Deepanshu Verma

Curriculum Vitae
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Education

2018 - 2021 **Ph.D. in Mathematics** | George Mason University, Fairfax, VA
Advisor: Prof. Harbir Antil
GPA: 4.0

2015 - 2018 **M.Sc. in Mathematics** | Indian Institute of Technology (IIT) Bombay, Mumbai, India
CPI: 9.65/10

2012 - 2015 **B.Sc.(Hons.) in Mathematics** | Shri Guru Teg Bahadur Khalsa College, Delhi University, India.
Percentage: 95%

Professional Experience

Emory University Department of Mathematics Atlanta, GA

2021 - Present **Distinguished Visiting Assistant Professor**

Emory REU/RET Computational Mathematics for Data Science Atlanta, GA

Summer 2022 **Executive Board Member**
Responsibilities included organizing tutorials, seminars, professional development opportunities; designing the REU/RET schedule, deliverables; and catering food and beverages for seminars.

Summer 2022 **Project Advisor**
Project: *Learning Ordinary Differential Equations from Data*

Lawrence Livermore National Lab Livermore, CA

Summer 2021 **Summer Graduate Computing Student Intern**
Mentors: Dr. Boyan Lazarov, Dr. Vladimir Zdravkov Tomov

George Mason University Fairfax, VA

2018 - 2021 **Graduate Research Assistant**

Summer 2019 **Summer Research Intern**

Fall 2019-2021 **Executive Board Member**, *SIAM GMU Student Chapter*

Research Interests

PDE-constrained optimization, inverse problems, calculus of variations, scientific computing, numerical analysis, deep learning, reinforcement learning

Honors and Awards

George Mason University

2018-2021	Presidential Merit Fellowship
2019-2020	Dean's Graduate Award for Excellence
Summer 2020	Presidential Scholar Summer Research Fellowship
May 2019	Achievements in Analysis Award

Indian Institute of Technology, Bombay

2017-2018	PhD Scholarship
2017	Institute Silver Medal for academic excellence
2017	Mrs. Rama Mathur Award for securing highest GPA
2017	Prof. P.V. Sukhatme Memorial Prize Award for securing highest GPA

Shri Guru Teg Bahadur Khalsa College, Delhi University

2015	1^{st} rank holder

Additional Honors

2017	Graduate Aptitude Test in Engineering in Mathematics; All India Rank: 70
2016	Junior Research Fellowship Awardee; All India Rank: 09
2015	Joint Admission test for Masters; All India Rank: 21

Funding

SIAM Student Travel Award

July 2021	SIAM Annual Meeting*
March 2021	SIAM Conference on Computational Science and Engineering*

George Mason University

2018-2021	Presidential Merit Fellowship *Stipend and Tuition support during PhD.*
Summer 2020	Presidential Scholar Summer Research Fellowship *Financial support during the summer term for research.*
August 2019	Graduate Student Travel Fund (GSTF)

Local Support from Organizing Committees

February 2020	Workshop on Finite Elements for Nonlinear and Multiscale Problems Indian Institute of Sciences (IISc), Bangalore, India
October 2019	Special Semester on Optimization Johann Radon Institut (RICAM), Linz, Austria
August 2019	Sixth International Conference on Continuous Optimization (ICCOPT) TU Berlin, Germany
December 2018	Workshop on Dynamics, Control and Numerics for Fractional PDEs University of Puerto Rico, San Juan, Puerto Rico

Mentoring

Emory Honors Program

Summer 2022 - Present	Oliver Wang Co-advised with Dr. Lars Ruthotto

*held virtually

Indian Institute of Technology, Bombay

Fall 2022 - Present	Sylvia Vincent Co-advised with Dr. Neela Nataraj	

Emory REU Mentees

	Emma Hayes	Carnegie Mellon University
Summer 2022	Mathias Heider	University of Delaware
	Carrie Vanty	Middlebury College

Preprints and Publications

In Preparation

(1) E. Hayes, M. Heider, C. Vanty and **D. Verma**. Hamiltonian Inspired Neural Networks. (advised)

(2) L. Ruthotto, **D. Verma**, N. Winovich and B. Waanders. Comparing Reinforcement Learning and HJB approaches for PDE-constrained Optimization.

