

Buddhika Jayawardana

Home

13600 Wimbledon Loop B-212
Little Rock, AR 72210
Phone: (469) 733-7165
Email: buddhika.cb.jayawardana@gmail.com
LinkedIn: linkedin.com/in/buddhika159

Office

FDA National Center for Toxicological Research,
3900 NCTR Rd. Jefferson, AR 72079
Email: buddhika.jayawardana@fda.hhs.gov

EDUCATION

- | | |
|---|---|
| PhD in Mathematics | University of Texas at Dallas, Richardson, Texas, Jul 2022 Dissertation title: Geometric Integrators for Non-separable Hamiltonian Systems |
| Post Graduate Program in Cloud Computing | University of Texas at Austin – McCombs School of Business, Nov 2022 (portfolio) |
| MS in Mathematics | University of Texas at Dallas, Richardson, Texas, May 2020 (degree certificate) |
| BS in Mathematics | University of Peradeniya, Sri Lanka, Nov 2015 Thesis title: A Numerical Study on Fourier Continuation |

PROFESSIONAL WORK EXPERIENCE

Post-Doctoral Research Fellow Oct 2022 – Present
Division of Biostatistics and Bioinformatics, NCTR, Jefferson, Arkansas

- Collaborated with division members on machine learning and artificial neural network related projects that are focused on improving public health.
- Developed and implemented advanced statistical models to analyze high-dimensional healthcare data, optimizing prediction accuracy.
- Presented research findings at division seminars and conferences.
- Co-authored research papers for publication in peer-reviewed journals.

Graduate Teaching / Research Assistant Aug 2017 – Aug 2022
University of Texas at Dallas, Richardson, Texas

- Engaged in independent research under the guidance of faculty advisors, developing efficient geometric numerical integrators for Hamiltonian systems using MATLAB and Mathematica.
- Authored and co-authored research papers for publication in peer-reviewed journals and presented research findings at conferences and workshops.
- Assisted instructors with course development, including creating lecture materials, assignments, and exams.
- Graded assignments, conducted exams, and led discussions and lab sessions to facilitate student learning.
- Provided tutoring in Linear Algebra, Calculus I, and Integral Calculus, offering one-on-one or group support during office hours.

Instructor of Mathematics Jan 2016 – Jul 2017
University of Peradeniya, Sri Lanka

- Conducted classes in Linear Algebra, Vector Analysis, and Fluid Dynamics for undergraduate students.
- Assisted in grading assignments, exams, and projects, ensuring fairness and consistency.
- Introduced COMSOL modeling into the Fluid Dynamics syllabus in the Mathematics department.
- Guided two undergraduate students in their research studies.

TEACHING EXPERIENCE

Graduate Teaching Assistant

Department of Mathematical Sciences, University of Texas at Dallas

- **MATH 2414 – Integral Calculus** - *Spring 2022, Fall 2021, Spring 2018*
Assisted in preparing problem sets, grading assignments, and evaluating exams for lectures. Held office hours to support students in mastering concepts related to integration techniques, applications of integrals, and series.
- **MATH 3380 - Differential Geometry** - *Spring 2022*
Provided additional guidance on advanced geometric concepts such as curves, surfaces, geodesics, and curvature. Graded coursework.
- **MATH 2418 – Linear Algebra** - *Spring 2021, Fall 2020, Fall 2019*
Led group discussions on linear transformations, eigenvalues, and matrix theory, prepared problem sets, graded assignments, and provided supplemental instruction for computational tools like MATLAB.
- **MATH 2413 – Differential Calculus** - *Spring 2020, Spring 2019*
Conducted tutorials and review sessions on topics such as limits, derivatives, and optimization problems. Worked with students one-on-one to address conceptual challenges.
- **MATH 2417 – Calculus I** - *Fall 2018, Fall 2017*
Taught sections on the fundamentals of calculus, including limits, continuity, and introductory integration. Graded exams and developed supplementary learning materials.

Instructor of Mathematics

Department of Engineering Mathematics, Faculty of Engineering, University of Peradeniya

- **GP 116 – Linear Algebra** - *Fall 2016, Spring 2017*
Designed and delivered lectures covering vector spaces, matrix operations, and linear mappings for first-year engineering students. Integrated real-world applications to enhance comprehension.
- **EM 212 – Calculus II** - *Fall 2016, Spring 2017*
Taught advanced calculus topics, including multivariable calculus, differential equations, and their applications in engineering contexts. Provided targeted feedback and support during lab sessions.

