Naveen Kumar Garg
Curriculum Vitae

AFFILIATION:
Department of Mathematics
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Academic Experience

- Assistant Professor Grade-1 in the Department of Mathematics at Indian Institute of Technology Kharagpur (IIT-KGP) from July 04, 2022 onwards.

- Research Associate from August, 2021 to May, 2022 at Indian Institute of Science, Bangalore, 560012, India.

- Visiting Scholar from December 10, 2020 to June 09, 2021 in the IISc Mathematics Initiative (IMI) at the Department of Mathematics, Indian Institute of Science, Bangalore, 560012, India.

- Postdoctoral Fellow from October 10, 2018, to December 09, 2020, in the Department of Mathematics at Southern University of Science and Technology, Shenzhen, 518055, China. (Postdoctoral Advisor: Prof. Alexander Kurganov)

- Postdoctoral Fellow from June 12, 2017, to October 08, 2018 at the Centre of Applicable Mathematics, Tata Institute of Fundamental Research (TIFR-CAM) Bangalore, 560065, India. (Postdoctoral Advisor: Prof. G. D. Veerappa Gowda)

- Lecturer at DAV College, Chandigarh, for the session 2009-2010.

Academic Education

- **Doctorate**: Interdisciplinary Mathematical Sciences
  Institute: Indian Institute of Science, Bangalore, India
  Thesis title: Novel upwind and central schemes for various hyperbolic systems
  PhD Advisors: Prof. S.V. Raghurama Rao and Prof. M. Sekhar
  Awarded: 2017

- **Degree**: Master in Mathematics
  Institute: Panjab University, Chandigarh, India
  Awarded: 2009

Focus of Research

My research focuses on studying the numerical solutions for time-dependent hyperbolic partial differential equations. In particular, I am interested in designing robust, stable and accurate—central schemes, upwind schemes, and central-upwind schemes for the systems of time-dependent conservation laws. As such systems are highly non-linear in nature, discontinuities in the solutions can

appear even for smooth initial conditions. Due to this, the solutions break down in the classical sense, and thus weak solutions are required to consider. Therefore, numerical algorithms play an important role in studying such systems. One can find numerous discretization frameworks in literature. Typically, the Finite Difference (FD), Finite Volume (FV), and Discontinuous Galerkin (DG) based methods are often used to construct stable and robust higher-order schemes.

Publications

- N. K. Garg and G. D. Veerappa Gowda: Godunov-type schemes for the pressureless gas dynamics and related models, Applied Mathematics and Computation, 418, 1 April 2022, 126790, 2022.

- N. K. Garg, A. Kurganov, and Liu Yongle: Semi-Discrete Central-Upwind Rankine-Hugoniot Schemes for Hyperbolic Systems of Conservation Laws, Journal of Computational Physics, 428, 1 March 2021, 110078, 2021.

- B-S Wang, W. S. Don, N. K. Garg, and A. Kurganov: Fifth-Order A-WENO Finite-Difference Schemes Based on a New Adaptive Diffusion Central Numerical Flux, SIAM Journal on Scientific Computing, 42, 6, A3932-A3956, 2020.

- N. K. Garg, N. H. Maruthi, S. V. R. Rao, and M. Sekhar: Use of Jordan forms for convection-pressure split Euler solvers, Journal of Computational Physics, 407, 15 April 2020, pp. 109258, 2020.

- N. K. Garg: A class of upwind methods based on generalized eigenvectors for weakly hyperbolic systems, Numerical Algorithms, 83, 3, pp. 1091–1121, 2019.

- N. K. Garg, S. V. R. Rao, and M. Sekhar: Weak-strong hyperbolic splitting for simulating conservation laws, Int. J. Adv. Eng. Sci. Appl. Math., 7, 1-2, pp. 62-69, 2015.

Recent Works

- Third-Order A-WENO Finite-Difference Schemes with a Jordan Canonical Based Splitting Flux (Under Review)
- Local projection stabilization for Galerkin approximations of the linearized Navier-Stokes equations (Submitted)

Presentations at International Conferences

- International Conference on Recent Advances in Applied Mathematics (RAAM 2023), Dubai, UAE, June 20-22, 2023 (Hybrid Mode).

- 19th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2021), September 20-26, 2021, Rhodes, Greece (Hybrid Mode).

- Indo-German Conference on Computational Mathematics, IISc, Bangalore, India, December 2-4, 2019.

- 9th International Congress on Industrial and Applied Mathematics - ICIAM 2019, Valencia, Spain, July 15-19, 2019.

- 9th International Congress on Industrial and Applied Mathematics - ICIAM 2019, Valencia, Spain, July 15-19, 2019.

- International Conference on Advances in Scientific Computing (ICASC), IIT-Madras, India, November 28-30, 2016.

