SHUBHAJIT DEY

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% Webpage

G GitHub

in LinkedIn

RG ResearchGate

EDUCATION

Bachelor of Science - Master of Science, BSMS Dual-degree

Indian Institute of Science Education and Research, Bhopal

Major in Mathematics | Minor in Data Science

1 2019 − 2024 **CPI** : 8.13/10

INTERESTS & SKILLS

• General Numerical analysis on DEs : Fourier-Chebyshev spectral methods, Pseudo-spectral FEMs

Continuous optimisation: Optimization in manifolds, Optimization algo. for deep learning

• Other Approximation theory | Computational matrix theory | Theoretical deep learning

• Language Fluent : Python, C++ | Familiar : R

• Prog. Skills Fluent : Object Oriented Programming | Familiar : Functional Programming

• Libraries Fluent: NumPy, Matplotlib, Pandas, SciPy, Scikit-Learn, PyTorch | Familiar: Keras, Qiskit, Librosa

• Software MATLAB | Wolfram Mathematica | Jupyter Notebook

• Tools LATEX | HTML

PROFESSIONAL EXPERIENCES

 Teaching 	Taught undergrads and aided host Prof. Partha Pratim Das in the	Jan 2025 - Jun 2025
Fellow	Discrete Mathematics course at Ashoka University, New Delhi.	

Teaching Taught undergrads and aided host Prof. Bhargab Bhattacharya in the
 Fellow QRMT course at Ashoka University, New Delhi.

QRMT course at Ashoka University, New Delhi.

Worked under the guidance of Dr. Janosch Ortmann & Dr. Walter Rei

May 2024 - Sep 2024

RESEARCH EXPERIENCES & PROJECTS

Analysis Theoretical & Computational considerations of Sturm-Liouville systems.

on extension of the Mitacs Globalink project.

Aug 2023 - May 2024

Sep 2024 - Dec 2024

Approx. Theory

on ODE &

Graduate

Researcher

- Supervisor : Dr. Anandateertha Mangasuli & Dr. Ambuj Pandey, IISERB

- Studied the theory of regular SL systems, in particular oscillation theory, asymptotic analysis and completeness theory of eigenfunctions.
- Conducted numerical experiments to compute and visualise Fourier & Chebyshev approximations, Gibbs phenomenon.
- Explored theoretical foundations of pseudo-spectral methods, in particular discrete computation Chebyshev coefficients along with numerics.
- Thesis: 10.13140/RG.2.2.13890.39364 | Code: GitHub Repo

Operations On signature based algorithmic algebra involved in stochastic programming.
 Research

May 2023 - Aug 2023 + May 2024 - Sep 2024

- Supervisor: Dr. Janosch Ortmann & Prof. Walter Rei, ESG UQAM
- Investigated signature-based algorithms and their role in discarding redundant calculations during Gröbner basis computations relevant to stochastic programming.
- Performed theoretical surveys and contributed towards the theoretical foundations of the signatureapproach of the considered optimisation problem.
- **Report**: progressing towards a publication; preprint to be available soon.

• Topology On characterizing compact and dense subspaces of $C(X, \mathbb{R})$.

May 2022 - Aug 2022

- **Supervisor**: Dr. Anandateertha Mangasuli, IISERB
- Explored foundational analysis of functional approximation theory from the perspective of metric-space topology.
- Studied Ascoli's theorem, Weierstrass approximation theorem and Stone-Weierstrass theorem.
- Report : ResearchGate

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Real Analysis On Taylor's approximation and some associated theorems for convergence of power series with computational applications.

Dec 2021 - Jan 2022

- Supervisor: Dr. Anandateertha Mangasuli, IISERB
- Studied analytical results on convergence of Taylor's series. Primary focus was on Bernstein's theorem, Abel's limit theorem & Tauber's first theorem from the perspective of analytical approximation theory.
- Explored theory on minimisation of error in Taylor's approximation, via it's integral form.
- Additionally studied 'Higher-order Taylor method to numerically solve DEs' as a computational application of the theory (implementation in python).
- **Report** : ResearchGate | **Code** : Jupyter Notebook

Artificial Intelligence

Acoustic scene classification using auditory dataset.

Aug 2021 - Dec 2021

- Built a system employing a CNN based framework (PyTorch, Librosa) to classify audio scenes.
- Used robust statistical data analysis and data pre-processing including exploitation of physics based Mel spectograms to boost predictability.
- Report: arXiv:2112.13450 | Code: GitHub Repo
- Deep Maths

A preliminary survey on Deep Maths. (Reading project)

- Studied the collaborative works done by Google DeepMind and Oxford University, and the foundations of problem-specific ANNs in solving problems in abstract mathematics.
- Explored advancements in active research on guiding mathematical intuition using AI.
- Report: 10.13140/RG.2.2.18971.34085

CONFERENCES & WORKSHOPS

 Attended <u>exSPLORe 2025</u>, a five-day workshop cum conference conducted jointly by Google & <u>Safexpress Centre for Data</u>, <u>Learning and Decision Sciences</u>.

Jan 2025

• Attended **Annual Mathematics Symposium 2024 - (Analysis)**, a three-day conference conducted by the Dept. of Mathematics at IISER Bhopal.

Feb 2023

 Attended 8th <u>India School of Logic and its Applications</u> [ISLA 2020], a virtual school conducted jointly by IISERB & <u>Association of Logic in India (ALI)</u>.

Dec 2020

SCHOLASTIC ACHIEVEMENTS

- Obtained an A-grade for the research work done during my MS Thesis project.
- Obtained an **O-grade** for outstanding performance in the course *DSE 309*: Advanced programming in Python.
- Awarded the Mitacs Globalink Research Grant (CAD 10,000) for an on-site research project in Montréal.
- Cleared ISI B.Math entrance examination round 1 (clearance only for top 150 out of 50k+ applicants).

CO-CURRICULAR ACHIEVEMENTS

- Second Runners Up at SBI NUMERO YONO QUIZ, Central India region.
- Third Runners Up at CBSE HERITAGE INDIA QUIZ, National Semi Finale.
- First Runners Up at BHARAT KO JANO QUIZ COMP., National Finale.
- Gold Medal for Intra State Rapid-Fire chess tournament, Assam.

VOLUNTEERED RESPONSIBILITIES

- Event Coordinator for the Interactive Quiz Event in the annual outreach programme of IISER-B.
- **Department Representative** for the mathematics 2019 batch.
- Coordinator at IISERB QUIZ CLUB for 2 consecutive terms.

REFERENCES

• Dr. Anandteertha Mangasuli IISERB anand@iiserb.ac.in

• Dr. Janosch Ortmann UQAM ortmann.janosch@ugam.ca

• <u>Dr. Partha Pratim Das</u> Ashoka University partha.das@ashoka.edu.in (teaching reference)