Submitted Articles

(1) X. Li, L. Ruthotto and **D. Verma**. A Neural Network approach for Stochastic Optimal Control problems. arXiv: https://arxiv.org/pdf/2209.13104.pdf. presentation: ZOOM

(2) H. Antil, H.C. Elman, A. Onwunta, **D. Verma**. Novel Deep Neural Networks for Solving Bayesian Statistical Inverse Problems. arXiv: https://arxiv.org/pdf/2102.03974.pdf.

Published/Accepted

(1) H. Antil, T.S Brown, R. Löhner, F. Togashi, and **D. Verma**. Deep Neural Nets with Fixed Bias Configuration. *Numer. Algebra Control Optim. (NACO) 2022*. DOI: 10.3934/naco.2022016.

(2) H. Antil, R. Arndt, C. N. Rautenberg, and **D. Verma**. Non-Diffusive Variational Problems with Distributional and Weak Gradient Constraints. *Advances in Nonlinear Analysis 2022*. DOI: https://doi.org/10.1515/anona-2022-0227

(3) T.S. Brown, H. Antil, R. Lohner, F. Togashi, and **D. Verma**. Parallel Deep ResNets for Chemically Reacting Flows. *AIAA SciTech Forum 2022-1076*. DOI: https://arc.aiaa.org/doi/10.2514/6.2022-1076.

(4) H. Antil, T.S. Brown, R. Khatri, A. Onwunta, **D. Verma**, and M. Warma. Optimal Control, Numerics, and Applications of Fractional PDEs. *Handbook of Numerical Analysis, Volume 23, 2022, Pages 87-114*. DOI: https://doi.org/10.1016/bs.hna.2021.12.003

(5) H. Antil, T.S. Brown, **D. Verma** and M. Warma. Optimal Control of Fractional PDEs with State and Control Constraints. Accepted in *Pure and Applied Functional Analysis 2021*. arXiv: https://arxiv.org/pdf/2106.13289.pdf.

(6) T.S. Brown, H. Antil, R. Löhner, F. Togashi, and **D. Verma**. Novel DNNs for Stiff ODEs with Applications to Chemically Reacting Flows. *International Supercomputing Conference (ISC) Computational Fluid Dynamics Simulations and Analysis (CFDML) 2021*. DOI: https://doi.org/10.1007/978-3-030-90539-2_2.

(7) H. Antil, R. Khatri, R. Löhner and **D. Verma**. Fractional Deep Neural Network via Constrained Optimization. *Machine Learning: Science and Technology 2020*. DOI: https://doi.org/10.1088/2632-2153/aba8e7.

(8) H. Antil, **D. Verma** and M. Warma. Optimal Control of Fractional Elliptic PDEs with State Constraints and Characterization of the dual of Fractional Order Sobolev Spaces. *J Optim Theory Appl (2020)*. DOI: https://doi.org/10.1007/s10957-020-01684-z.

(9) H. Antil, **D. Verma** and M. Warma. External Optimal Control of Space-Time Fractional Prabolic PDEs. *ESAIM: COCV 26 (2020) 20*. DOI: https://doi.org/10.1051/cocv/2020005.

Conferences and Workshops

Invited Talks

September 2022	Minisymposium on Scientific Machine Learning to Enable Outer Loop Analysis SIAM Conference on Mathematics of Data Science (MDS22)
September 2022	Colorado School of Mines
July 2022	Minisymposium on Optimization and Dynamics Based Deep Neural Networks International Conference on Continuous Optimization (ICCOPT22)
September 2021	Minisymposium on RISE of the Machines[†] Mechanistic Machine Learning and Digital Twins (MMLDT) for Computational Science conference
September 2021	Minisymposium on Recent Developments in Nonlocal Continuum Modeling[‡] SIAM Southeastern Atlantic Section Conference (SEAS)
August 2021	Minisymposium on Optimal Control and Optimization for nonlocal and fractional problems[‡] IFIP TC7 Conference on System Modelling and Optimization
July 2021	Minisymposium on Nonlocal Problems in Analysis and Numerics[‡] SIAM Annual Meeting (AN21)
March 2021	Minisymposium on Optimal Control and Deep Learning[‡] SIAM Conference on Computational Science and Engineering (CSE21)
August 2021	Minisymposium on Modelling with Fractional PDEs: Numerical Analysis and Applications[‡] The Second Joint SIAM/CAIMS Annual Meeting 2020, Toronto, Canada
May 2020	Minisymposium on Numerical Methods for Optimization Problems with PDE Constraints[§] Second International Conference on Computational Methods and Applications in Engineering (ICCMAE), Mississippi State University
March 2020	16th Copper Mountain Conference on Iterative Methods[§]
October 2019	Special Semester on Optimization Johann Radon Institut (RICAM), Linz, Austria
October 2019	Student Research Talks (StReeTs), George Mason University
August 2019	Minisymposium on Fractional/Nonlocal PDEs: applications, control, and beyond International Conference on Continuous Optimization, TU Berlin, Germany

