RAHUL BARTHWAL

CONTACT INFO

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RESEARCH INTERESTS

Hyperbolic conservation laws, Applied analysis, Mathematical modelling, Nonlinear wave interactions, Transonic flows, Mathematical fluid dynamics, Data-driven modelling and simulation.

ACADEMIC BACKGROUND

PH.D. IN APPLIED MATHEMATICS 2018-2023

Department of Mathematics | *Indian Institute of Technology Kharagpur*

- Doctor of Philosophy (Ph.D.) in Mathematics under the supervision of Dr. T. Raja Sekhar
- **Title of the thesis:** Nonlinear Aspects of Certain Multi-dimensional Hyperbolic System of Conservation laws
- **Graduation:** 05-06-2023
- **CGPA during course work of Ph.D.:** 9.33 **(On a scale of 10)**
- **Courses Credited (Pre Ph.D. Course):** Advanced Fluid Mechanics, Computational Fluid Mechanics, Boundary Integral Methods, Advanced Numerical Analysis, Advanced Mathematical Techniques, English for Technical Writing

M.SC. IN MATHEMATICS AND SCIENTIFIC COMPUTING 2015-2017

Department of Mathematics | *Motilal Nehru National Institute of Technology Allahabad*

- **CPI:** 9.37 **(On a scale of 10)**
- **Graduation:** May 2017
- **Courses Credited:** Programming Languages, Real Analysis and General Topology, Algebra, Advanced Differential Equations, Fluid Dynamics, Principal of Numerical Computation, Probability and Statistics, Data Structures, Communication Skill and Personality Development, Mathematical Modeling, Complex Analysis, Optimization, Mathematical Methods, Computational Fluid Dynamics, Functional Analysis.
- **Dissertation title:** Magnetogasdynamics Shock Wave in a Rotating Non-Ideal Gas with Conduction Radiation Heat Flux.

B.SC. IN NATURAL SCIENCES **2012-2015**

Hemwati Nandan Bahuguna Garhwal University | *Srinagar, Uttarakhand*

- **Percentage:** 80.83% **(Distinction with first position in college)**
- **Graduation:** June 2015
- **Major Subjects:** Mathematics, Physics, Chemistry

INTERMEDIATE **2012**

Board of Intermediate Education | *Uttarakhand*

- **Percentage:** 87.4% (**Distinction with 9^{th} position in the state merit list**)
- **Graduation:** May 2012
- **Major subjects:** Mathematics, Physics, Chemistry

PROFESSIONAL EXPERIENCE

- Postdoctoral researcher at Institute of Applied Analysis and Numerical Simulation, University of Stuttgart, July 2023- Till present.
- Lecturer and instructor for the Masters' Course "Numerical methods for differential equations", University of Stuttgart, Summer Semester 2024 (**Feedback score 1.6 out of 5, 1 being the best and 5 being the worst**).
- Tutorial teacher for graduate students to the courses on Advanced Calculus, Linear Algebra, Numerical and Complex Analysis, and Advanced Numerical Techniques Lab, Department of Mathematics, Indian Institute of Technology Kharagpur, July 2020- June 2022.
- Research Scholar, Department of Mathematics, Indian Institute of Technology Kharagpur, July 2018 - June 2023.
- Assistant Professor, Smt. S. R. Patel Engineering College, Unjha, July 2017-April 2018.

