

Arnab Roy

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Curriculum Vitae

Personal Information

Nationality Indian.
Date of Birth 01 June 1991.
Sex Male
Languages English, Hindi, Bengali.

Research Interests

Partial Differential Equations

- Fluid-Structure Interaction: Modelling and mathematical analysis of FSI problems, Existence, uniqueness, singular limits and long time behaviour of the solutions.
- Control of PDE : Controllability, Stabilizability and Optimal control problem for fluid models (Incompressible, Compressible Navier-Stokes), Fluid-Structure interaction models.

Employment

Jan. 2020 - Present **Post Doctoral Fellow**, *Institute of Mathematics of the Czech Academy of Sciences*, Prague, Czech Republic.
Advisor: Prof. Šarka Nečasová.
Team: Evolution Differential Equations (EDE).

Sep. 2018 - Aug. 2019 **Post Doctoral Fellow**, *Institut Élie Cartan de Lorraine (IECL) and Inria*, Nancy, France.
Advisor: Prof. Takéo Takahashi.
Team: EDP (IECL) and SPHINX (Inria).

Education

2015–2018 **PhD**, *Tata Institute Of Fundamental Research-CAM*, Bangalore, India.
Title: *Existence, Controllability and Stabilization of fluid models*.
Thesis Advisor: Prof. Mythily Ramaswamy.
Date of Defense: 10 July 2018.

2014–2015 **Master Degree Dissertation**, *Tata Institute Of Fundamental Research-CAM*, Bangalore, India.
Title: *Existence and regularity of nonlinear Boussinesq system*.
Thesis Advisor: Prof. Mythily Ramaswamy.

2012–2014 **M.Sc in Mathematics**, *Tata Institute Of Fundamental Research-CAM*, Bangalore, India, *1st class with distinction*.

2009–2012 **B.Sc in Mathematics**, *University of Calcutta*, Kolkata, India, *1st class*.

Accepted Publications

- Boundary feedback stabilization of the Boussinesq system with mixed boundary conditions, with M. Ramaswamy and J.-P. Raymond, *J. Differential Equations* 266 (2019), no. 7, 4268–4304, 2019.
<https://doi.org/10.1016/j.jde.2018.09.038>

- Local null controllability of a rigid body moving into a Boussinesq flow, with T. Takahashi, *Math. Control Relat. Fields*, December 2019, Volume 9, Issue 4, 793–836.
<https://www.aims sciences.org/article/doi/10.3934/mcrf.2019050>
- Remark on the global null controllability for a viscous Burgers-particle system with particle supported control, with M. Ramaswamy and T. Takahashi, *Applied Mathematics Letters*, September 2020, Volume 107.
<https://doi.org/10.1016/j.aml.2020.106483>
- Maximal-in-time existence and uniqueness of strong solution of a 3d fluid-structure interaction model, with D. Maity and J. -P. Raymond, *SIAM J. Math. Anal.*, 52(6), 6338–6378.
<https://epubs.siam.org/doi/abs/10.1137/18M1178451>
- Stabilization of a rigid body moving in a compressible viscous fluid, with T. Takahashi, *J. Evol. Equ.* 21 (2021), 167–200.
<https://doi.org/10.1007/s00028-020-00574-1>
- Self-propelled motion of a rigid body inside a density dependent incompressible fluid, with Š. Nečasová, M. Ramaswamy and A. Schlömerkemper, *Math. Model. Nat. Phenom.*, 16 (2021) 9.
<https://doi.org/10.1051/mmnp/2020052>
- Existence of strong solutions for a system of interaction between a compressible viscous fluid and a wave equation, with D. Maity and T. Takahashi, *Nonlinearity* 34 (4), 2021, 2659-2687.
<https://doi.org/10.1088/1361-6544/abe696>
- Measure-valued solutions and weak-strong uniqueness for the incompressible inviscid fluid-rigid body interaction, with M. Caggio, O. Kreml, Š. Nečasová and T. Tang, *Journal of Mathematical Fluid Mechanics* 23 (3), 2021.
<https://doi.org/10.1007/s00021-021-00581-3>
- Approximate controllability and stabilizability of a linearized system for the interaction between a viscoelastic fluid and a rigid body, with D. Mitra and T. Takahashi, *Mathematics of Control, Signals and Systems*, 2021.
<https://doi.org/10.1007/s00498-021-00295-x>
- Existence and uniqueness of maximal strong solution of a 1D Blood flow in a network of vessels, with D. Maity and J. -P. Raymond, *Nonlinear Analysis: Real World Applications*, Volume 63, February 2022, 103405.
<https://doi.org/10.1016/j.nonrwa.2021.103405>

