DEEPAK BHORIYA

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University of Notre Dame,
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ABOUT ME

- Passionate educator and researcher specializing in applied mathematics and scientific computing, dedicated to applying research skills to real-world applications and helping students to engage and succeed in mathematics.

EMPLOYMENT

- **POST-DOCTORAL RESEARCHER (16, OCTOBER, 2022 TO PRESENT)**
  Department of Physics & Astronomy, University of Notre Dame, IN 46556 USA.
- **RESEARCH FELLOW (1, MAY, 2022 TO 15, OCTOBER, 2022)**
  Department of Physics & Astronomy, University of Notre Dame, IN 46556 USA.
- **ADVISOR**: DINSHAW S. BALSARA

DOCTORAL THESIS (PH.D.)

- **PH.D. APPLIED MATHEMATICS**   **Year: 2017-2022**
  Department of Mathematics, IIT-Delhi (Indian Institute of Technology Delhi)
- **TITLE:** ENTROPY STABLE SCHEMES FOR RELATIVISTIC FLOWS.
- **SUPERVISOR:** PROF. HARISH KUMAR

EDUCATION

- **M.SC. MATHEMATICS**   7.75 C.P.I.   2015-2017
  Department of Mathematics, IIT-Bombay (Indian Institute of Technology Bombay)
- **B.SC. MATHEMATICS**   94.89 %   2012-2015
  Sri Venkateswara College (Delhi University), New Delhi, India.
- **INTERMEDIATE/+2**   86.50 %   2011-2012
  SDR Public School (CBSE board), New Delhi, India.

RESEARCH INTEREST

- High-order AFD-WENO schemes for Hyperbolic Systems with non-conservative products, Efficient implementation of Divergence free methods, Techniques, Tricks and Algorithms for Efficient GPU-Based Processing of Higher Order Hyperbolic PDEs, High-Performance Computing for Astrophysics, Parallel Computing using CPUs and GPUs, 3D simulations of Black-Hole and punchured Black-Hole, Entropy Stable Finite-Difference (and Finite Volume) numerical schemes, Discontinuous Galerkin schemes, Isotropy analysis of the Magneto-Heliosphere om Geodesic (Spherical) mesh, Numerical Analysis, Partial and Ordinary Differential Equations.

PUBLICATIONS (PUBLISHED/ACCEPTED)

- **Bhoriya, D.**, Balsara, D., Florinski V., Kumar, H., *Going Beyond the MHD Approximation: Physics-Based Numerical Solution of the CGL Equations.*, The Astrophysical Journal, ApJ, (970) 154 (2024).
  https://doi.org/10.3847/1538-4357/ad50a4

- Balsara, D., **Bhoriya, D.**, Shu C.-W., Kumar, H., *Efficient Alternative Finite Difference WENO Schemes for Hyperbolic Systems with Non-Conservative Products*, Communications on Applied Mathematics and Computation (2024).
  https://doi.org/10.1007/s42967-024-00374-1

- Balsara, D., **Bhoriya, D.**, Shu C.-W., Kumar, H., *Efficient Alternative Finite Difference WENO Schemes for Hyperbolic Conservation Laws*, Communications on Applied Mathematics and Computation (2024).
  https://doi.org/10.1007/s42967-023-00360-z

- **Bhoriya, D.**, Biswas, B., Kumar, H., Chandrashekhar, P., *Entropy stable discontinuous Galerkin schemes for two-fluid relativistic plasma flow equations*, Journal of Scientific Computing, 97(3), 72 (2023).
  https://doi.org/10.1007/s10915-023-02387-z

- Yadav, A., **Bhoriya, D.**, Kumar, H., Chandrashekar, P., *Entropy stable schemes for the shear shallow water model Equations,* Journal of Scientific Computing, 97(3), 77 (2023).
  https://doi.org/10.1007/s10915-023-02374-4

- **Bhoriya, D.**, Kumar, H., Chandrashekar, P., *High-order finite-difference entropy stable schemes for two-fluid relativistic plasma flow equations,* Journal of Computational Physics 488, (2023) 112207.
  https://doi.org/10.1016/j.jcp.2023.112207

- Balsara, D., **Bhoriya, D.**, Shu C.-W., Kumar, H., *Efficient Finite Difference WENO Scheme for Hyperbolic Systems with Non-Conservative Products,* Communications on Applied Mathematics and Computation (2023).
  https://doi.org/10.1007/s42967-023-00275-9

- Subramanian, S., Balsara, D., **Bhoriya, D.**, Kumar, H., *Techniques, Tricks and Algorithms for Efficient GPU-Based Processing of Higher Order Hyperbolic PDEs*, Communications on Applied Mathematics and Computation (2023).
  https://doi.org/10.1007/s42967-022-00235-9

- Biswas, B., Kumar, H., **Bhoriya, D.**, *Entropy stable discontinuous Galerkin schemes for the special relativistic hydrodynamics equations*, Computers & Mathematics with Applications, 112, 55-75 (2022).
  https://doi.org/10.1016/j.camwa.2022.02.019

