

Dr. Abhinav Jha

Date of Birth: 2nd July 1994 ◊ **Place of Birth:** New Delhi, India

Current Address: Indian Institute of Technology, Gandhinagar, Gujarat ◊ abhinav.jha@iitgn.ac.in

Research Interests

Numerical Analysis of Partial Differential Equations, Stabilization Methods for Convection Dominated Problems, A Posteriori Error Estimates, Domain Decomposition Methods in Computational Chemistry, Scientific Computing, including writing scientific software.

Work Experience

Indian Institute of Technology, Gandhinagar

October 2024 - Present

Assistant Professor, Grade 1
Department of Mathematics

Universität Stuttgart, Stuttgart

September 2022 - August 2024

Postdoctoral Researcher, Mathematics.
Group: Numerical Mathematics for High Performance Computing
Advisor: Prof. Dr. Benjamin Stamm.

RWTH Aachen University, Aachen

January 2021 - August 2022

Postdoctoral Researcher, Mathematics.
Group: Applied and Computational Mathematics
Advisor: Prof. Dr. Benjamin Stamm.

Education

Freie Universität, Berlin

October 2017 - October 2020

PhD, Mathematics.
Grade: Magna cum Laude
Title: Numerical Algorithms for Algebraic Stabilizations of Scalar Convection-Dominated Problems.
Advisor: Prof. Dr. Volker John.

Indian Institute of Technology, Roorkee

July 2015 - July 2017

Master of Science, Mathematics.
CGPA: 9.59/10.0
Title: Finite Element Method for Population Balance Equations.
Advisor: Prof. Dr. Ankik Kumar Giri.

St. Stephen's College, University of Delhi

July 2012 - July 2015

Bachelor of Science, Mathematics.
Overall Percentage: 89.3%

Publications

Published

- Thiago Carvalho Corso, Muhammad Hassan, **Abhinav Jha**, and Benjamin Stamm: *Trace estimates for harmonic functions along circular arcs with applications to domain decomposition on overlapping disks*. SIAM Journal on Mathematical Analysis, -, -, (to appear), 2025, **Q1**, IF: 1.9.
- Petr Knobloch, Dmitri Kuzmin, and **Abhinav Jha**: *Well-balanced convex limiting for finite element discretizations of steady convection-diffusion-reaction equations*. Journal of Computational Physics, **518**, 113305, 10.1016/j.jcp.2024.113305, 2024, **Q1**, IF: 3.8.
- Michele Nottoli, Michael F. Herbst, Aleksandr Mikhalev, **Abhinav Jha**, Filippo Lipparini, and Benjamin Stamm: *ddX: Polarizable Continuum Solvation from Small Molecules to Proteins*. WIREs Computational Molecular Science, **14**, e1726, 10.1002/wcms.1726, 2024, **Q1**, IF: 27.0.
- **Abhinav Jha**: *Residual-based a posteriori error estimators for algebraic stabilizations*. Applied Mathematics Letters, **157**, 109192, 10.1016/j.aml.2024.109192, 2024, **Q1**, IF: 2.8.

- **Abhinav Jha**, Volker John, and Petr Knobloch: *Adaptive Grids in the Context of Algebraic Stabilizations for Convection-Diffusion-Reaction Equations*. SIAM Journal on Scientific Computing, **45**, B564-589, 10.1137/21M1466360, 2023, **Q1**, IF: 2.6.
- **Abhinav Jha**, Michele Nottoli, Aleksandr Mikhalev, Chaoyu Quan, and Benjamin Stamm: *Linear scaling computation of forces for the domain-decomposition linear Poisson-Boltzmann method*. The Journal of Chemical Physics, **150**, 104105, 10.1063/5.0141025, 2023, **Q1**, IF: 3.1.
- **Abhinav Jha**, Ondřej Pártl, Naveed Ahmed, and Dmitri Kuzmin: *An Assessment of Solvers for Algebraically Stabilized Schemes applied to Convection Diffusion Reaction Equations*. Journal of Numerical Mathematics, **31**, 79-103, 10.1515/jnma-2021-0123, 2023, **Q1**, IF: 4.0.
- **Abhinav Jha**: *Hanging Nodes for Higher-Order Lagrange Finite Elements*. Examples and Counterexamples, **1**, 100025, 10.1016/j.exco.2021.100025, 2021, **Q4**, IF: 0.7.
- **Abhinav Jha**: *A Residual Based A Posteriori Error Estimators for AFC Schemes for Convection-Diffusion Equations*. Computer and Mathematics with Applications, **97**, 86-99, 10.1016/j.camwa.-2021.05.031, 2021, **Q1**, IF: 2.5.
- **Abhinav Jha** and Volker John: *On basic iteration schemes for nonlinear AFC discretizations*. Boundary and Interior Layers, Computational and Asymptotic Methods BAIL 2018, **135**, 113-128, 10.1007/978-3-030-41800-7_7, 2020, **QNA**, IF: NA.
- **Abhinav Jha** and Volker John: *A Study of Solvers for Nonlinear AFC Discretizations of Convection-Diffusion Equations*. Computer and Mathematics with Applications, **78**, 3117-3138, 10.1016/j.camwa.2019.04.020, 2019, **Q1**, IF: 2.5.

