

# Deepanshu Verma

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## Curriculum Vitae

Department of Mathematics, MS 3F2  
George Mason University  
Fairfax, 22030 VA, USA

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Office: Room 4310, Exploratory Hall  
Web: <https://dpnshvrn.github.io/>

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## Education

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- 2018 - Present    **Ph.D. in Mathematics** | George Mason University, Fairfax, Virginia  
Advisor: Prof. Harbir Antil  
GPA: 4.0  
Expected Graduation: 2021
- 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%

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## Research Interests

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PDE Constraint Optimization | Fractional PDEs | Inverse Problems |  
Numerical Analysis | Machine Learning

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## Research Experience

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- 2018 - Present    **Graduate Research Assistant**  
George Mason University, Fairfax, VA  
Advisor: Dr. Harbir Antil
- Summer 2019    **Summer Research Intern**  
George Mason University, Fairfax, VA  
Advisor: Dr. Harbir Antil

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## Teaching Experience

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- Spring 2020    **Speaker, PDE Control and Learning from Data Seminar**  
George Mason University, Fairfax, VA  
Topics<sup>1</sup>: • Newton's Method for Optimization  
          • Globally Convergent Methods for Optimization

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<sup>1</sup>For the complete list of topics, visit <http://math.gmu.edu/pde-control-seminar.php>.

- Feb 2020      **TA for Dr. Harbir Antil**  
 Workshop on Finite Elements for Nonlinear and Multiscale Problems  
 Indian Institute of Sciences (IISc), Bangalore, India  
 Duties: Helped Dr. Antil in setting up the slides for his course  
 Topics: • Introduction to Finite Elements and Theory  
           • PDE Constrained Optimization  
           • Fractional Operators: Analysis, Control, and Applications  
           • Introduction to Deep learning
- Fall 2019      **Speaker, PDE Control Seminar**  
 George Mason University, Fairfax, VA  
 Topics<sup>1</sup>: • Low Rank and Compressed Sensing  
           • Basics of Optimization
- Spring 2019   **Moderator**, Deep Learning and Optimization Discussion Group  
 George Mason University, Fairfax, VA  
 Duties: Held weekly review and discussion sessions for a graduate course  
           on Deep Learning and Optimization
- Fall 2018      **Speaker, PDE Control Seminar**  
 George Mason University (GMU), Fairfax, VA  
 Topics<sup>1</sup>: • Introduction to Augmented Lagrangian Methods  
           • Exact Penalty Methods  
           • Sequential Quadratic Programming
- 2017 - 2018   **Graduate Teaching Assistant**  
 Indian Institute of Technology Bombay, India  
 Duties: Grading and proctoring for Linear Algebra

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## Preprints and Publications

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### • Journal Articles In Preparation

- (1) H. Antil, R. Arndt, C. N. Rautenberg, and **D. Verma**. PreDualization of Sandpile growth model.

### • Submitted Articles

- (1) H. Antil, T.S. Brown, **D. Verma** and M. Warma. Optimal Control of Fractional Parabolic PDEs with State Constraints. arXiv: <https://arxiv.org/pdf/2004.09595.pdf>.
- (2) H. Antil, T.S. Brown, and **D. Verma**. Moreau-Yosida Regularization for Optimal Control of Fractional Elliptic Problems with State Constraints. arXiv: <https://arxiv.org/pdf/1912.05033.pdf>.

• **Published/Accepted**

- (1) 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>.
- (2) 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>.
- (3) H. Antil, **D. Verma** and M. Warma. External Optimal Control of Space-Time Fractional Parabolic PDEs. *ESAIM: COCV* 26 (2020) 20. DOI: <https://doi.org/10.1051/cocv/2020005>.

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**Honors and Awards**

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- George Mason University, **Presidential Merit Fellowship**, 2018 - 2022.
- George Mason University, **Dean's Graduate Award for Excellence**, 2019-2020.
- George Mason University, **Presidential Scholar Summer Research Fellowship**, Summer 2020.
- Travel support from SIAM as Student Chapter Representative for SIAM Annual Meeting 2020 Student Days Program, Toronto, Canada, July 2020.
- Travel support from SIAM Southeastern Atlantic Section (SIAM-SEAS) to present at SIAM-SEAS Conference at Auburn University, Auburn, March 2020.
- Local support from conference organizing committee to attend Workshop on Finite Elements for Nonlinear and Multiscale Problems, Indian Institute of Sciences (IISc), Bangalore, India, February 2020.
- Local support from conference organizing committee to present at Special Semester on Optimization, Johann Radon Institut (RICAM), Linz, Austria, October 2019.
- Office of the Provost, George Mason University, **Graduate Student Travel Fund (GSTF)** to present at Sixth International Conference on Continuous Optimization at TU Berlin, Germany, August 2019.
- Financial Support Grant from conference organizing committee to present at Sixth International Conference on Continuous Optimization (ICCOPT) at TU Berlin, Germany, August 2019.
- Department of Mathematics, George Mason University, **Achievements in Analysis Award**, May 2019.
- Travel Award from conference organizing committee to attend Workshop on Dynamics, Control and Numerics for Fractional PDEs, San Juan, Puerto Rico, December 2018.

