RAMI MASRI

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Experience

Postdoctoral Research Associate, June 2024–Present
Division of Applied Mathematics,
Brown University, Providence, RI
Advisor: Prof. Brendan Keith

Postdoctoral Fellow, June 2022–June 2024
Department of Numerical Analysis and Scientific Computing,
Simula Research Laboratory, Oslo, Norway
Advisor: Prof. Marie Rognes

Education

Ph.D., Computational and Applied Mathematics, May 2022
Rice University, Houston, TX
Advisor: Prof. Beatrice Riviere

Graduate Certificate in Teaching and Learning, December 2021
Rice University Center of Teaching Excellence, Houston, TX

M.A., Computational and Applied Mathematics, May 2019
Rice University, Houston, TX
Advisor: Prof. Beatrice Riviere

B.S., Mathematics, with high distinction, May 2017
Lebanese American University, Beirut, Lebanon

Research Articles

Submitted:

1. B. Keith, **R. Masri**, M. Zeinhofer. A priori error analysis of the proximal Galerkin method. *Submitted,* 2025.
2. M. Causemann, M. Kuchta, **R. Masri**, ME. Rognes. In–silico molecular enrichment and clearance of the human intracranial space. *Submitted, Completed first revision in Nature Communications,* 2025.
3. G. Fu, B. Keith, **R. Masri**. A locally conservative proximal Galerkin method for pointwise bound constraints. *Submitted, Completed first revision in Mathematics of Computation*, 2025.
4. **R. Masri**, K.L.A Kirk, E. Hauge, M. Kuchta. A discontinous Galerkin method for the extracellular membrane intracellular model, *Submitted. Completed first revision in IMA Journal of Numerical Analysis,* 2025.

Published:

1. M. Zeinhofer, **R. Masri**, and K. A. Mardal. A unified framework for the error analysis of physics-informed neural networks, *IMA Journal of Numerical Analysis*, 2024. DOI:10.1093/imanum/drae081.
2. **R. Masri**, M. Zeinhofer, M. Kuchta, and M. E. Rognes. The modelling error in multi-dimensional time-dependent solute transport models, *ESAIM: Mathematical Modelling and Numerical Analysis*, 2024. DOI:10.1051/m2an/2024060.
3. **R. Masri**, M. Kuchta, B. Riviere. Discontinuous Galerkin methods for coupled 3D–1D systems, *SIAM Journal on Numerical Analysis*, 2024. DOI/10.1137/23M1627390.
4. K.L.A. Kirk, **R. Masri**, B. Riviere, Numerical analysis of a hybridized discontinuous Galerkin method for the Cahn–Hilliard problem, *IMA Journal of Numerical Analysis*, 2023. DOI:10.1093/imanum/drad075.

5. C. Liu, **R. Masri**, B. Riviere. Convergence of a decoupled splitting scheme for the Cahn-Hilliard-Navier-Stokes System, *SIAM Journal on Numerical Analysis*, 2023. DOI:10.1137/22M1528069.
6. **R. Masri**, B. Shen, B. Riviere. Discontinuous Galerkin approximations to elliptic and parabolic problems with a Dirac line source, *ESAIM: Mathematical Modelling and Numerical Analysis*, 2023. DOI:10.1051/m2an/2022095
7. **R. Masri**, C. Liu, B. Riviere. Improved velocity and pressure error estimates for a discontinuous Galerkin pressure correction scheme. *Numerical Methods for Partial Differential Equations*, 2023. DOI:10.1002/num.23002
8. **R. Masri**, C. Liu, B. Riviere. A discontinuous Galerkin pressure correction scheme for the incompressible Navier-Stokes equations: stability and convergence. *Mathematics of Computation*, 2022. DOI:10.1090/mcom/3731
9. **R. Masri**, C. Puelz, B. Riviere. A discontinuous Galerkin method for blood flow and solute transport in one dimensional vessel networks. *Communications on Applied Mathematics and Computation*, 2021. DOI:10.1007
10. **R. Masri**, C. Puelz, B. Riviere. A reduced model for solute transport in compliant blood vessels with arbitrary axial velocity profile. *International Journal of Heat and Mass Transfer*, 2021. DOI:10.1016/j.ijheatmasstransfer

Reports

N. Berre, G. Castro, H. Kjeldsberg, **R. Masri**, and I. Gjerde. A computational study on flow instabilities in aneurysms. *SSCP Simula SpringerBrief on Computing: Reports on Computational Physiology*, 2021. DOI:10.1007/978-3-031-05164-7_6

Theses

R. Masri. Analysis of discontinuous Galerkin schemes for flow and transport problems *Thesis for the degree of Doctor of Philosophy, Rice University,* 2022

R. Masri. Derivation and numerical simulation of oxygen transport in blood vessels. *Master of Arts Thesis, Rice University*, 2019

Teaching Experience

Instructor
AMPA 0160: Introduction to Scientific Computing
Division of Applied Mathematics, Brown University
Fall 2025

Co-Instructor
AMPA 2560: Numerical Solution of Partial Differential Equations II,
Division of Applied Mathematics, Brown University
Spring 2025

Co-instructor, and co-organizer
FAEFEM, Functional Analysis Essential for the Finite Element Method
Simula Research Laboratory, Simula Academy
March, 2023

Teaching Assistant
CAAM 336, Differential Equations in Science and Engineering
Rice University, Department of Computational and Applied Mathematics
Fall 2019, Spring 2020, Fall 2021