- Eighth International Congress on Industrial and Applied Mathematics - ICIAM 2015, Beijing, China, August 10-14, 2015.

- International Conference on Mathematical Modeling and Computer Simulations (ICMMS), IIT-Madras, India, December 7-10, 2014

Conferences & Workshops

- International Conference on Modeling, Analysis and Simulations of Multiscale Transport Phenomena (ICMASMTP22), Indian Institute of Technology Kharagpur, August 25-27, 2022 (Local-organiser).

- International Conference on Hyperbolic Problems Theory, Numerics, Applications (online work-shop), University of Malaga, Spain, July 2, 2021.

- Recent Advances in the Numerical Approximation of Partial Differential Equations (online work-shop), Dipartimento di Matematica Universita degli Studi di Milano, Italy, June 24-25, 2021.

- International Conference on Modeling, Analysis and Simulations of Multiscale Transport Phenomena (ICMASMTP22), Indian Institute of Technology Kharagpur, August 25-27, 2022.

- Structure Preserving Numerical Methods for hyperbolic PDEs at SUSTech, Shenzhen, China, November 02-04, 2019 (Co-organised).

- The Second Conference on Numerical Methods for Shallow Water Equations and Related Models at SUSTech, Shenzhen, China, December 08-10, 2018.

- Advanced Training Program (ATM) Workshop on PDE and Mechanics at KSOM, Kozhikode, India, February 1-6, 2016.

- Summer School on Numerics and Control of PDEs at IISc, Bangalore, India, July 22 - August 2, 2013.

- CIMPA Research School on Current Trends In Computational Methods for PDEs at IISc, Bangalore, India, July 8-19, 2013.

- Advanced Level Training Program on Current Trends In Computational Methods For PDEs at IISc, Bangalore, India, June 24 - July 7, 2013.

- Advanced Training school in Mathematics for Lecturers in Algebra and Number Theory at Panjab University, Chandigarh, India, December 15-31, 2009

- 91st Indian Science Congress at Panjab University, Chandigarh, India, January 3-7, 2004

Teaching Experience

- Taught Linear Algebra, Numerical and Complex Analysis Course (**MA11004**) to first-year undergraduate students at IIT Kharagpur, March-June 2022-23.

- Coordinator of Numerical Methods Laboratory (**MA29202**) and Numerical Techniques Laboratory (**MA39110**) for undergraduate Mathematics and Engineering Students at IIT Kharagpur, Spring-2023 session.

- Taught Advanced Calculus Course (**MA11003**) to first-year under-graduate students at IIT Kharagpur, November-February 2022-23.

- Design & Analysis of Algorithms Laboratory (**MA39203**) for undergraduate Mathematics and Engineering Students at IIT Kharagpur, Autumn-2022 session.

- Taught Linear-Algebra (**MA41209**) to first-year MSc students in the Autumn-2022 session at IIT Kharagpur.

- Taught Ordinary Differential Equations course to undergraduate students at SUSTech, Shenzhen, spring 2019 and 2020 sessions.

- Teaching Assistant for the course Computational Methods for Hyperbolic PDEs to the Graduate students at TIFR Centre For Applicable Mathematics in the spring-2018 session.

Awards

- Program Officer, NSS, Indian Institute of Technology Kharagpur, June 2023 onwards.

- Research collaborator of an EPSRC sponsored project with a Numerical Analysis and Scientific Computing group team at University College London, United Kingdom.

- JEE Advanced 2023 Freeezing Team Member.

- Awarded SUSTech grant (Y01031300) to attend 9th International Congress on Industrial and Applied Mathematics-ICIAM 2019, Valencia, Spain, July 15–19, 2019.

- Awarded SUSTech grant (Y01031300) to visit “Research Center in Applied Mathematics & Scientific Computing ” in School of Mathematical Sciences at Ocean University of China during the period from March 14, 2019, to March 19, 2019.

- Awarded SUSTech, Shenzhen, China Post Doctoral funding and Shenzhen Municipal Government Post Doctoral Subsidy from October 10, 2018, to December 09, 2020.

- Awarded Shenzhen Municipal Government Post Doctoral Subsidy for two years from 2018 to 2020.

- Awarded TIFR-CAM Post Doctoral funding through Department of Atomic Energy (DAE) from June 12, 2017, to October 08, 2018.

- Awarded IISc GARP funding to attend 8th ICIAM 2015, Beijing, China, August 10–14, 2015.

- Awarded IISc GARP funding to attend the International Conference on Mathematical Modeling and Computer Simulations (ICMMS), IIT-Madras, India, December 7–10, 2014.

- Qualified joint CSIR-UGC Test for Research Fellowship and Lectureship eligibility (NET) held on June 21, 2009.