Arpit Babbar

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Education

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 467 (2022) https://doi.org/10.1016/j.jcp.2022.111423

Working papers

2023 *Admissibility preserving subcell limiter for Lax-Wendroff flux reconstruction*, Arpit Babbar, Sudarshan Kumar Kenettinkara, and Praveen Chandrashekar https://doi.org/10.48550/arXiv.2305.10781

Works in Progress

- *Lax-Wendroff Flux Reconstruction on adaptively refined, curvilinear meshes with embedded error-based time stepping for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar
- *Lax-Wendroff Flux Reconstruction for advection-diffusion problems on curvilinear meshes with error-based time stepping*, Arpit Babbar, Praveen Chandrashekar
- *Neural network based smoothness indicator for subcell based blending schemes*, Deep Ray, Praveen Chandrashekar, Vaishnavi Sharma, Arpit Babbar
- *Multiderivative Runge-Kutta Flux Reconstruction schemes for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar

Technical skills

Level	Languages	Operating systems, software and packages
Advanced	Julia, Python	`Trixi.jl`, `git`, Linux, TeX$_{\text{MACS}}$, LaTeX, Windows
Intermediate	C++	DEAL.II, `DifferentialEquations.jl`, Paraview, VisIt
Basic	Fortran	TensorFlow, `CUDA.jl`, `MPI.jl`, `clawpack`, `HOHQMesh`, macOS

Software

`Tenkai.jl` Single step hyperbolic conservation law solver with novel admissibility preserving subcell based shock capturing scheme on Cartesian meshes
https://github.com/arpit-babbar/Tenkai.jl *(currently private)*

`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
https://github.com/arpit-babbar/TrixiLW.jl *(currently private)*

Talks

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, Japan

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**, Yonsei University, Seoul, Korea

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 *Error based time stepping for Lax-Wendroff Flux Reconstruction*, Arpit Babbar, Praveen Chandrashekar, **Indo-German conference on Computational Mathematics (IGCM)**, organized by CDS IISc-Bangalore and IWR Heidelberg Germany

2022 *Lax-Wendroff Flux Reconstruction for hyperbolic conservation laws*, Arpit Babbar, Praveen Chandrashekar, Sudarshan Kumar Kenettinkara, during **visit at IISER-Trivandrum**

Academic achievements

Scholarships

2018-Present TIFR-CAM Research fellowship

Institute Awards

2017 Certificate of merit for the best academic performance at IISER Mohali

National competitions

2017 All India Rank (AIR) 55 in Council of Scientific and Industrial Research - National Eligiblity 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 Workshop - Finite Volume and Spectral Methods for Hyperbolic Problems(2023)*
Problem solving session prescription and software support

2023 *Numerical Analysis*
Teaching, tutorials, software support, prescribing assignments and exams, grading

2022 *National Centre for Mathematics (NCM)-Numerical Methods for Partial Differential Equations*
Tutorial, software support

2022 *Statistical learning, Summer Workout in Mathematics (SWIM), TIFR-CAM*
Discussions

2022 *Python programming, Summer Workout in Mathematics (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

10^{th} 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.jl` 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

References

Professor Praveen Chandrashekar

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Professor Sudarshan Kumar Kenettinkara

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