MTH 101–102, Introductory Calculus Courses
Lebanese American University, Department of Computer Science and Mathematics
Fall 2016, Spring 2017

Grader
CAAM 336, Differential Equations in Science and Engineering,
Rice University, Department of Computational and Applied Mathematics

Fall 2017, Spring 2018

CAAM 453, Numerical Analysis I
Rice University, Department of Computational and Applied Mathematics
Fall 2018

Research Presentations

Invited research presentations at universities

1. A locally-conservative proximal Galerkin method for pointwise bound constraints. *Applied Math Seminar in the Department of Mathematical Sciences, University of Arkansas.* January, 2025
2. A locally-conservative proximal Galerkin method for pointwise bound constraints. *NASC RTG Research Seminar, Rice University.* January, 2025
3. Pressure correction discontinuous Galerkin methods for Navier–Stokes and Cahn-Hilliard-Navier-Stokes equations. *Mechanics Seminar Series at the Department of Mathematics, University of Oslo.* November, 2023
4. Multi-dimensional transport models: Derivation, error analysis, and numerical methods. *Mathematical Institute at Albert Ludwigs University of Freiburg.* October, 2023.

Invited presentations at conference minisymposia

3. Coupled 3D-1D systems: derivation, error analysis, and discontinuous Galerkin methods. *International Conference on Computational Methods in Applied Mathematics (CMAM-10), Bonn University*, June 2024.
4. Derivation, model error analysis, and discontinuous Galerkin methods for coupled 3D-1D transport models. *ECCOMAS*, June 2024.
5. A unified framework for the error analysis for physics informed neural networks. *Sintef PhysML workshop*, May 2024.
6. Multi-scale modelling and simulation: EMI models, 3D-1D transport, and DG method. *ICIAM Tokyo*, August 2023.
7. Discontinuous Galerkin methods for elliptic and parabolic problems with a line source. *SIAM Conference on Mathematical & Computational Issues in the Geosciences*, June 2023
8. The modeling error in reduced 3D-1D time dependent solute transport models. *Large Scale Scientific Computations (LSSC'23)*, June 2023
9. Derivation and model error analysis of multidimensional time dependent solute transport models. *Math 2 Product, ECCOMAS (M2P 2023)*, June 2023
10. A decoupled splitting scheme combined with a discontinuous Galerkin spatial discretization for solving the Cahn-Hilliard-Navier-Stokes equations. *SIAM Conference on Computational Science and Engineering*, March 2023
11. Analysis of discontinuous Galerkin methods combined with splitting techniques for incompressible flow. *2022 SIAM Annual Meetings*, July 2022
12. Discontinuous Galerkin pressure correction methods for incompressible flow. *Finite Element Rodeo at Southern Methodist University*, March 2022
13. Stability and convergence of high order discontinuous Galerkin methods for incompressible flows. *SIAM Texas Louisiana Annual Meeting*, November 2021
14. One dimensional models of solute transport and blood flow: derivation and numerical simulation. *SIAM Conference on Computational Science and Engineering*, March 2021
15. Derivation and simulation of blood flow and solute transport models in one dimensional vessel networks. *SIAM Texas Louisiana Annual Meeting*, October 2020

16. Discontinuous Galerkin methods for blood flow and solute transport models. *Finite Element Rodeo at Baylor University*, March 2020

Research presentations at departments:

14. The modeling error in multi dimensional solute transport models. *Departmental Seminar at Simula Research Laboratory*, May 2023
15. Error analysis for discontinuos Galerkin methods for elliptic and parabolic problem with line sources. *Departmental Seminar at Simula Research Laboratory*, August 2022
16. One dimensional models of solute transport and blood flow in vessel networks. *Departmental Graduate Student Seminar at Rice University*, October 2020
17. Reduced models of blood flow and solute transport. *Departmental Graduate Student Seminar at Rice University*, January 2020

Mini-symposium Organization

Co-organizer of a mini-symposium on *Numerical Analysis of Finite Element Schemes for PDEs with Point or Line Sources*, SIAM Conference on Mathematical & Computational Issues in the Geosciences

Reviews

Reviewer for articles submitted to the journals: " SIAM Journal on Numerical Analysis", "SIAM Journal on Scientific Computing", "Mathematics of Computation", "IMA Journal of Numerical Analysis", "ESAIM: Mathematical Modelling and Numerical Analysis", "Computers and Mathematics with Applications", "BIT Numerical Mathematics", and "PLOS Computational Biology".

Awards and Scholarships

Student Travel Award, SIAM Texas-Louisiana Section, 2021

Student Travel Award, SIAM Conference on Computational Science and Engineering, 2021

Alan Weiser Memorial Travel Award, Rice University, 2020

Fulbright Foreign Student Program Winner, U.S. Embassy in Beirut, 2017

Full Merit Scholarship, Lebanese American University, 2015-2017

Mentorship and Service

Graduate Student Peer Mentor
Rice University, Department of Computational and Applied Mathematics, Fall 2021

Co-organizer of a Journal Club at Simula
We organized series on several mathematical topics on e.g., PDE constrained optimization

Graduate Liaison
Center of Teaching Excellence, Rice University, Fall 2021 - Spring 2022

Vice President
SIAM Student Chapter, Rice University, Fall 2021 - Spring 2022

Languages

English (fluent), Arabic (native)