

RISHABH DATTA

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EDUCATION

Massachusetts Institute of Technology Ph.D. in Mechanical Engineering; Major in Plasma Physics, Minor in Photonics Thesis: “ <i>Radiatively-cooled magnetic reconnection on the Z pulsed-power machine</i> ”	2022-Present <i>Cambridge, MA</i> <i>GPA: 5.0/5.0</i>
Massachusetts Institute of Technology S.M. in Mechanical Engineering Thesis: “ <i>High-Energy-Density Shocks in Magnetized Hypersonic Plasma Flows</i> ”	2019-2022 <i>Cambridge, MA</i> <i>GPA: 5.0/5.0</i>
Georgia Institute of Technology B.S. in Mechanical Engineering (Highest Honors)	2015-2019 <i>GPA: 3.97/4.0</i>

RESEARCH EXPERIENCE

Research Assistant, Plasma Science & Fusion Center, MIT <i>Research Supervisor: Dr Jack D Hare</i> <ul style="list-style-type: none">• Demonstrated first evidence of radiative collapse in a novel magnetic reconnection experiment• Led the multi-institute MARZ collaboration (MIT, Sandia National Labs, Princeton, UMich, and others)• Computational modeling (MHD, radiation transport, etc. in Python, Fortran) of high energy density plasmas• Novel diagnostic development (machine learning with spectroscopy, tomography, shock-based imaging, etc.)• Developed analysis and synthetic modeling software (visible/X-ray spectroscopy, interferometry, imaging, etc.)	2020-Present
Research Intern, Technical University Munich <i>Research Supervisor: Dr Stefan Adami</i> <ul style="list-style-type: none">• Developed Riemann solver(s) in C++ for compressible multiphase flow modeling	2018
Research Assistant, Solar Fuels & Technologies Lab, Georgia Tech <i>Research Supervisor: Dr Peter Loutzenhiser</i> <ul style="list-style-type: none">• Thermodynamic characterization of novel fuels for thermochemical concentrated solar reactors	2017-2018

AWARDS, GRANTS, AND HONORS

• Igor Alexeff Outstanding Student in Plasma Science Award (1 selected, international)	2024
• ZNetUS Program Grant (<i>\$50,000 to study compression in magnetized oblique shocks</i>)	2024
• Wunsch Foundation Silent Hoist and Crane Outstanding Student Award (2 selected, department)	2023
• MIT College of Engineering Exponent Fellowship (1 selected, institution)	2023
• Finalist, Best Student Paper, IEEE Plasma Science Conference (5 selected, international)	2023
• Best Poster, MIT Machine Learning for Engineering Design Poster Expo.	2022
• MIT MathWorks Fellowship	2022
• Keck Award in Thermal Sciences, MIT (1 selected, department)	2021
• GSC Conference Grant, MIT (1 selected, institute)	2021
• Honorable Mention, MIT Mechanical Engineering Research Exhibition	2021
• President’s Undergraduate Research Award, Georgia Tech	2018
• Diversity, Equity and Inclusion Fellow, Georgia Tech	2018

- Practical Research Experience Program Scholarship 2018
- Dean's List 2018
- Faculty Honors 2015, 2016, 2017, 2018

PUBLICATIONS

- [8] **Datta, R.**, Crilly, A., Hansen, S., et al. (2024). Radiatively-cooled magnetic reconnection driven by pulsed power. *Invited Paper. Phys. Plasmas. (In Review)*.
- [7] **Datta, R.**, Crilly, A., Hansen, S., et al. (2024). Plasmoid formation and strong radiative cooling in a driven magnetic reconnection experiment. *Phys. Rev. Lett. (In Review)*.
- [6] **Datta, R.**, Crilly, A., Chittenden, J., et al. (2024). Simulations of radiatively cooled magnetic reconnection driven by pulsed-power. *Journal Plasma Phys. (In Review)*.
- [5] **Datta, R.**, Faez, A., Hare, J.D. (2023). Machine learning assisted analysis of visible spectroscopy in pulsed-power-driven plasmas. *IEEE Transactions on Plasma Science. 10.1109/TPS.2024.3364975*.
- [4] **Datta, R.**, Angel, J., Greenly, J.B. , et al. (2023). Plasma flows during the ablation stage of an over-massed pulsed-power-driven planar wire array. *Phys. Plasmas 30, 092104*.
- [3] **Datta, R.**, Russell, D. R., Tang, I., Clayson, T., et al. (2022). The structure of 3-D collisional magnetized bow shocks in pulsed-power-driven plasma flows. *Journal Plasma Phys., 88(6), 905880604*.
- [2] **Datta, R.**, et al. (2022) Time-resolved velocity and ion sound speed measurements from simultaneous bow shock imaging and inductive probe measurements. *Rev. Sci. Instrum., 93(10), 103530*.
- [1] Bush, H. E., **Datta, R.**, & Loutzenhiser, P. G. (2019). Aluminum-doped strontium ferrites for a two-step solar thermochemical air separation cycle: Thermodynamic characterization and cycle analysis. *Solar Energy, 188, 775-786*.