- 2017 - 2018: Indian Institute of Technology, Bombay, **Ph.D. Scholarship**.
- 2017: M.Sc. Mathematics, Indian Institute of Technology, Bombay, **Institute Silver Medal** for academic excellence.
- 2017: M.Sc. Mathematics, Indian Institute of Technology, Bombay, **Mrs. Rama Mathur Award** for securing highest CPI (GPA).
- 2017: M.Sc. Mathematics, Indian Institute of Technology, Bombay, **Prof. P.V. Sukhatme Memorial Prize Award** for securing highest CPI (GPA).
- 2017: **Graduate Aptitude test in Engineering in Mathematics**, All India Rank: 70.
- 2016: **Junior Research Fellowship Awardee**, All India Rank: 09.
- 2015: B.Sc.(H) Mathematics, Shri Guru Teg Bahadur Khalsa College, Delhi University, India, **1<sup>st</sup> rank holder**.

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## Presentations

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- September 2020: **Minisymposium speaker**. Optimal Control and Optimization for nonlocal and fractional problem. IFIP TC7 Conference on System Modelling and Optimization, Quito, Ecuador.
- September 2020: **Minisymposium speaker**. Nonlocal PDEs and Calculus of Variations. IFIP TC7 Conference on System Modelling and Optimization, Quito, Ecuador.
- July 2020: **Minisymposium speaker**. Modelling with Fractional PDEs: Numerical Analysis and Applications. The Second Joint SIAM/CAIMS Annual Meeting 2020, Toronto, Canada.
- May 2020: Sayas Numerics Day, University of Maryland, Baltimore County.
- May 2020: **Minisymposium speaker**. Numerical Methods for Optimization Problems with PDE Constraints. Second International Conference on Computational Methods and Applications in Engineering (ICCMAE), Mississippi State University.
- April 2020: East Coast Optimization Meeting 2020, George Mason University, Fairfax, VA.
- March 2020: 16th Copper Mountain Conference on Iterative Methods, Copper Mountain, CO.
- March 2020: **Minisymposium speaker**. Recent Developments in Nonlocal Continuum Modeling. 44th SIAM Southeastern Atlantic Section Conference, Auburn University, Auburn.

- November 2019: Finite Element Circus, Virginia Tech, Blacksburg, VA.
- October 2019: **Invited talk** at Special Semester on Optimization, Johann Radon Institut (RICAM), Linz, Austria.
- October 2019: Student Research Talks (StReeTs), George Mason University.
- August 2019: **Minisymposium speaker**. Fractional/Nonlocal PDEs: applications, control, and beyond. Sixth International Conference on Continuous Optimization, TU Berlin, Germany.
- May 2019: DelMar Numerics Day 2019, University of Maryland, College Park.
- April 2019: East Coast Optimization Meeting 2019, George Mason University, Fairfax, VA.

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### Professional Services

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- Fall 2019 - Present: **Executive Board Member**, SIAM, Student Chapter GMU.
- April 2020: **Support Team Member and SIAM Representative**, Annual East Coast Optimization Meeting, George Mason University. April 2-3, 2020, <http://math.gmu.edu/~hantil/ECOM/2020/>.
- March 2020: **Reviewer**, Spring 2020 Mason Core assessment.
- November 2019: **Co-Organizer**, SIAM Symposium, SIAM Student Chapter GMU.
- September 2019: **Volunteer**, Departmental Tea/Coffee time organized by Department of Mathematics in Fall 2019.
- Fall 2019 - : **Student Coordinator**, PDE-Control Seminar, George Mason University.
- April 2019: **Support Team Member**, Annual East Coast Optimization Meeting, George Mason University. April 4-5, 2019, <http://math.gmu.edu/~hantil/ECOM/2019/>.
- 2018: **Volunteer Grader**, Northern VA Regional MATHCOUNTS Competition, George Mason University, Fairfax, VA.
- Fall 2018: **Volunteer**, Mason Experimental Geometry Lab (MEGL) Outreach for middle school students.
- March 2018: **Student Volunteer**, New Directions in PDE Constrained Optimization, Indian Institute of Technology, Bombay.
- July 2016 - 2017: Core team member of Public Relation team in Mathematics Olympiad, conducted by Mathematics Association of IIT Bombay.

- May 2016 - 2017: Member of the Institute Student Companion Programme (ISCP), a programme within the IIT Bombay with the primary objective of aiding in the overall development of the new entrants.

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## Professional Memberships

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- 2018 - Present: Member of the American Mathematical Society (AMS).
- 2018 - Present: Member of the Association for Women in Mathematics (AWM), Student Chapter GMU.
- 2018 - Present: Member of the Society for Industrial and Applied Mathematics (SIAM).

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## Programming

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C++ | Matlab | Python |  $\text{\TeX}$  | Mathematica

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## Other Interests

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Hiking | Traveling