Contributed Talks

November 2020	Finite Element Circus[‡]
September 2020	Sayas Numerics Seminar[‡] (link to zoom recording)

[‡]held virtually
[§]did not take place due to COVID-19

November 2019	Finite Element Circus at Virginia Tech
May 2019	DelMar Numerics Day 2019 at University of Maryland, College Park
April 2020	East Coast Optimization Meeting 2020[§] at George Mason University
April 2019	East Coast Optimization Meeting 2019 at George Mason University

Teaching Experience

Primary Instructor

Fall 2021	Math 111: Calculus I	Emory University
Spring 2022	Math 221: Linear Algebra	Emory University
Fall 2022	Math 221: Linear Algebra	Emory University

Speaker

Fall 2020	PDE Control and Learning from Data Seminar[§]	George Mason University
Spring 2020	PDE Control and Learning from Data Seminar[†]	George Mason University
Fall 2019	PDE Control Seminar[†]	George Mason University
Fall 2018	PDE Control Seminar[†]	George Mason University

Teaching Assistant

Feb 2020	Workshop on Finite Elements for Nonlinear and Multiscale Problems	Indian Institute of Sciences (I-ISc), Bangalore
Spring 2019	Moderator, Deep Learning and Optimization Discussion Group	George Mason University
2017 - 2018	Linear Algebra	Indian Institute of Technology Bombay

Conferences, Workshops and Seminars Organized

Minisymposium Co-Organizer

September 2022	Optimal Control and PDE insights into Deep Learning SIAM Conference on Mathematics of Data Science (MDS22)
July 2022	Optimization and Dynamics Based Deep Neural Networks International Conference on Continuous Optimization (ICCOPT22)
July 2021	Advances in Shape Optimization Algorithms SIAM Conference on Optimization (OP21)
March 2021	Optimal Control and Deep Learning SIAM Conference on Computational Science and Engineering (CSE21)
November 2019	SIAM Symposium SIAM Student Chapter-George Mason University

Support Team Member and SIAM Representative

April 2021	Annual East Coast Optimization Meeting (ECOM) 2021
April 2020	Annual East Coast Optimization Meeting (ECOM) 2020
April 2019	Annual East Coast Optimization Meeting (ECOM) 2019

[§]For a list of topics, visit http://math.gmu.edu/pde-control-seminar.php.

Student Coordinator/Volunteer

Fall 2019-2021	Student Coordinator for PDE-Control Seminar
Spring 2018	Volunteer for New Directions in PDE Constrained Optimization

Additional Professional Services and Memberships

Services

Poster Judge

September 2022	SIAM conference on Mathematics of Data Science

SIAM GMU Student Chapter

Fall 2019-2021	Executive Board Member

George Mason University

Spring 2020	Reviewer for Spring 2020 Mason Core Assessment
Fall 2019	Volunteer for Tea/Coffee time organized by Department of Mathematics
Spring 2018	Grader for Northern VA Regional MATHCOUNTS Competition
Fall 2018	Volunteer for Outreach for middle school students organized by Mason Experimental Geometry Lab(MEGL)

Indian Institute of Technology, Bombay

July 2016-2017	Core team member of Public Relation team in Mathematics Olympiad *Responsibilities included contacting and informing high and middle schools about the benefits of participating in olympiad*
May 2016-2017	Member of the Institute Student Companion Programme (ISCP) *Responsibilities included facilitating overall development of the new entrants*

Reviewer

Society for Industrial and Applied Mathematics

Journal on Scientific Computing (SISC)

Elsevier

Journal of Computational Physics (JCOMP)

Springer

Journal of Optimization Theory and Applications (JOTA)

Memberships

- Member of the American Mathematical Society (AMS).
- Member of the Association for Women in Mathematics (AWM), Student Chapter GMU.
- Member of the Society for Industrial and Applied Mathematics (SIAM).