Jiten Kumbhakar

Postdoctoral Researcher in Mathematics

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Research Profile

I work on partial differential equations arising in fluid mechanics and control theory. My research focuses on controllability and stabilization of compressible Navier–Stokes systems, and on well-posedness, asymptotic behavior, and time-periodic solutions for fluid and transport-type equations in critical Besov spaces. I am currently a postdoctoral researcher at the Institute of Mathematics of the Czech Academy of Sciences under the mentorship of Professor Šárka Nečasová.

Research Interests

- Partial differential equations and mathematical fluid mechanics.
- Compressible Navier–Stokes equations; linearized and nonlinear fluid models.
- Boundary controllability, null controllability, observability, and stabilization of PDEs.
- Harmonic analysis methods in PDEs; homogeneous and inhomogeneous Besov spaces.
- Time-periodic solutions for fluid equations.
- Convective Brinkman–Forchheimer models in critical Besov spaces.

Academic Positions

Feb. 2025–present **Postdoctoral Researcher**, Institute of Mathematics, Czech Academy of Sciences, Prague, Czech Republic.
Mentor: Professor Šárka Nečasová.

Education

2017–2024 **Integrated Ph.D. in Mathematics**, Indian Institute of Science Education and Research Kolkata, India.
Thesis: *Boundary controllability of linearized compressible Navier–Stokes system and related equations.*
Supervisor: Dr. Shirshendu Chowdhury.

2014–2017 **B.Sc. in Mathematics**, Jagannath Kishore College, Purulia, India.

Publications

[**P1**] Kuntal Bhandari, Shirshendu Chowdhury, Rajib Dutta, and Jiten Kumbhakar. *Boundary null-controllability of 1d linearized compressible Navier–Stokes system by one control force. Journal of Differential Equations*, **453** (2026), Article 113891. doi:10.1016/j.jde.2025.113891.

[**P2**] Kuntal Bhandari, Jiten Kumbhakar, and Subrata Majumdar. *Local null-controllability of a two-parabolic nonlinear system with coupled boundary conditions by a Neumann control. Evolution Equations and Control Theory*, **13**(2) (2024), 587–615. doi:10.3934/eect.2023059.

Submitted Manuscripts and Preprints

[**S1**] **Jiten Kumbhakar**. *Boundary controllability of one-dimensional barotropic and non-barotropic linearized compressible Navier–Stokes systems.* Submitted to *Journal of Differential Equations.*
Earlier version available at arXiv:2301.04080.

[**S2**] **Jiten Kumbhakar**. *Global well-posedness and stabilization of a damped transport–diffusion equation in critical Besov spaces.* Submitted to *Journal of Mathematical Analysis and Applications.*

Current Research Projects

- **Time-periodic solutions for compressible Navier–Stokes equations.**
  Ongoing postdoctoral project on periodic solvability and associated analytic estimates for compressible fluid models.

- **Convective Brinkman–Forchheimer equations in Besov spaces.**
  Research direction on well-posedness and time-periodic solutions in critical Besov-type frameworks.
- **Nonlinear transport–diffusion equations with exponential stabilization.**
  Ongoing research direction extending the submitted linear theory toward nonlinear models and stabilization mechanisms in critical spaces.

Ph.D. Thesis

- **Jiten Kumbhakar**. *Boundary controllability of linearized compressible Navier–Stokes system and related equations*, Ph.D. thesis, IISER Kolkata, 2024.
  Thesis PDF.

Awards and Fellowships

- **Prime Minister Research Fellowship (PMRF)**, IISER Kolkata, India, 2020–2023.
- **CSIR Junior Research Fellowship**, India, December 2018. National Rank: 98.
- **Joint Admission Test for M.Sc. (JAM)**, 2017. National Rank: 38 in Mathematics; 72 in Statistics.
- **Gold Medalist**, 2017: Shakti Sadhan Basu Memorial Medal and Prize; Manindralal Banerjee Memorial Prize.

Research Talks and Seminars

- **Some controllability results for one-dimensional linearized compressible Navier–Stokes equations**. Mathematics with Applications 2025 (MathApp2025), Funchal, Madeira, Portugal, June 4, 2025. Contributed talk.
- **Local null controllability of a parabolic system using a Neumann boundary control**. Weekly Seminar in PDE, Institute of Mathematics, Czech Academy of Sciences, Prague, Czech Republic, March 25, 2025.
- **Null and approximate controllability of the heat equation in one dimension using the method of flatness**. Weekly Research Seminar organized by Professor Mythily Ramaswamy, TIFR–ICTS Bangalore, August 5, 2021.

Conferences, Workshops, and Schools Attended

- **Mathematics with Applications 2025 (MathApp2025)**, Funchal, Madeira, Portugal, June 2–6, 2025. Conference on the occasion of the 60th birthday of Professor Šárka Nečasová.
- **Rotation and Fluids – Prague-Sum Summer School 2025**, Institute of Mathematics, Czech Academy of Sciences, Prague, Czech Republic, August 25–29, 2025.
- **Mathematical Analysis of Fluid Flow Models**, TIFR CAM Bangalore, India, June 10–22, 2024. NCM Workshop.
- **Recent Advances on Control Theory of PDE Systems**, ICTS Bangalore, India, February 12–23, 2024. International Conference.
- **Control Theory Meets the Theory of Homogenization**, IIT Bombay, India, February 28–March 4, 2023. Discussion Meeting.
- **Convex Integration Solutions for the Transport Equation**, IISER Kolkata, India, November 8–18, 2021. Lecture Series by Dr. Ujjwal Koley.
- **Short Course in Calculus of Variations**, IISER Kolkata, India, January 28–February 1, 2019. Lecture Series by Professor Bernard Dacorogna.

Teaching Experience

Teaching Assistant, IISER Kolkata

- Mathematics I (MA1101), Autumn 2022 and Autumn 2021.
- Mathematics II (MA1201), Spring 2022, Spring 2021, and Spring 2020.
- Analysis II (MA2201), Spring 2021.
- Analysis III (MA3101), Autumn 2019.

Teaching Assistant, Workshops

- **Control Theory for Partial Differential Equations**, NCM Workshop, IISER Thiruvananthapuram, India, December 4–16, 2023.
- **Control Theory for Differential Equations**, NCM Workshop, IISER Kolkata, India, November 28–December 10, 2022.

NPTEL Live Sessions

- **Basic Linear Algebra** (noc23-ma07), Course Instructor: Professor I. K. Rana, IIT Bombay, February–April 2023.
- **Introductory Course in Real Analysis** (noc22-ma79), Course Instructor: Professor P. D. Srivastava, IIT Kharagpur, July–October 2022.

Languages

Bengali (native), Hindi, English.

References

Available upon request.