- **Bhoriya, D.**, Kumar, H., *Entropy-stable schemes for relativistic hydrodynamics equations,* Z. Angew. Math. Phys. (ZAMP) 71, 29 (2020).
  https://doi.org/10.1007/s00033-020-1250-8

- Balsara, D., **Bhoriya, D.**, Zanotti, O., Dumbser, M., *Well-balanced high order finite difference WENO schemes for a first-order Z4 formulation of the Einstein field equations.* (The Astrophyical Journal (ApJ), Accepted) https://arxiv.org/abs/2406.05450

- Agnihotri, J., **Bhoriya, D.**, Kumar, H., Chandrashekar, P., Balsara, D., *Second order divergence constraint preserving entropy stable finite difference schemes for two-fluid plasma flow equations.* (Journal of Scientific Computing, Accepted) http://dx.doi.org/10.48550/arXiv.2409.16004

(COMMUNICATED/UNDER-REVIEW/REVISION)

- **Bhoriya, D.**, Balsara, D., Chandrashekar, P., Shu C.-W., *Physical Constraint Preserving Method for Alternative Finite Difference WENO with Non-Conservative Products.* (Under review, JSC)

- Singh, C., Yadav, A., **Bhoriya, D.**, Kumar, H., Balsara, D., *Entropy stable finite difference schemes for Chew, Goldberger & Low anisotropic plasma flow equations.* (Under review, JSC) https://arxiv.org/abs/2406.04783

- Agnihotri, J., **Bhoriya, D.**, Kumar, H., Chandrashekar, P., Balsara, D., *Second order divergence constraint preserving entropy stable finite difference schemes for two-fluid Relativistic plasma flow equations.* (Under review, CAMC)

CONFERENCES/WORKSHOPS

- **HOT TOPICS: RECENT PROGRESS IN DETERMINISTIC AND STOCHASTIC FLUID-STRUCTURE INTERACTION,**   5-days   December, 2023
  Berkeley, California, USA.
- **FOUNDATIONS OF NUMERICAL PDEs (FoCM-2023),**   3-days   June, 2023
  Sorbonne University, Paris, France.
- **AIS DIFFERENTIAL-EQUATIONS (2018),**   28-days   June – July, 2018
  University of Hyderabad, Hyderabad.
- **COMPUTATIONAL SOLUTION OF HYPERBOLIC PDEs FOR SCIENTISTS, ENGINEERS, AND MATHEMATICIANS,**   12-days   December, 2017
  IIT-Delhi, New Delhi.
- **SPIM (SUMMER PROGRAMME IN MATHEMATICS),**   28-days   June – July, 2016
  Harish-Chandra Research Institute (HRI), Allahabad.
- **MTTS (MATHEMATICS TRAINING AND TALENT SEARCH),**   28-days   June – July, 2014
  IIT-Guwahati, Assam.

TRAVEL AWARDS AND LODGING SUPPORTS

- Travel support of 1600 € (Euros) for the conference: Foundations of Numerical PDEs (FoCM-2023), 3-days, June, 2023
- Travel support of 1700 $ (USA dollars) for the workshop: Hot Topics: Recent Progress in Deterministic and Stochastic Fluid-Structure Interaction, 5-days, December, 2023

SCHOLASTIC ACHIEVEMENTS

- Secured **1st Rank (AIR)** in **M.Sc. Maths. Entrance** Exam. (Delhi University), 2015
- Secured **AIR 39** in NET-JRF (UGC-CSIR) – 2016 (Dec). and **AIR 59** in NET (UGC-CSIR) – 2015 (Dec).
- Qualified **Gate 2017** with **AIR 280**.
- Secured **AIR 73** in **IIT-JAM Maths.** and **AIR 155** in **IIT-JAM-Stats.** 2015.

SCIENTIFIC COMPUTING/TECHNICAL SKILLS

SCIENTIFIC PROGRAMMING LANGUAGES:	Fortran │ C │ C++ │ Python │ Matlab
PARALLEL COMPUTING LIBRARIES:	**GPU:** OpenACC │ **CPU:** PETSc │ MPI │ OpenMP
GRAPHICAL FRAMEWORKS & LIBRARIES:	Gnuplot │ VisIt │ Matplotlib │ Numpy │ Pandas
SCRIPTING LANGUAGES:	Linux BASH scripting │ Python3 based scripting
OTHER:	LaTeX │ Mathematica │ Basic HTML │ HPC user

PERSONAL DETAILS

FULL NAME:	Deepak Bhoriya
DATE OF BIRTH:	February 15, 1996
CONTACT INFO:	dbhoriy2@nd.edu │ dkbhoriya@gmail.com
CITIZENSHIP:	India
LANGUAGE KNOWN:	English │ Hindi

References:

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Indian Institute of Technology Delhi,
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Prof. Praveen Chandrashekar
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