SELECTED TALKS AND PRESENTATIONS

- APS Division of Plasma Physics Meeting, Denver, CO. *Invited talk.* 2023
- Z Fundamental Science Workshop (Virtual). *Invited plenary.* 2023
- Dense Z Pinch Conference, Ann Arbor, MI. Contributed talk. 2023
- International Magnetic Reconnection Workshop, Japan. Contributed talk. 2023
- International Conference on Plasma Science, Santa Fe, NM. Contributed talk. 2023
- MIT PSFC-NSF Meeting, Cambridge, MA. *Invited talk.* 2023
- MIT Machine Learning for Engineering Design Expo, Cambridge, MA. Contributed Poster. 2022
- APS Division of Plasma Physics Meeting, Spokane, WA. Contributed talk. 2022
- High Temp. Plasma Diagnostics, Rochester, NY. Contributed poster. 2022
- APS Division of Plasma Physics Meeting, Pittsburgh, PA. Contributed poster. 2023
- MIT-Imperial College Meeting. *Invited Talk.* 2021
- MIT Graduate Association of Mechanical Engineers Lunch Seminar. 2021

TEACHING AND MENTORSHIP

- Teaching Assistant, 2.005 Thermofluids Engineering, MIT 2024

Prepared teaching materials and lectures for 75 junior/senior undergraduate students

- Teaching Assistant, MechE Advanced Fluid Mechanics Qualifying Exam, MIT 2022
- The Professor's Toolkit Teaching Course, MIT, Cambridge, MA 2024
- Teaching Days Course, MIT, Cambridge, MA 2024
- Graduate Student Coach, MIT, Cambridge, MA 2021-2022

- Undergraduate researcher (UROP) Advisor 2022-Present
Closely mentored 6 undergraduate students on research projects I proposed as part of my research.
 1. Emily Neill (Spring 2023-Present): Measuring the adiabatic index in high energy density plasmas
 2. Osahon Odiase (Spring – Summer 2023): Construction and testing of a 1kA pulsed-power device
 3. Dylan Robinson (Spring 2023): Mach-Zehnder interferometry measurements in planar wire arrays
 4. Jane Atkinson (January 2023): Construction and testing of a 1kA pulsed-power device
 5. Jose Arevalo (Spring – Fall 2023): Design and modeling of a 1kA pulsed-power device
 6. Emily Wong (Fall 2022): Three-dimensional MHD modeling of planar wire arrays

LEADERSHIP & ACTIVITIES

- MIT GSC Sustainability, Committee Chair 2020-2022
- MIT Sustainability Fund, Chair 2020-2022
- Peer Mentor | MIT Graduate Association of Mechanical Engineers 2022-2023
- Housing and Community Affairs, MIT Graduate Student Council 2020-2022
- Graduate Student Coach, MIT 2021
- Diversity and Inclusion Fellow, Georgia Tech 2018
- Executive Board Member, Georgia Tech Mental Health Student Coalition 2017
- Chair, Council of Grad Life, Georgia Tech 2017-2019
- Diversity & Inclusion Chair, Student Center Programs Council, Georgia Tech 2016-2017
- Committee Chair, Georgia Tech Student Government Association 2015-2017

OTHER PROJECTS & PROFESSIONAL EXPERIENCE

Optics and Photonics

- Tomographic reconstruction using Mach-Zehnder interferometry measurements 2023
Developed simultaneous algebraic reconstruction tomography software in Python.

- Surface Plasmon Polaritons on Anisotropic Interfaces 2023
Analytical and FDTD computational modeling in Lumerical of SPP generation.

- Photonic band gaps in periodic double-negative multilayer structures 2023
Modeled (FEM, COMSOL) photonic band gaps in multilayer crystals with negative index materials.

- Optical Modeling of Tunable Optical Plasma Metamaterials 2022
Designed tunable plasma metamaterials using geometric ray tracing and Fourier optics.

Optimization and Machine Learning

- Optimization of pulsed-power-driven loads 2024
Optimizing load geometry (using gradient-free optimization) based on electrostatic simulations.

- Multi-objective optimization of linkage mechanisms **2022**
Designed linkage mechanisms using genetic optimization algorithms (NSGA-II, SMS-EMOA, etc.)
 - Using Deep Generative models for topological design of truss structures **2023**
Developed generative adversarial networks (GANs) and Variational Auto-Encoders (VAEs) in TensorFlow for generating novel diverse topologies of truss structures.
- Computational Modeling and Design**
- Engineering Intern, Emrgy Distributed Hydropower Solutions **2019**
Performed CFD simulations, numerical finite-difference modeling, and electrical systems modeling of hydrokinetic devices using Simscale, MATLAB, Python, and VBA.
 - Design of a 10 kA micro-second pulsed power device **2023**
Designed (in Simulink) and manufactured a table-top pulsed power device.
 - A finite-element Biot-Savart solver for electrostatic modeling of loads **2022**
Developed a numerical tool in MATLAB & Python to model the electrostatic magnetic field distribution in pulsed-power-driven loads.
 - Thermochemical energy storage for concentrated solar power plants **2018-2019**
Thermodynamic modeling for a 1.5 MW solar plant with a primary air cycle and a secondary Rankine cycle, and storage modeling using a MnO₂/Mn₂O₃ continuous flow systems.
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