LIST OF PUBLICATIONS

1. **Rahul Barthwal** and T. Raja Sekhar, *Existence of solutions to gas expansion problem through a sharp corner for 2-D Euler equations with general equation of state*, **Studies in Applied Mathematics, MIT (Wiley), 151 (1), 141-170, (2023)**.
2. **Rahul Barthwal** and T. Raja Sekhar, *Existence and regularity of solutions of a supersonic-sonic patch arising in axisymmetric relativistic transonic flow with general equation of state*, **Journal of Mathematical Analysis and Applications (Elsevier), 523 (2), 127022, (2023)**.
3. **Rahul Barthwal**, T. Raja Sekhar and G. P. Raja Sekhar, *Construction of solutions of a two-dimensional Riemann problem for a thin film model of a perfectly soluble anti-surfactant solution*, **Mathematical Methods in the Applied Sciences (Wiley), 46 (6), 7413-7434, (2023)**.
4. **Rahul Barthwal** and T. Raja Sekhar, *On the existence and regularity of solutions of semi-hyperbolic patches to 2-D Euler equations with van der Waals gas*, **Studies in Applied Mathematics, MIT (Wiley), 148(2), 543–576, (2022)**.
5. **Rahul Barthwal** and T. Raja Sekhar, *Two-dimensional non self-similar Riemann solutions for a thin film model of a perfectly soluble anti-surfactant solution*, **Quarterly of Applied Mathematics (American Mathematical Society), 80(4), 717-738, (2022)**.
6. **Rahul Barthwal** and T. Raja Sekhar, *Simple waves for two-dimensional magnetohydrodynamics with extended Chaplygin gas,* **Indian Journal of Pure and Applied Mathematics (Springer), 53, 542--549, (2022)**.

COMMUNICATED RESEARCH WORKS

1. **Rahul Barthwal**, Christian Rohde and Yue Wang, *Generalized Riemann solver to a two-phase thin film model with a perfectly soluble anti-surfactant*, In preparation.
2. **Rahul Barthwal** and Christian Rohde, *Convergence of an operator-splitting Lax-Friedrichs scheme for the Burgers-Hilbert equation*, In preparation.
3. Anamika, **Rahul Barthwal** and T. Raja Sekhar, *Construction of solutions to a Riemann problem for a two-dimensional Keyfitz-Kranzer type model governing thin film flow* , Submitted for publication.
4. **Rahul Barthwal** and T. Raja Sekhar, *On a degenerate boundary value problem to relativistic magnetohydrodynamics with a general pressure law*, Submitted for publication.

EDITORIAL AND REVIEWER SERVICES

- Reviewer for the Journal "Studies in Applied Mathematics".
- Reviewer for the Journal "Zeitschrift für angewandte Mathematik und Physik".

COLLABORATORS

- Dr. Yue Wang, Associate Professor, Institute of Applied Physics and Computational Mathematics, Beijing, China
- Dr. Firas Dhaouadi, Assistant Professor, Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy
- Prof. G. P. Raja Sekhar, Professor, Indian Institute of Technology Kharagpur, India

ACHIEVEMENTS

Awards

- IMS Award for best paper presentation in the **88th Annual Conference of Indian Mathematical Society** held at BIT-Mesra for presenting "Study of a supersonic-sonic patch arising in axisymmetric relativistic transonic flow".
- Travel grant (1000 Euro) for young researchers from Institute of Applied Analysis to attend the summer school "Horizons in Nonlinear PDEs", Ulm University, Germany.
- DST international travel grant award for young researchers to attend the summer school "Horizons in Nonlinear PDEs", Ulm University, Germany (Not availed).
- Young Scientist Award in the **66th Congress of Indian Society Of Theoretical and Applied Mechanics(ISTAM)** held at VIT-AP University for presenting "A two-dimensional Riemann problem for a new hyperbolic thin film model of a perfectly soluble anti-surfactant solution".
- Silver Medalist in M.Sc. Mathematics and Scientific Computing.
- Deendayal upadhyay excellency in education award for securing 9^{th} Rank in state board's senior secondary exam.

Scholarships

- Senior Research Fellowship (UGC-SRF) in the Department of Mathematics, IIT Kharagpur from September 2021 to Present.
- Junior Research Fellowship (UGC-JRF) in the Department of Mathematics, IIT Kharagpur from September 2019 to August 2021.
- Teaching Assistantship (Institute) in the Department of Mathematics, IIT Kharagpur from July 2018 to August 2019.
- INSPIRE fellowship from the Department of Science and Technology, India from July 2013- April 2017.