Instructor of Mathematics

Department of Mathematics, Faculty of Science, University of Peradeniya

- **MAT 1042 – Vector Methods** - *Spring 2016*
Instructed on vector calculus, focusing on gradient, divergence, and curl, along with practical applications in physics and engineering. Utilized visual tools and interactive simulations to clarify concepts.
- **MAT 4053 – Fluid Mechanics II** - *Spring 2016*
Conducted weekly discussion sessions and computational modeling labs. Assisted with the implementation of numerical simulations using MATLAB to solve fluid dynamics problems.

Mentorship and Supervision, for undergraduate students

- Mentored an engineering student in research on airflow modeling in a classroom.
Guided the student through problem formulation, solution methodology, and analysis using COMSOL.
- Mentored an undergraduate student in a research project titled “A Numerical Study on Flow and Heat Transfer Between Two Rotating Spheres.”
Provided guidance on problem setup, numerical implementation, and validation of results using theoretical benchmarks.

RESEARCH PROJECT EXPERIENCE

Post-Doctoral Research Fellow, NCTR

Oct 2022 – Present

- Life cycle disease patterns for women, a study with All of Us database using machine learning approaches
- Examining ethnic and racial disparities in critical care delivery to heart failure patients using artificial intelligence (AI) and real-world data (RWD)
- Exploring Multidimensional Electronic Health Records: Topic Modeling of ICD10 Codes for Comprehensive Disease Insights
- Application of domain adaptation techniques for shifted domains when predicting mortality of ethnic minority groups using electronic health record (EHR)
- Reducing Complexity in EHR Data Using Autoencoders: A Case Study with MIMIC-IV data
- Addressing Domain Shifts: Temporal and Racial Impact on Predictive Models in MIMIC database

Doctor of Philosophy Research, University of Texas at Dallas

Jan 2020 – Aug 2022

- *Geometric Integrators for Non-separable Hamiltonian Systems* – Ph.D. Dissertation
- Implementation of a multiscale mixed method (MuMM), Supervisor: Prof. Luis Felipe Pereira
- Reduction of order in bacteria-viruses interaction model, Supervisor: Prof. Dmitry Rachinskiy

Master of Science Research, University of Texas at Dallas

Aug 2017 - Dec 2020

- Clebsch Canonization of Lie-Poisson Systems, Supervisor: Prof. Tomoki Ohsawa
- MPI 2018: Boeing Problem: Actuating Platform Systems – 34th annual Mathematical Problems in Industry workshop
- Measuring the true treatment effect of a drug with a two-step Bayesian approach
- Temperature forecasting in Texas cities, Supervisor: Prof. Pankaj Choudhary
- Mice vertebrae shape classification, Supervisor: Prof. Yan Cao
- Cell nuclei segmentation, Supervisor: Prof. Yan Cao

Bachelor of Science Research, University of Peradeniya

Jul 2011 - Nov 2015

- A Numerical Study on Fourier Continuation, Supervisor: Dr. J. A. Weliwita
- Modeling sesame oil extraction, Prof. R. Shanthini, Dr. D. S. K. Karunasinghe
- Early childhood dental caries in Sri Lanka, Dr. Sachith P. Abeysundara

SKILLS (*with Artificial Intelligence experience)

| | |
|---------------------------|---|
| Software/Programming | Python, R, SQL, MATLAB, Mathematica, COMSOL Multiphysics, Processing |
| Area of Expertise | Machine Learning*, Dynamical Systems, Image Analysis, Causal Inference, Numerical Analysis, Statistical Analysis, Optimization, Time series forecasting |
| Machine Learning Concepts | Regression*, Classification*, Neural networks*, Tree-based methods*, Ensemble methods*, Support vector machines*, Clustering algorithms*, Autoencoders* |
| Database Management | BigQuery, Postgre SQL |
| Deployment and Cloud | Model Deployment (Docker, Kubernetes), Cloud platforms (Google*, AWS*, Azure) |

LIST OF PUBLICATIONS AND PRESENTATIONS - Google Scholar

Publications

- Buddhika Jayawardana, and Tomoki Ohsawa. “Semiexplicit symplectic integrators for non-separable Hamiltonian systems.” *Mathematics of Computation* 92, no. 339 (2023): 251-281.
- Buddhika Chathuranga Bandara Jayawardana. “Geometric Integrators for Non-separable Hamiltonian Systems.” *PhD dissertation*, 2022.
- Buddhika Jayawardana, Philip J. Morrison, Tomoki Ohsawa. Clebsch canonization of Lie–Poisson systems. *Journal of Geometric Mechanics*, 2022, 14(4): 635-658.
- Subas Acharya, Robert Atmur, Buddhika Jayawardana, Peter Kramer, Richard Moore, Vrushaly Shinglot, Rui Xiang, and Yimin Zhong. Actuating platform systems. *Mathematics in Industry Reports*, 2022.

