24th, 2022).
5. *Neural Network and Deep Learning Talk*, Department of Mathematics and Statistics, Stephen F Austin State University, Nacogdoches, TX, USA. (October 11th, 2022).
6. *Student Math and Applications Seminar*, Department of Mathematics and Computer Science, Wabash College, Crawfordsville, IN, USA. (April 28th, 2022)
7. *Mathematics Special Colloquium*, Louisiana School for Math, Science, and the Arts, Natchitoches, LA, USA. (March 22nd, 2022)
8. *Analysis Seminar*, Department of Mathematics, Wayne State University, Detroit, MI, USA. (Feb 28th, 2022).
9. *Mathematics Special Colloquium on Calculus*, Department of Mathematics, University of Wisconsin-Oshkosh, Oshkosh, WI, USA. (Jan 7th, 2022).
10. *Topological Data Analysis (TDA) seminar*, Department of Mathematics, Wayne State University, Detroit, MI, USA. (April 15th 2019).
11. *Numerical Analysis Seminar*, Department of Mathematics and Statistics, The University of Toledo, Toledo, OH, USA. (May 1st, 2017).

PARTICIPATION IN  
WORKSHOPS AND  
CONFERENCES

1. “Undergraduate Research Showcase”, Stephen F Austin State University, Nacogdoches, TX, (November 10, 2022).
2. Banff International Research Station Workshop, “Theoretical and Applied Aspects for nonlocal Models,” attended virtually (July 17 - 22, 2022).
3. “Nonlocal School on Fractional Equations NSF-E 2022”, Iowa State University, Ames (Iowa), (June 9-11, 2022).
4. 1<sup>st</sup> Midwest Graduate Student Conference, “Geometry and Topology meet Data Analysis and Machine Learning,”, Ohio State University, Columbus, OH, USA. (June 1-2, 2019)
5. “SIAM Great Lakes Section Meeting”, University of Michigan, Ann Arbor, MI, USA. (April 2019)

6. "SIAM Great Lakes Section Meeting", Department of Mathematics, Wayne State University, Detroit, MI, USA. (April 2018)
7. "Real Analysis Day", Department of Mathematics, University of Michigan, Dearborn, MI, USA. (April 2016)

#### SERVICES

- Committee at Fontbonne University:
 

Faculty Hiring	Fall 2023
Library Advisory Council	Aug 2023 - Continue
- Reviewer for Math. Reviews:  
FlatWorld Textbook (Spring 2023), Aktiv Mathematics (Fall 2022), Hawkes Learning (Fall 2022)
- Assist New Graduate Teaching Assistant (GTA):
  1. Guideline for Prelim. and Qualifying Exams, Wayne State University (2019 - 2022)
  2. Class Observation for Teaching Evaluation, Wayne State University (2020 - 2022)
- Grader, Michigan Mathematics Prize Competition (MMPC)
- Student Advisor Served:
  1. Department of Mathematics & Statistics, Stephen F. Austin State University (Fall 2022)
  2. East Texas Math Teachers' Circle, Stephen F. Austin State University (Fall 2022)

#### TEACHING EXPERIENCE

- **Department of Mathematics & Statistics, Stephen F. Austin State University**

MATH 2313 Calculus I & MATH 2113 Calc I Lab	Spring 2023
MATH 1324 Finite Mathematics (2 sections)	Spring 2023
MATH 3180 Seminar in Mathematics I	Fall 2022
MATH 2211 Precalculus A	Fall 2022
MATH 1342 Introduction to Probability and Statistics (3 sections)	Fall 2022
- **Department of Mathematics, Wayne State University**

