Manish Kumar

Curriculum Vitae

Shivaji Nagar, Jakkanpur, Patna, Bihar-800001
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Education

August 2019-Current **Integrated Ph.D.**, Indian Institute of Science Education and Research (IISER), Kolkata, West Bengal, India

August 2016-May 2019 **B.Sc.(Hons.) in Mathematics**, CGPA: 9.54, Rajdhani College, University of Delhi, Delhi, India

2014-2016 **Higher Secondary in Science**, Percentage: 91.67%, D.A.V Public School, BSEB Colony Road, Patna, Bihar, India

2014 **Matriculation**, CGPA: 10.0, R.P.S Public School, Pahari, Patna, Bihar, India

Research Interests

Partial Differential Equations, Fluid Mechanics, Control Theory, Numerical Analysis:
Linear and Nonlinear Partial Differential Equations, Fluid Mechanics, Compressible Navier-Stokes equations,Control of PDE (In particular Controllability, Stabilizability, Optimal control problem for coupled parabolic-parabolic and paraboli-hyperbolic mixed class of PDEs)

Awards & Achievements

PMRF Fellow, Selected for Prime Minister Research Fellowship for May, 2021 cycle

Interviews, Cracked IPhD interviews of IISER, TVM and IISER, Kolkata in 2019

JAM, Got 491 rank in JAM exam in Mathematics in 2019

Topper, In bachelors at college level

Projects

- **Summer Project**
  Project Title: *Semigroup Theory For Operators And Control Of PDEs*
  I did this project in the last summer under the supervision of my PhD supervisor where I learned the controllability and stability concepts in case of PDEs, for which I needed the semigroup theory as a tool.
- **IPhd Project II**
  Project Title: *Controllability and Stability of ODEs*
  I did this project in my 4th semester of MS under the supervision of my PhD supervisor where I got introduced to my research field,i.e., Control of PDEs. In this project because of ODE setup, everything was in finite dimension.
- **IPhd Project I**
  Project Title: *Distribution theory and Sobolev Space*
  I did this project in my 3rd semester of MS under the supervision of my PhD supervisor where I get to know about the generalisation of classical theories and about new spaces, using which we work in research.

- **Summer Project**
  Project Title: *Partial differential equations*
  I did this project in 2020 under the supervision of my present PhD supervisor Dr. Rajib Dutta and it was a sort of intrductory study in pde where I learned about Characteristic method of solving 1st order pde and also studied about the four important linear PDEs.
- **Summer Project**
  Project Title: *Completion of incomplete metric space and basic topology*
  I did this project in 2018 in IISER,TVM under the supervision of Dr. Srihari Sridharan and it was mainly about how the number system evolved from counting numbers to complex numbers and few approximation results of real analysis.

Master's Thesis

Controllability of a hyperbolic and a parabolic system in one dimensional periodic domain
In the thesis, I have studied controllability aspect of tranpsport equation and Kuramoto-Sivashinsky-Korteweg-De-Vries equation using Carleman estimates and method of moments, respectively.

Preprints

Null Controllability of the Linear Stabilized Kuramoto-Sivashinsky System Using Moment Method, Joint work with Subrata Mazumdar
arxiv link: https://arxiv.org/pdf/2205.03638.pdf

Null Controllability of a System Coupling Kuramoto-Sivashinsky-Korteweg-De-Vries and Transport Equations., Joint work with Subrata Mazumdar
HAL link: https://hal.science/hal-03695906v1/document

Ongoing Works

Boundary controllability of 1-d coupled time discrete heat equation with Kirchoff conditions, Joint work with Kuntal Bhandari and Rajib Dutta

Null controllability of linearized compressible Navier-Stokes equation under nonnegative constraint, Joint work with Shirshendu Chowdhury and Rajib Dutta

Teaching Assistantships

Spring 2023 **Mathematics II**, 1st year undergraduate, IISER Kolkata
- **Instructor:** Dr. Anirban Banerjee

Spring 2022 **Mathematical Methods I**, 1st year undergraduate, IISER Kolkata
- **Instructor:** Dr. Anandamohan Ghosh

Spring 2022 **Analysis II**, 2nd year undergraduate, IISER Kolkata
- **Instructor:** Dr. Rajib Dutta

Autumn 2021 **Linear Algebra I**, 2nd year undergraduate, IISER Kolkata
- **Instructor:** Dr. Somnath Basu

NPTEL Live sessions

Autumn 2022 **Sobolev Space and Partial Differential Equations**
- **Instructor:** Prof. S. Kesavan

Spring 2023 **Ordinary and Partial Diffrential Equations and Applications**
- **Instructor:** Prof. P.N. Agarwal, Prof. D.N. Pandey

Workshops and webinars attended

- **Title:** Control Theory meets the Theory of Homogenization
  Organizers: Debanjana Mitra, Harsha Hutridurga
  Date: 28 Feb-04 March, 2023
- **Title:** NdAM Workshop - Analysis and Numerics of Design, Control and Inverse Problems
  Organiser: Giuseppe Floridia and Enrique Zuazua.
  Date: 1-7 July, 2021
- **Title:** Convex integration solutions for the transport equation
  Speaker: Dr. Ujjwal Koley, TIFR CAM
  Date: November, 2021
- **Title:** NdAM Workshop - Analysis and Numerics of Design, Control and Inverse Problems
  Organiser: Giuseppe Floridia and Enrique Zuazua.
  Date: 1-7 July, 2021
- **Title:** Webinar on PDE and related areas
  Organiser: IIT Kanpur in collaboration with TIFR-CAM, IISER-Pune and IISER-Kolkata
  Date: 3 September -15 December, 2020

References

- **PhD Supervisor: Dr. Rajib Dutta**
  Department of Mathematics
  Faculty
  IISER Kolkata
  West Bengal, India
  rajib.dutta@iiserkol.ac.in

- **Dr. Shirshendu Chowdhury**
  Department of Mathematics
  Faculty
  IISER Kolkata
  West Bengal, India
  shirshendu@iiserkol.ac.in

Additional responsibilities

- As a current member of Library committee of my department.
- As a current member of Outreach committee in my institute.

Webpage Link

manishgnu.github.io

Declaration: I hereby declare that all the statements made herein are true to my best of knowledge and belief.

Place: Kolkata Manish Kumar