

Justin Dong

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Education

Brown University

Providence, RI

Ph.D. Student, Applied Mathematics

2017–Present

- Relevant coursework: Computational Fluid Dynamics, Real/Functional Analysis, High-Order Finite Element Methods, Heterogeneous Computing on CPUs and GPUs

Rice University

Houston, TX

Bachelor of Arts, Computational and Applied Mathematics

2010–2014

Bachelor of Science, Mechanical Engineering

- Magna cum laude, distinction in research and creative work

Research Interests

- High-order accurate numerical methods for PDEs
- Computational fluid dynamics
- Machine learning for the solution of PDEs

Honors & Awards

National Science Foundation Graduate Research Fellowship	March 2018
National Defense Science and Engineering Graduate Fellowship (declined)	April 2018
Rice University Wagoner Foreign Study Fellowship	March 2015
Rice University Chevron Research Prize	April 2014
Swiss Office of Science & Technology – ThinkSwiss Research Scholarship	May 2013

Publications

- J. Dong and B. Rivère. *A semi-implicit method for incompressible three-phase flow in porous media*. Computational Geosciences **20**(6). 1169-1184 (2016).
- J. Dong. *A high-order method for three-phase flow in homogeneous porous media*. SIAM SIURO Vol. 7, 2014.

Research Experience

Brown University, Providence, RI

Jan 2019 – Present

Graduate Student Researcher

Presently, I am working on deep neural network approaches to solving PDEs with my advisor, Professor Mark Ainsworth.

Lawrence Livermore National Laboratory, Livermore, CA**May – July 2018***Research Intern*

Implemented a two-dimensional solver for Maxwell's equation using a nodal discontinuous Galerkin method on GPUs. Integrated the solver with RAJA – a software abstraction layer for C++ enabling architecture portability for HPC applications – and mint – a mesh generation package. Advised by Dr. Arturo Vargas.

University of Stuttgart, Germany**March – August 2015***Visiting Research Scholar*

Implemented a discontinuous Galerkin finite element method for two-phase flow in heterogeneous media with discontinuous capillary pressures, with particular attention given to interface conditions at the media boundaries. Research funded by Rice University's Wagoner fellowship. Advised by Professor Rainer Helmig.

Argonne National Laboratory, Lemont, IL**May – August 2014***Research Intern*

Calibrated hydrological watershed models in parallel using a shuffled complex evolution (SCE) optimization. Implemented the code on Argonne's Blues computing cluster using the Swift parallel scripting language. Advised by Dr. Eugene Yan.

Rice University, Houston, TX**Jan 2013 – May 2014***Undergraduate Research Assistant*

Developed a semi-implicit discontinuous Galerkin spatial discretization for three-phase flow in porous media and carried out simulations in highly heterogeneous media using data from the SPE10 dataset. This work was published in *Computational Geosciences* in 2016. Advised by Professor Béatrice Rivière.

ETH Zürich, Switzerland**May 2013 – July 2013***Research Intern*

Carried out the implementation of an $H(\text{curl})$ -conforming discontinuous finite element method as well as implementation of an auxiliary subspace preconditioner for Maxwell's equations in MATLAB. Research funded by the ThinkSwiss fellowship.

Teaching Experience

- Applied Mathematics 330: Methods of Applied Mathematics I, head teaching assistant (Fall 2018)
- Applied Mathematics 340: Methods of Applied Mathematics II, head teaching assistant (Spring 2019)

Mentoring Experience

- Simran Nayak (undergraduate): supervised an independent reading project in adaptive finite element methods for differential equations in one dimension (Fall 2018)
- Daniel Masotti (undergraduate): supervised an independent reading project in preconditioned Krylov subspace methods for large-scale linear systems of equations - ongoing (Spring 2019)

Presentations

- Poster: *A High-Order Method for Incompressible Three-Phase Flow in Heterogeneous Porous Media*. SIAM Annual Meeting, 2014.
- Poster: *A Controllable Heat Exchanger System for Space Applications*. Rice University Engineering Design Showcase, 2014.

Computer skills

Languages: C/C++, MATLAB, Python

API: OpenMP, CUDA, MPI

Typesetting: L^AT_EX

Outreach & Service

Applied Math Directed Reading Program

Aug 2018 – Present

Founder & Organizer

In Fall 2018, I founded the Department of Applied Mathematics's Directed Reading Program at Brown University, which allows advanced undergraduates to work one-on-one with graduate student mentors on independent reading projects. Some testimonials from undergraduates:

- "The mentorship I received was valuable both as an opportunity to hear first-hand mathematical expertise from a mentor as well as learn more about experiences from a female mentor in the math community."
- "[The DRP was] a great way to get interested undergraduates their first exposure to doing research and... begin to dive into a topic they can't just study in a more general class."

Faculty Graduate Liason

Aug 2018 – Present

Division of Applied Mathematics, Brown University

I present budget requests from student organizations in the department to the department chair and convey concerns of graduate students to faculty.

Applied Math Graduate/Undergraduate Mentorship Program

Jan 2018 – Present

Organizer

The Graduate/Undergraduate Mentorship Program allows undergraduate applied math concentrators at Brown to receive one-on-one advising from graduate students. The program is geared towards undergraduates planning to go to graduate school or those who simply seek an extra avenue of advising beyond their faculty advisor.

Mathematics Resource Center

Aug 2017 – May 2018

Tutor

Rice University Undergraduate Admissions

Dec 2014 – Present

Alumni Interviewer