STA 2210 Introduction to Probability and Statistics	Summer 2022
MAT 6150 Probability and Statistics for Teachers	Summer 2022
STA 1020 Elementary Statistics (Hybrid)	Winter 2022
MAT 2020 Calculus II	Fall 2021
MAT 2150 Differential Equations and Linear Algebra (Online Synchronous)	Summer 2021
STA 2210 Probability and Statistics (Online Synchronous)	Winter 2021
MAT 1800 Pre-Calculus (Online Synchronous)	Fall 2020
MAT 2030 Calculus III (Online Synchronous)	Summer 2020
MAT 1050 Algebra with Trigonometry	Fall 2019, Fall 2018
MAT 2020 Calculus II	Summer 2019
MAT 2010 Calculus I	Winter 2019 2018
MAT 1050 Algebra with Trigonometry	Summer 2018
MAT 1800 Pre-Calculus	Winter 2018
MAT 1050-5610 (Undergrad - grad tutoring) Mathematics Resource Center	Fall 2017
- **Department of Mathematics & Statistics, The University of Toledo**

MAT 1760 Life Science and Business Calculus	Spring 2017, Spring 2016
MAT 1730 Calculus I	Fall 2016, Fall 2015
- **Department of Mathematics, Lamar University**

Calculus I, II, III, Linear Algebra, Differential Equations, & Statistics tutoring at Mathematics Computer Lab and Tutoring Center (MCLTC)	Spring 2015
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STUDENT  
MENTORED  
RESEARCH  
PROJECTS

Stephen F. Austin State University

Fall 2022 - Spring 2023

Nazrul Khan (MS in Natural Science), Master's Project: *Mathematical modeling of infectious diseases using ordinary and fractional differential equations.*

Angel Tran (BBA in Finance), Undergraduate's Project: *Table Tennis and Business: A Research Study on How Table Tennis Develops Mental Acuity and Can Be Applied in Business.*

RESEARCH  
EXPERIENCE

1. *Data Competition Seminar*, R and Python Programming Competition on Kaggle, Wayne State University, Detroit, MI, USA. (Spring/Summer 2022).
2. *Mathematical modeling of infectious diseases using ordinary and fractional differential equations*, Collaboration with Iowa State University, Ames, Iowa, USA. (June 22 - Aug 22).
3. *Machine Learning, Artificial Intelligence and Deep Learning*, Coursera Online Projects. (Jan 2021 - December 2022).
4. *Time Series Forecasting Data Analysis in Sports, and Finance*, Statistical Data Analysis with R Programming, Wayne State University, Detroit, MI, USA. (Summer 2019 - Winter 2020).
5. *Computational Statistics, Topology and Geometric Method for Data Analysis*, Data Science with RTDA Programming, Wayne State University, Detroit, MI, USA. (Fall 2018 - Fall 2019).
6. *Finite Element Method (FEM) in Numerical Analysis*, Programming with MATLAB, and OCTAVE, Wayne State University, Detroit, MI, USA. (Summer 2018 - Fall 2018).

PROGRAMMING  
LANGUAGES

**Proficient:** MATLAB, Octave, R, RTDA, Mathematica, C, SQL, Python, FORTRAN-95, Maple, Kaggle, Wolfram Alpha, Statskingdom, Minitab, Statcrunch

**Familiar:** JavaScript, Google Apps Script, C++

**Document Creation:** Microsoft Office Suite, L<sup>A</sup>T<sub>E</sub>X, Markdown, Overleaf

PROFESSIONAL  
CERTIFICATIONS

□ **Coursera**

*Problem Solving Using Computational Thinking*, University of Michigan May 2021  
*Machine Learning*, Stanford University July 2021  
*Deep Learning and Artificial Intelligence*, Stanford University August 2021  
*Computer Science: Programming with a Purpose*, Princeton University January 2022  
*SQL for Data Science*, University of California Davis February 2022  
*Biostatistics in Public Health Specialization*, Johns Hopkins University December 2022

