Harshit Tiwari

D301, Hall 7, IIT Kanpur
Kanpur (208016), Uttar Pradesh, India
+91-8958211294, tharshit@iitk.ac.in

RESEARCH INTERESTS

Electron magnetohydrodynamics (EMHD), Magnetic field evolution in Neutron Stars, Thermal convection, High-Performance Computing (HPC), Turbulence and nonlinear dynamics, Accretion processes, etc.

EDUCATION

Doctor of Philosophy in Physics *August, 2021 - Present*
Indian Institute of Technology Kanpur, Kanpur, India

- Courses on Physics of Turbulence, High-Performance Computing and Advanced Statistical Physics.
- Credits: 81
- Current Cumulative Performance Index: 9.43/10

Master of Science in Physics *July, 2019 - June, 2021*
Indian Institute of Technology Kanpur, Kanpur, India

- Courses on High Energy Astrophysics, Nuclear and Particle Physics and Quantum Field Theory.
- Credits: 207
- Cumulative Performance Index: 8.30/10

Bachelor of Science *July, 2016 - June, 2019*
Kumaun University, Nainital, India

- Subjects: Physics, Mathematics and Chemistry
- Percentage: 66.39%, First Class

TEACHING ASSISTANCE

I have assisted in the following courses at Indian Institute of Technology Kanpur:

- PHY441A: Electronics from *August, 2022* to *November, 2022*.
- PHY441A: Electronics from *January, 2022* to *May, 2022*.
- PHY473A: Computational Physics from *August, 2022* to *November, 2022*.

RESEARCH EXPERIENCE & PROJECTS

Electron magnetohydrodynamic Turbulence *October, 2022 - Present*

Supervised by Dr. M. K. Verma (Professor, IIT Kanpur), we used the pseudo-spectral code TARANG for electron magnetohydrodynamic (EMHD) simulations in a periodic box. Currently, we are analyzing the energy spectrum for different parameters.

Convective Instability and Stellar Convection *October, 2021 - October, 2022*

Supervised by Dr. M. K. Verma (Professor, IIT Kanpur), we used Solar Model 1996 to analyze solar convection. To model the marginal stability in the Sun's convection zone with an extremely large Rayleigh number, we developed an object-oriented fully compressible code using finite differences. We verified the *Schwarzschild criterion* and studied the convective instability.

Magnetic Field Evolution in Neutron Stars *August, 2021 - July, 2022*

Supervised by Dr. M. K. Verma (Professor, IIT Kanpur), we did a literature survey on the astrophysics of neutron stars while focusing specifically on their magnetic field evolution. We

studied the EMHD formalism for Neutron Star's crust using the governing equations of a complex multi-fluid system.

Theoretical Modelling of Accretion Disk Oscillations *Sept, 2020 - April, 2021*

Supervised by Dr. Pankaj Jain (Professor, IIT Kanpur) and Dr. J.S. Yadav (Visiting Professor, IIT Kanpur), we studied the normal modes of acoustic oscillations within thin accretion disks. Using an effective Kerr potential, we found the *dispersion relation*, valid for some interval of the spin parameter.

WORKSHOPS

- Attended the **ICTS Summer School on Gravitational-Wave Astronomy 2021**.
- Participated in **NSM GPU Hackathon 2022**. We ported Quantum Solver (Gross–Pitaevskii equation) sequential code to run on multiple GPUs and found speedups on Nvidia's A100 cards.

COMPUTER SKILLS

Languages & Softwares: Python, LaTeX, Mathematica, Microsoft Office, OriginLab, Adobe Photoshop, Adobe Illustrator.
Operating Systems: Linux, Windows.

SCHOLASTIC ACHIEVEMENTS

- Secured an **All India Rank 74** among 15,000 applicants in IIT JAM 2019, for the admission to M.Sc. program at Indian Institute of Technology Kanpur.
- Recipient of **Merit cum Means Scholarship** at Indian Institute of Technology Kanpur, Aug 2019- May 2021.
- Secured **AIR 307** in JEST 2019.
- Qualified National Defence Academy (NDA) entrance exam in 2016.

OTHER EXPERIENCE

- Secretary of Adventure Sports Club, IIT Kanpur 2022-23.
- Election Officer at Hall 7, HEC Elections 2022, voting percentage $\sim 85\%$.

INTERESTS

Competitive Powerlifting, Trekking, Running, Reading, Sketching, Music.