Professional Presentations

- Buddhika Jayawardana, Dong Wang, Paul Rogers, Zhiyuan Lu, Hyeonju Kim. Resilience to Covariate Shift: Evaluating the Impact of Model Complexity on Mortality Prediction with MIMIC Data, *Arkansas Biostatistics Consortium (AR-BIC)* February 2024 Little Rock, Arkansas.
- Buddhika Jayawardana, Philip J. Morrison, Tomoki Ohsawa. Geometric Integrators for Lie-Poisson Hamiltonian Systems. *DFW Area 2021 Virtual Poster Competition in Mathematics*.
- Buddhika Jayawardana, Jinendrika Weliwita. A Numerical Study on Fourier Continuation. *International Conference on Computational Modeling & Simulation (ICCMS-2017)* May 2017 Colombo, Sri Lanka

MANUSCRIPTS IN PREPARATION

- Buddhika Jayawardana, Hyeonju Kim, Paul Rogers, Dong Wang. *The effect of covariate shift on the performance prediction models for clinical decision support, an investigation with Medical Information Mart for Intensive Care (MIMIC) data.* - under review
- Zhiyuan Lu, Buddhika Jayawardana, Paul Rogers, Hyeonju Kim, Dong Wang. *Exploring the relationship between race and admission rates to cardiology Intensive Care Units (ICUs): Findings from the Medical Information Mart for Intensive Care (MIMIC) Database* - under review
- Buddhika Jayawardana, Hyeonju Kim, Paul Rogers, Dong Wang. *Exploring racial disparities among sepsis patients utilizing autoencoders with the MIMIC-IV database.* - manuscript in preparation

RESEARCH GRANTS AND FUNDING

- Project Title: *Life cycle disease patterns for women, a study with All of Us database using machine learning approaches* - Special Funding

Source: Office of Women’s Health, FDA

Recipient: National Center for Toxicological Research, FDA

Role: Co-Investigator

PI: Dr. Dong Wang, Division of Bioinformatics and Biostatistics, NCTR, FDA, Jefferson, AR

Funding Period: October 1, 2024 to September 30, 2027

- Project Title: *Examining ethnic and racial disparities in critical care delivery to heart failure patients using artificial intelligence (AI) and real-world data (RWD)* (challenge # 1748)

Source: Office of Minority Health and Health Equity, FDA

Recipient: National Center for Toxicological Research, FDA

Role: Co-Principal Investigator

PI: Dr. Dong Wang, Division of Bioinformatics and Biostatistics, NCTR, FDA, Jefferson, AR

Total Amount Requested: \$48,000.00 per year for two years

Funding Period: January 1, 2022 to December 31, 2023

- Project Title: *Shape Dynamics of Vortices: Theory and Numerics* (Award Abstract # 2006736)

Source: National Science Foundation, Division of Mathematical Sciences
 Recipient: University of Texas at Dallas
 Role: Co-Principal Investigator
 PI: Dr. Tomoki Ohsawa, University of Texas at Dallas, TX
 Total Intended Award Amount: \$164,965.00
 Funding Period: August 1, 2020 to July 31, 2024

AWARDS AND SCHOLARSHIPS

- 2020 Natural Sciences and Mathematics Scholarship, University of Texas at Dallas, Richardson, Texas, USA
- 2018 Received travel funds from the University of Texas at Dallas to attend and present at the 34th annual MPI workshop held at Claremont Center for the Mathematical Sciences, Claremont Graduate University, USA.
- 2016 “Eramudugolla Dunuvila” Scholarship for the academic performance in Mathematics, Science Faculty, University of Peradeniya (Conducted by the Alumni Association of the University of Peradeniya - Colombo Chapter)
- 2015 Winner of three “Mathematical Problem of the Month” at the University of Peradeniya, Sri Lanka

REFERENCES

Reference 1

Name: Dr. Dong Wang
 Title: Supervisory Mathematical Statistician, Biostatistics Branch Chief
 Organization: FDA National Center for Toxicological Research
 Email: dong.wang@fda.hhs.gov
 Phone: (870) 543-7121
 Relationship: Current Supervisor

Reference 2 (Teaching)

Name: Dr. Diarisoa Mihaja Rakotomalala
 Title: Assistant Professor of Instruction - Mathematical Sciences
 Organization: University of Texas at Dallas
 Email: mihaja@utdallas.edu
 Phone: (972) 883-6431
 Relationship: Former Colleague

Reference 3

Name: Dr. Augustine Annan
 Title: Postdoctoral Associate
 Organization: Melax Technologies Inc.
 Email: augustine.annan@utdallas.edu
 Phone: (682) 408-0613
 Relationship: Former Colleague