Preprints

- Samir Karaa, Naveed Ahmed, and **Abhinav Jha**: *Symmetric Stabilized FEM for Time-Fractional Convection-Diffusion-Reaction Equations*. [arXiv].
- **Abhinav Jha** and Benjamin Stamm: *Domain decomposition method for Poisson-Boltzmann equations based on Solvent Excluded Surface*. [arXiv].

Grants

- **Algebraic Stabilization Schemes for Evolutionary Convection-Diffusion Equation**
 - DST INSPIRE Faculty Award
 - Funding Agency: *Department of Science and Technology*.
- **A Posteriori Error Estimation for Flux Corrected Transport Schemes**
 - Institute Research Grant
 - Funding Agency: *Indian Institute of Technology, Gandhinagar*.

Presentation in Conferences

- *Recent Advancements in a Posteriori Error Estimation for Algebraic Stabilizations*, ENUMATH 2025, 1st September – 5th September 2025, Heidelberg, Germany.
- *Domain Decomposition Methods for the Poisson-Boltzmann Equations*, 93rd Annual Meeting of the International Association of Applied Mathematics and Mechanics, 30th May – 2nd June 2023, Dresden, Germany.
- *Adaptive Grids for Algebraic Stabilizations of Convection-Diffusion-Reaction Equations*, SIAM Conference on Computational Science and Engineering (CSE23), 26th February – 3rd March 2023, Amsterdam, Netherlands.
- *Computation of Forces Arising from the Linear Poisson-Boltzmann Method in the Domain Decomposition Paradigm*, 92nd Annual Meeting of the International Association of Applied Mathematics and Mechanics, 15th – 18th August 2022, Aachen, Germany.
- *A Residual based a Posteriori Error Estimators for Algebraic Flux Correction Scheme*, 15th World Congress on Computational Mechanics & 8th Asian Pacific Congress on Computational Mechanics, 31st July – 5th August 2022, Yokohoma, Japan.

- *Adaptive Grids for Algebraic Stabilizations of Convection-Diffusion-Reaction Equations*, Workshop on Numerical Methods and Analysis in CFD, 5th – 8th July 2022, WIAS, Berlin, Germany.
- *Adaptive Grids for Algebraic Stabilizations of Convection-Diffusion-Reaction Equations*, 18th Workshop on Numerical Methods for Problems with Layer Phenomena, 24th – 26th March 2022, Hagen, Germany.
- *Residual based a Posteriori Error Estimators for Algebraic Flux Correction Scheme*, Chemnitz Finite Element Symposium 2021, 6th – 8th September 2021, Online.
- *Residual based a Posteriori Error Estimators for Algebraic Flux Correction Scheme*, Bound-Preserving Space and Time Discretizations for Convection-Dominated Problems, BIRS & CMO, 22nd – 27th August 2021, Online, [**invited talk**].
- *Towards A Posteriori Error Estimators for Algebraic Flux Correction Scheme*, ESCO 2020, 7th International Congress of Computational Engineering and Sciences, 8th – 12th June 2020, Online.
- *On Numerical Simulations and a Posteriori Analysis for Algebraic Flux Correction Schemes*, MAFE-LAP 2019, The Mathematics of Finite Elements and Applications 2019, 17th – 21st June 2019, Brunel University, London.
- *On Numerical Simulations and a Posteriori Analysis for Algebraic Flux Correction Schemes*, The 28th Biennial Numerical Analysis Conference, 25th – 28th June 2019, University of Strathclyde, Glasgow.
- *Investigation of different solvers for nonlinear algebraic stabilizations of convection diffusion equations*, 13th International Workshop on Variational Multiscale and Stabilized Finite Elements, 5th – 7th December 2018, Weierstrass Institute for Applied Analysis and Stochastic, Berlin.
- *Study of Iterative Methods for Nonlinear AFC Discretizations on Convection-Diffusion Equations*, BAIL 2018, International Conference on Boundary and Interior Layers, 18th – 22nd June 2018, Glasgow, Scotland.