WORKSHOPS/ CONFERENCES/ INVITED TALKS

1. Participated and delivered a talk "On the convergence of an operator-splitting Lax-Friedrichs scheme for Burgers-Hilbert equation" in the 19th International Conference on Hyperbolic Problems: Theory, Numerics, Applications (HYP2024) held in SJTU, Shanghai, China during July 01-05, 2024.
2. Participated in a SPP-2410 workshop Analysis of Dissipation in Inviscid and Compressible Fluid Dynamics held in University of Konstanz, Germany during June 5-7, 2024.
3. Delivered an invited talk "On a class of sonic-supersonic boundary value problems" in an Online PDE workshop conducted by the Department of Mathematics, University of Oslo, Norway on October 31, 2023.
4. Participated and delivered a talk on "Study of supersonic-sonic patch for axisymmetric relativistic transonic flow" in the Sino-German Workshop on Advanced Nonlinear Methods for Hyperbolic Balance Laws held in Beijing, China during September 25-28, 2023.
5. Participated and delivered a talk "On a supersonic-sonic patch for axisymmetric relativistic Euler equations" in the 16th Hirschegg Workshop on Conservation Laws held in Hirschegg, Austria during September 10-16, 2023.
6. Participated in a NCM workshop on "Control Theory for Differential Equations" in the IISER Kolkata during November 28-December 10, 2022.
7. Delivered a talk on "Nonlinear wave interactions in certain hyperbolic system of conservation laws" at Institute of Applied Analysis and Numerical Simulation, University of Stuttgart, Stuttgart, Germany on October 4, 2022.
8. Participated and delivered a presentation on "Existence and regularity of solutions of a supersonic-sonic patch arising in axisymmetric relativistic transonic flow" in the summer school Horizons in Nonlinear PDEs held at Institute of Applied Analysis, Ulm University, Ulm, Germany during September 26-30, 2022.
9. Participated and delivered a poster presentation on "Construction of solutions of a two-dimensional Riemann problem for a thin film model of a perfectly soluble anti-surfactant solution" in the XVIII International Conference on Hyperbolic Problems: Theory, Numerics, Applications (HYP2022) held at University of Malaga, Malaga, Spain during June 20-24, 2022.
10. Participated and delivered a presentation on "A two-dimensional Riemann problem for a new hyperbolic thin film model of a perfectly soluble anti-surfactant solution" in the 66th Congress of Indian Society Of Theoretical and Applied Mechanics(ISTAM) held at VIT-AP University, Amravati during December 3-5, 2021.

11. Participated and delivered a presentation on "Existence and regularity of solutions of semi-hyperbolic patch problem for 2-D Euler equations with non-ideal gas" at the "65th Congress of Indian Society Of Theoretical and Applied Mechanics(ISTAM)" held at GITAM, Hyderabad, India during December 9-11, 2020.
12. Participated and delivered a presentation on "Simple waves for two-dimensional magnetohydrodynamics with extended Chaplygin gas" at the 64th Congress of Indian Society Of Theoretical and Applied Mechanics (ISTAM) held at the Indian Institute of Technology Bhubaneshwar during December 9-12, 2019.
13. Participated in an NCM workshop on "System of Conservation Laws: Theory and Numerics" in the Tata Institute of Fundamental Research Center for Applicable Mathematics, Bengaluru during August 5-17, 2019.
14. Participated in a GIAN course on "Kinetic Theory of Non-Equilibrium Gas Flows: Theory and Computations" in IIT Madras during December 10-14, 2018.

PERSONAL DETAILS

Name	Rahul Barthwal
Father's Name	Girish Chandra Barthwal
Mother's Name	Rekha Devi
Date of Birth	August 23, 1995
Gender	Male
Marital Status	Unmarried
Nationality	Indian
Present Address	Institute of Applied Analysis and Numerical Simulation, University of Stuttgart, Pfaffenwaldring 57, D-70569, Stuttgart, Germany.

REFERENCES

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