
Education

- 2025-Present **Humboldt Postdoctoral researcher** Numerical Mathematics, Johannes Gutenberg University, Mainz.
Supervisor: Prof. Hendrik Ranocha
- 2024-2025 **Postdoctoral researcher** Numerical Mathematics, Johannes Gutenberg University, Mainz.
Supervisor: Prof. Hendrik Ranocha, funded by Mainz Institute of Multiscale Modeling
- 2020-2024 **Ph.D.** Tata Institute of Fundamental Research - Centre for Applicable Mathematics
Supervisor: Prof. Praveen Chandrashekar
- 2018-2020 **M.Sc. in Mathematics** Tata Institute of Fundamental Research - Centre for Applicable Mathematics
Percentage - 87.25
First class with distinction
- 2014-2017 **B.Sc. (Honours) in Mathematics** Sri Venkateswara College, Delhi University
Percentage - 83
- 2012-2014 **CBSE, AISSCE** Nosegay Public School
Percentage - 92.4
- 2010-12 **CBSE, AISSCE** Nosegay Public School
CGPA - 9.6/10

Publications

- 2022 *Lax-wendroff flux reconstruction method for hyperbolic conservation laws*, Arpit Babbar, Sudarshan Kumar Kenettinkara, and Praveen Chandrashekar, *Journal of Computational Physics (JCP)* 467 (2022)
<https://doi.org/10.1016/j.jcp.2022.111423>
- 2023 *Admissibility preserving subcell limiter for Lax-Wendroff flux reconstruction*, Arpit Babbar, Sudarshan Kumar Kenettinkara, and Praveen Chandrashekar, accepted in *Springer Journal of Scientific Computing*,
<https://link.springer.com/article/10.1007/s10915-024-02482-9>
- 2024 *Generalized framework for admissibility preserving Lax-Wendroff Flux Reconstruction for hyperbolic conservation laws with source terms*, Arpit Babbar, Praveen Chandrashekar, ICOSAHOM2023,
<https://arxiv.org/abs/2402.01442>
- 2024 *Lax-Wendroff Flux Reconstruction for advection-diffusion equations*, Arpit Babbar, Praveen Chandrashekar, ICOSAHOM2023, <https://arxiv.org/abs/2402.12669>
- 2024 *Multiderivative Runge-Kutta (MDRK) Flux Reconstruction schemes for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar, *Communications on Applied Mathematics and Computation*,
<https://doi.org/10.1007/s42967-024-00463-1>
- 2024 *Lax-Wendroff Flux Reconstruction on adaptive curvilinear meshes with error based time stepping for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar, *Journal of Computational Physics*,
<https://doi.org/10.1016/j.jcp.2024.113622>
- 2025 *Bound preserving Lax-Wendroff flux reconstruction method for special relativistic hydrodynamics*, Sujoy Basak, Arpit Babbar, Harish Kumar and Praveen Chandrashekar, <https://doi.org/10.1016/j.jcp.2025.113815>
- 2025 *Constraints Preserving Lax-Wendroff Flux Reconstruction for Relativistic Hydrodynamics with General Equations of State*, Sujoy Basak, Arpit Babbar, Harish Kumar and Praveen Chandrashekar, accepted in *Journal of Scientific Computing*, <https://arxiv.org/abs/2505.05128>

Working papers

- *Automatic differentiation for Lax-Wendroff-type discretizations*, Arpit Babbar, Valentin Churavy, Michael Schlottke-Lakemper, Hendrik Ranocha, <https://arxiv.org/abs/2506.11719>
- *Compact Runge-Kutta Flux Reconstruction for Hyperbolic Conservation Laws with admissibility preservation*, Arpit Babbar and Qifan Chen, <https://arxiv.org/abs/2502.07517>
- *Equivalence of ADER and Lax-Wendroff in DG / FR framework for linear problems*, Arpit Babbar, Praveen Chandrashekar, <https://arxiv.org/abs/2402.18937>

Technical skills

Level	Languages	Operating systems, software and packages
Advanced	Julia, Python	<code>Trixi.jl</code> , <code>git</code> , Linux, $\text{T}_{\text{E}}\text{X}_{\text{MACS}}$, $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$, Windows, macOS
Intermediate	C++	<code>DEAL.II</code> , <code>DifferentialEquations.jl</code> , Paraview, VisIt, HOHQMesh, <code>MPI.jl</code>
Basic	Fortran	TensorFlow, <code>CUDA.jl</code> , <code>clawpack</code>

Software

- `Tenkai.jl` Single step hyperbolic conservation law solver with novel admissibility preserving subcell based shock capturing scheme on Cartesian meshes with continuous integration (CI) <https://github.com/arpit-babbar/Tenkai.jl>
- `TrixiLW.jl` Hyperbolic conservation law solver on adaptively refined curvilinear meshes with novel error-based time stepping with Lax-Wendroff and Multi-Derivative Runge-Kutta space-time discretization in Flux Reconstruction framework with continuous integration (CI) <https://github.com/arpit-babbar/TrixiLW.jl>