□ **MATLAB**

*MATLAB Onramp*, MathWorks September 2021

SELECTED  
GRADUATE  
COURSEWORK

□ **Wayne State University**

MAT 7400 Advance Algebra Fall 2020  
STA 5830 Applied Time Series Winter 2020  
STA 5890 Special Topics in Data Science Winter 2020  
STA 5990 Investment and Financial Markets (IFM) Winter 2020  
STA 7810 Advanced Statistical Theory Fall 2019  
MAT 5890 Special Topics in Topological Data Analysis Winter 2019  
MAT 7600 Real Analysis Fall 2018  
MAT 7200 Partial Differential Equations Fall 2018  
STA 5800 Mathematical Statistics Winter 2018  
STA 5700 Intr to Probability Theory Fall 2017  
MAT 5992 Teaching Mathematics in College Fall 2017

□ **The University of Toledo**

MATH 5710 & MATH 5720 Numerical Analysis I & II Fall 2015, Spring 2016  
MATH 6440 & MATH 6450 Differential Geometry I & II Fall 2015, Spring 2016  
MATH 5800 Ordinary Differential Equations Fall 2016

## SKILLS

- More than eight years of teaching experience at undergraduate level
- Ability to teach a variety of undergraduate mathematics and Statistics courses
- Excellent written and oral communication skills
- Ability to easily adapt to changing circumstances
- Good time management and problem solving skills
- Experience using technology in classroom
- Experience using Canvas, D2L, Moodle, Blackboard, MathLab Pearson, Webassign, Desmos, Geogebra Clasic, Statskingdom, Hawkes Learning, and online homework system
- Strong background in computational, applied mathematics, and statistics
- Enjoy working in collaborative environment

## OTHER

- Teaching Assistant/Research Assistant (GTA/RA) Scholarship Outreach Lecturer. On June 15th, 2017, I gave a colloquium titled “*An Analytical Overview of Life History of Euler & Introduction to Graph Theory*” to undergraduate students in the sciences, engineering, and mathematics who are interested in pursuing doctoral degrees.
- Attending *Stephen F Austin State University’s STEM* day with high school students. On February 17th, 2023, while visiting, I gave a talk about mathematics and data science as professions in industry and academia.
- Participating in well being program: *Sky Campus Happiness* as a volunteer and working with Professor Charro to secure a grant from Wayne State University to make this breathing technique available to the public.

## LANGUAGES

English (Fluent), Bengali (Native).

## REFERENCES

**Dr. Pei-Yong Wang**, Professor  
Department of Mathematics, Wayne State University  
(248)835-5786, email: [av2308@wayne.edu](mailto:av2308@wayne.edu)

**Dr. F. Charro**, Associate Professor  
Department of Mathematics, Wayne State University  
(313)577-2479, email: [fcharro@wayne.edu](mailto:fcharro@wayne.edu)

**Dr. Tao Huang**, Assistant Professor  
Department of Mathematics, Wayne State University  
(313)577-2479, email: [taohuang@wayne.edu](mailto:taohuang@wayne.edu)

**Steven Loher**, Director  
Human Resources, Fontbonne University  
(314)889-1493, email: [sloher@fontbonne.edu](mailto:sloher@fontbonne.edu)

**Dr. Kathleen Roy**, Assistant Professor and Chair  
Department of Mathematics and Computer Science, Fontbonne University  
(314)719-8081, email: [kroy@fontbonne.edu](mailto:kroy@fontbonne.edu)

**Dr. Ivie Stein**, Associate Professor  
Department of Mathematics & Statistics, University of Toledo  
(419)450-3814, email: [ivie.stein@utoledo.edu](mailto:ivie.stein@utoledo.edu)

**Dr. Lesa Beverly**, Professor  
Department of Mathematics & Statistics, Stephen F. Austin State University  
(936)468-3805, email: [beverly11@sfasu.edu](mailto:beverly11@sfasu.edu)

**Dr. Jacob Turner**, Associate Professor  
Department of Mathematics & Statistics, Stephen F. Austin State University  
(936)468-1692, email: [turnerja2@sfasu.edu](mailto:turnerja2@sfasu.edu)