Organisation of Conferences

- *Minisymposium: Advances in Numerical Methods for Problems from Fluid Mechanics*, ENUMATH 2025, 1st September – 5th September 2025, Heidelberg, Germany.
- *Minisymposium: Special Methods in Computational Fluid Mechanics*, 15th World Congress on Computational Mechanics & 8th Asian Pacific Congress on Computational Mechanics, 31st July – 5th August 2022, Yokohoma, Japan.
- 8th *BMS Student Conference*, 19th – 22nd February 2020, Technische Universität, Berlin.

Research Visits

- Prof. Dr. Filippo Lipparini, Department of Chemistry and Industrial Chemistry, Università di Pisa, Italy; 27th – 30th March 2022.
- Prof. Dr. Benjamin Stamm, Applied and Computational Mathematics, RWTH Aachen University, Germany; 10th November – 24th December 2020.

Software

ddPB-SES - Domain Decomposition for Poisson-Boltzmann Equation *Language: MATLAB*
Universität Stuttgart, Stuttgart

- Developed the Domain Decomposition method for Poisson Boltzmann Equation on SES cavity.
- Solves both the Linear and Non-Linear equation.

ddX - Domain Decomposition Paradigm for Continuum Solvation Models *Language: Fortran-90*
RWTH Aachen University, Aachen

- Developed the Domain Decomposition Linear Poisson Boltzmann (ddLPB) sub-module.
- Co-developed the general framework of the package.

ParMooN - Parallel Mathematics and object-oriented Numerics *Language: C++*
Weierstraß Institute for Applied Analysis and Stochastic, Berlin

- Developed the Algebraic Flux Correction package for Steady-State and Time-Dependent Convection-Diffusion Equations.
- Co-developed the a Posteriori Estimator package.

Teaching Duties

Indian Institute of Technology, Gandhinagar

- Instructor for *MA643: Numerical Analysis of Partial Differential Equations*, Summer Semester, 2025.
- Instructor for *MA637: Numerical Analysis and Computing*, Winter Semester, 2024-2025.
Evaluation: 3.57/4
- TA for *MA205: Calculus of Several Variables*, Summer Semester, 2025.
- TA for *MA203: Numerical Methods*, Winter Semester, 2024 - 2025.

Univeristät Stuttgart

- TA for *Numerische Grundlagen für ernen, fmt, mach, mawie*, Summer Semester, 2024, 2023.
- TA for *Numerische Mathematik 1*, Winter Semester, 2023 .
- TA for *Numerical Methods for Differential Equations*, Summer Semester, 2023 .
- Supervisor for *Hauptseminar Numerische Analysis und Simulation*, Winter Semester, 2022 .
- TA for *Höhere Mathematik 3 für Ingenieurstudiengänge*, Winter Semester, 2022 .

RWTH Aachen University

- TA for *Mathematische Grundlagen II (CES)*, Summer Semester, 2022 .
- TA for *Partial Differential Equations (CES+SiSc)*, Winter Semester, 2021 .
- TA for *Mathematische Grundlagen IV (CES)*, Summer Semester, 2021 .

Freie Universität Berlin

- TA for *Numerical Methods for PDEs -Numerik III*, Summer Semester, 2019 .
- TA for *Numerical Methods for ODEs and Numerical Linear Algebra-Numerik II*, Winter Semester, 2018 .