Talks/presentations

- 2025 Compact Runge-Kutta Flux Reconstruction for non-conservative hyperbolic equations, [Kompaktseminar 2025](#).
- 2025 [Automatic differentiation and its application to Lax-Wendroff methods](#), invited talk at TIFR-CAM
- 2025 IMEX compact Runge-Kutta Flux Reconstruction for hyperbolic equations, Arpit Babbar, Hendrik Ranocha, [ICOSAHOM 2025](#), McGill University, Montreal, Canada
- 2025 Compact Runge-Kutta methods for solving hyperbolic conservation laws, Arpit Babbar, Qifan Chen, [ICOSAHOM 2025](#), McGill University, Montreal, Canada
- 2025 [Admissibility preserving IMEX Compact Runge-Kutta Flux Reconstruction](#), Arpit Babbar, Hendrik Ranocha, poster presentation at Numerical Methods for Hyperbolic Problems (numhyp) 2025
- 2025 [Compact Runge-Kutta methods for solving hyperbolic conservation laws](#), Oberseminar Mathematische Strömungsmechanik, Institut für Mathematik der Julius-Maximilians-Universität Würzburg
- 2024 Admissibility preserving Lax-Wendroff Flux Reconstruction schemes for compressible flows, IGHASC: [Indo-german Workshop on Hardware-aware Scientific Computing 2024](#), Heidelberg, Germany.
- 2024 Compact Runge-Kutta Flux Reconstruction methods, [Kompaktseminar 2024](#), Prien am Chiemsee, Germany.
- 2024 Admissibility preserving Flux Reconstruction / Discontinuous Galerkin methods for compressible flows, [Mathematics Of the Weather 2024](#), Bad Orb, Germany.
- 2023 *TrixiLW.jl: A high-order, single stage hyperbolic PDE solver using Trixi.jl*, Arpit Babbar, Praveen Chandrashekar, invited to present in the [Numerical Engine Room Talks](#)
- 2023 *Domain-invariant subcell-based blending limiter for Lax-Wendroff Flux Reconstruction*, Arpit Babbar, Praveen Chandrashekar, Sudarshan Kumar Kenettinkara, [ICIAM August 20-25, 2023](#), Waseda Univ., Tokyo
- 2023 *Embedded error-based time stepping for Lax-Wendroff Flux Reconstruction for compressible flows*, Arpit Babbar, Praveen Chandrashekar, [ICOSAHOM, 14-18 August, 2023](#), Yonsei University, Seoul, Korea
- 2023 *Admissibility preserving subcell limiter for Lax-Wendroff flux reconstruction*, Arpit Babbar, Praveen Chandrashekar, Sudarshan Kumar Kenettinkara, in *MS6 Towards Practical High-Order Methods for Unsteady High-Fidelity Computational Fluid Dynamics*, [ICOSAHOM, 14-18 August, 2023](#)
- 2023 *Error based time stepping for Lax-Wendroff Flux Reconstruction*, Arpit Babbar, Praveen Chandrashekar, [Indo-German conference on Computational Mathematics \(IGCM\)](#), CDS IISc & IWR Heidelberg
- 2022 *Lax-Wendroff Flux Reconstruction for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar, Sudarshan Kumar Kenettinkara, during [visit at IISER-Trivandrum](#)

Academic achievements

- 2025 Humboldt postdoctoral research fellowship
- 2018-2024 TIFR-CAM Research fellowship
- 2023 National Board of Higher Mathematics (NBHM) travel grant to attend ICIAM-2023, Tokyo
- 2017 Certificate of merit for the best academic performance at IISER Mohali
- 2017 All India Rank (AIR) 55 in Council of Scientific and Industrial Research - National Eligibility Test (CSIR-NET), thus qualifying for Junior Research Fellowship
- 2017 AIR 22 in IIT-JAM, the nationwide M.Sc. entrance exam for IITs

Teaching Experience

- 2023 *NCM - Finite Volume and Spectral Methods for Hyperbolic Problems* (Problem session prescription, software)
- 2023 *Numerical Analysis* (Teaching, tutorials, software support, prescribing assignments and exams, grading)
- 2022 *National Centre for Mathematics (NCM)-Numerical Methods for PDE* (Tutorial, software)
- 2022 *Statistical learning, Summer Workout in Mathematics (SWIM), TIFR-CAM* (Discussions)
- 2022 *Python programming (SWIM), TIFR-CAM* (Tutorials, recitations, discussions)
- 2022 *Computational Methods of PDEs* (Tutorials, software support, recitation, discussion)
- 2021 *Computational Methods of PDEs* (Recitations, software support, assignment evaluation, discussions)
- 2020 *Real Analysis* (Assignment evaluation, discussions)

Referee Service

- 10th International Congress on Industrial and Applied Mathematics (ICIAM) 2023, Tokyo

Workshops attended

- 2022 NCM Workshop - Numerical Methods for Partial Differential Equations, IISER-TVM
- 2022 Juliacon hackathon - *CUDA . j1 FVM code for 1D Euler's equations*
- 2021 IGP / IWR School on *Hardware aware scientific computing*
Mini project-*Performance analysis of the CFD code HiFlow3*
- 2019 NCM Advanced Instructional School-Geometric analysis, IIT Bombay
- 2019 NCM Advanced Instructional School-Geometric measure theory, IIT Madras