

Jibon Krishna Joy

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EDUCATION

M.Sc. in Mathematics (one year, with thesis)

Expected June 2027

Jagannath University, Dhaka

Dhaka, Bangladesh

Thesis: Numerical Study of Hall and Ion-Slip Effects on Rotating MHD Flow and Heat Transfer in a Curved Square Duct Using Spectral Analysis.

B.Sc. (Honours) in Mathematics

2020 – 2024 (conferred June 2026)

Jagannath University, Dhaka

Dhaka, Bangladesh

CGPA: 3.52 / 4.00.

RESEARCH INTERESTS

Numerical PDEs, Numerical Linear Algebra, Scientific Computing, and Scientific Machine Learning.

RESEARCH EXPERIENCE

Graduate Research Assistant -- Numerical Study of Hall and Ion-Slip Effects on Rotating MHD Flow and Heat Transfer in a Curved Square Duct Using Spectral Analysis

June 2026 -- Present

Department of Mathematics, Jagannath University · Supervisor: Prof. Dr. Rabindra Nath Mondal

- Study rotating MHD flow with Hall and ion-slip currents in a curved square duct, over a wider rotation range, a higher magnetic parameter, and different curvature and aspect ratios.
- Implemented a Chebyshev spectral method for the governing equations: Newton-Raphson for the steady solutions, pseudo-arclength continuation to follow solution branches, linear stability analysis, and Crank-Nicolson/Adams-Bashforth time stepping for unsteady flow and heat transfer.
- Rewrote the group's Fortran solver in Python (NumPy, SciPy, JAX) and checked it against the Fortran results. A full continuation run of 4,208 steps agrees to about 10^{-10} relative error, and the Python code runs 6 to 12 times faster.
- Plan to test physics-informed neural networks (PINNs) as a faster stand-in for the numerical solver.

Undergraduate Researcher (Honors Project) -- Randomized Low-Rank Approximation for PDE-Derived Kernel Matrices

Nov 2025 -- June 2026

[GitHub](#)

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- Compared three randomized low-rank methods (Gaussian rSVD, SRHT-rSVD, randQB_EI) in Python (NumPy, SciPy, Numba) on matrices from PDEs, up to $n = 20,000$. A boundary-integral

kernel matrix compressed very well (relative error 3.7×10^{-5} at rank 200), but real finite-element matrices did not: one still needed 86% of full rank to reach 10% error.

- SRHT needs about $12\times$ fewer floating-point operations than Gaussian sketching, yet its sketch step ran $2.1\times$ slower. A BLAS matrix multiply runs at about 85 GFLOP/s, while the compiled Hadamard transform reaches only 3.3 GFLOP/s.

SELECTED PROJECTS

Numerical Algorithms in Python

[GitHub](#)

Implemented the methods from Numerical Analysis I & II (root finding, interpolation, quadrature, linear solvers, Runge-Kutta and multistep ODE solvers, shooting methods), each with a notebook example; plotted stability regions and verified convergence orders with log-log plots.

TEACHING EXPERIENCE

Private Tutor

Jan 2020 -- Present

Mathematics, ICT, Physics, and Chemistry (Grades 8--12, English-version curriculum)

Dhaka, Bangladesh

Instructed 15+ students in mathematics, physics, chemistry and ICT (Grades 8–12), developing individualized lesson plans for the English-medium curriculum.

TECHNICAL SKILLS

- **Languages:** Python, C/C++, FORTRAN.
- **Scientific computing libraries:** NumPy, SciPy, Matplotlib, scikit-learn, JAX, PyTorch, Eigen, pandas.
- **Mathematical software:** Mathematica, MATLAB.
- **Typesetting:** LaTeX.
- **Developer tools & environments:** Linux, command-line environments (bash, Zsh), remote server deployment (SSH), Git.

SELECTED COURSEWORK

Real Analysis I-II, Functional Analysis, Linear Algebra I-II, ODE I-II, PDEs, Numerical Analysis I-II, Methods of Applied Mathematics I-II, Abstract Algebra I-II, Numerical Methods for Differential Equations, Fluid Dynamics, Dynamical Systems.

TEST SCORES

IELTS Academic (August 2026): Overall 8.0

Reading 9.0 · Listening 8.5 · Writing 7.0 · Speaking 6.5

CERTIFICATIONS

Machine Learning Specialization

DeepLearning.AI / Coursera, 2025

Data Analysis with Python

Coursera, 2021

Introduction to Git and GitHub

Coursera, 2021

CS50's Databases with SQL

Harvard University, 2025