*TA = Teaching Assistant

Supervision

IIT Gandhinagar

Supervisor

May 2025 –

- Postdoctoral Fellow: Pinki Khatun (May 2025 – October 2025)
- Postdoctoral Fellow: Aditi Tomar (May 2025 –)
- Ph.D. Student: Sathak Sourav Dash (July 2025 –)

Universität Stuttgart

Supervisor

April 2023 – October 2023

- Master Thesis: Junghoon Lee
- Title: *A Posteriori Error Estimators for Laplace Eigenvalue Problems.*

Certifications

Machine Learning Specialisation

Coursera

November 2023

Projects and Fellowships

Finite Element Method for Population Balance Equation

January 2017 - May 2017

Indian Institute of Technology Roorkee, India

- Developed Convergence Analysis of Finite Element Method (Collocation Method) for Population Balance Equations.

Professor Nagpaul Fellowship

October 2014 - May 2015

St. Stephen's College, University of Delhi

- Researched on Network Optimization and its applications in daily life.

Summer Research Fellowship

May 2014 - June 2014

Indian Institute of Science Bangalore, India

- Derived continuous time domain representation of Riesz Transform in two dimensions using Fourier transforms.

Position of Responsibility

Indian Institute of Technology, Gandhinagar

Head of the Department Website.

- Co-organizer of the Foundation Program 2025.

Berlin Mathematical School, Berlin

December 2018 - December 2019

Student Representative

- Member of the Executive board and the Admissions Committee.
- Organized the Career Event 2019.
- Organized the 8th BMS Student Conference.

The Mathematics Society, St. Stephen's College

July 2014 - July 2015

President

- Initiated the Professor Nagpaul Fellowship.
- Initiated the Professor Mathur Memorial Lecture Series.
- Editor of Society Magazine, *Mathematica*.
- Organized *MathSoc Open 2014* and *MathSoc Open 2015*.

Gandhi Study Circle, St. Stephen's College

July 2014 - July 2015

Vice President

- Coordinated the Regional Study Conference, August 2013.
- Member of the organizing team that held Mock Parliament, February 2014.

Scholarships and Awards

DST INSPIRE Faculty Award

June 2025 - June 2030

Ministry of Human Resources and Development, India.

BMS Phase 2 Scholarship

October 2017 - September 2020

Berlin Mathematical School.

Dr. Gorakh Prasad Scholarship

July 2015 - July 2017

Indian Institute of Technology, Roorkee.

1st Rank in Department

INSPIRE Scholarship

July 2012 - July 2017

Ministry of Human Resources and Development, India.

Department of Mathematics Leadership Award
St. Stephen's College, University of Delhi.

April 2015

Kesar Devi Scholarship
St. Stephen's College, University of Delhi.

April 2013

National Examinations

CSIR-UGC NET JRF
Rank : 28.

June 2016

Joint Application test for M.Sc. (JAM)
Rank : 196.

February 2015

Technical Strengths

Programming Language	C++, Fortran
Scripting Language	Python
Operating System	Linux, MacOS
Version Control	Mercurial, Git
Software & Tools	Mathematica, Matlab, L ^A T _E X, Photoshop CS5

Reviewer for Journals

Journal of Computational and Applied Mathematics	<i>Elsevier</i>
International Journal of Computational Mathematics	<i>Taylor & Francis</i>
SIAM Journal on Numerical Analysis	<i>SIAM</i>
MathSciNet	<i>AMS</i>
The Journal of Supercomputing	<i>Springer</i>
Mathematical Control and Related Fields	<i>AIMS</i>
Journal of Numerical Mathematics	<i>De Gruyter</i>
Multidiscipline Modeling in Materials and Structures	<i>Emerald Group</i>
Journal of Chemical Theory and Computation	<i>ACS Publications</i>
Zeitschrift für angewandte Mathematik und Physik	<i>Springer</i>

References

Prof. Dr. Volker John john@wias-berlin.de
Doctoral Supervisor

· Freie Universität, Berlin & Weierstrass Institute for Applied Analysis and Stochastics.

Prof. Dr. Benjamin Stamm best@ians.uni-stuttgart.de
Postdoctoral Supervisor

· Universität Stuttgart, Stuttgart.

Prof. Dr. Petr Knobloch knobloch@karlin.mff.cuni.cz
Research Collaborator

· Charles University, Prague.