Submitted

- Motion of a Rigid body in a Compressible Fluid with Navier-slip boundary condition, with Š. Nečasová, M. Ramaswamy and A. Schlömerkemper.
<https://arxiv.org/pdf/2103.08762.pdf>
- Compressible Navier-Stokes system with the hard sphere pressure law in an exterior domain, with Š. Nečasová and A. Novotný.
https://www.math.cas.cz/fichier/preprints/IM_20210810010136_49.pdf
- Existence of a weak solution to a nonlinear fluid-structure interaction problem with heat exchange, with V. Mácha, B. Muha, Š. Nečasová and S. Trifunović.
<https://arxiv.org/pdf/2109.11096.pdf>

Long Term Research Visits

- Institute for Mathematics, University of Würzburg, Germany. May – June 2018.
- Institut de Mathématiques de Toulouse, Paul Sabatier University, Toulouse, France. April – May 2018, Sept. – Oct. 2017, Sept. – Oct. 2016.
- Institut Élie Cartan de Lorraine, Nancy, France. Oct. – Nov. 2017, Oct. – Nov. 2016.
- Tata Institute Of Fundamental Research, India. Nov. – Dec. 2019.
- Indian Institute Of Technology-Bombay, India. Oct. – Nov. 2019.

Invited Talks

- *NS-FSI Research Group Seminar*, Politecnico di Milano, Italy, 24th September, 2021.
- Existence of strong solutions for a system of interaction between a compressible viscous fluid and a wave equation, *12th Forum of Partial Differential Equations*, Bedlewo, Poland 19th–25th September, 2021.
- *SysConTalks, Department of Systems and Control*, IIT-Bombay, Mumbai, India, 9th August, 2021.
- Brijuni Applied Mathematics Workshop, Croatia, 4th–10th July, 2021.
- Motion of a Rigid body in a Compressible Fluid, *Minisymposium in 8th European Congress of Mathematics*, 20th–26th June 2021.
- Existence of strong solutions for a system of interaction between a compressible viscous fluid and a wave equation, *Nečas Seminar on Continuum Mechanics*, Charles University, Dec 07, 2020.
- Global null controllability for a viscous Burgers-particle system with particle supported control, *Seminar on PDEs*, Czech Academy of Sciences, June 23, 2020.
- Stabilization of a rigid body moving in a compressible fluid, *IIT-Bombay*, Mumbai, India, Nov 13, 2019.
- Stabilization of a rigid body moving in a compressible fluid, *IFSMACS Réunion*, Institut Élie Cartan de Lorraine, Nancy, France, Jan 21–22, 2019.
- Local in time strong solution of a 3D FSI system, *Institute of Mathematics*, Czech Academy of Sciences, Dec 18, 2018.
- Local in time strong solution of a 3D FSI system, *Institute for Mathematics*, University of Würzburg, June 08, 2018.
- Null controllability of a rigid body moving into a Boussinesq flow, *Poster presentation*, Institut de Mathématiques de Bordeaux, France, Analysis and Control of Fluid-Structure Interaction Systems, Oct 02–05, 2017.
- Existence, Regularity and Stabilization Results of Boussinesq System, *AIRBUS Investigators' Meeting*, TIFR - CAM, Bangalore, August 21, 2017.

Teaching Experience

- Fall 2017 : *Linear Partial Differential Equations*, Master level (Teaching Assistant), TIFR- CAM.
- Spring 2017 : *PDE III*, Master level (Teaching Assistant), TIFR- CAM.
- Spring 2016 : *PDE III*, Master level (Teaching Assistant), TIFR- CAM.
- Fall 2015 : *Real Analysis*, Master level (Teaching Assistant), TIFR- CAM.
- Fall 2014 : *Complex Analysis*, Master level (Teaching Assistant), TIFR- CAM.

Computer skills

- Markup Language: Latex
- Operating Systems: Unix/Linux, Windows.

References

- **Prof. Šarka Nečasová**
Institute of Mathematics of the Czech Academy of Sciences,
Žitná 25, CZ - 115 67,
Praha 1, Czech Republic.
matus@math.cas.cz
- **Prof. Mythily Ramaswamy**
TIFR - CAM,
Bangalore - 560065,
Karnataka, India.
mythily@tifrbng.res.in
- **Prof. Jean Pierre Raymond**

Institut de Mathématiques de Toulouse,
Université Paul Sabatier & CNRS,
31062 Toulouse Cedex, France.
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- **Prof. Takéo Takahashi**

Institut Élie Cartan de Lorraine,
BP 239, 54506 Vandœuvre-lés-Nancy,
Nancy, France.
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