Sachin Venkatesh Thakku Saravana

tssachin.venkatesh@gmail.com | Google Scholar | Website | GitHub | LinkedIn
Northwestern University, Dept. of Physics and Astronomy — PhD expected 2028

Research interests: AI for science; physics-informed neural operators and foundation models for plasma/fluid simulations (GRMHD); high-performance computing; time-domain astrophysics (GRBs, black-hole accretion/jets); Bayesian and unsupervised learning for large surveys.

Education

Northwestern University — PhD Physics, Advisor: Alexander Tchekhovskoy — Jun 2025 – 2028 (exp.)
Georgia Institute of Technology — MS Computational Science and Engineering — May 2025
— MS Physics — May 2025
— PhD Physics (transferred), Advisor: Matthew Liska — Sep 2023 – May 2025
Delhi Technological University — B.Tech Engineering Physics — May 2022

Publications (peer-reviewed)

- S. Bhardwaj, M. Dainotti, **S. Venkatesh**, A. Narendra et al. GRB optical and X-ray plateau properties classifier using unsupervised machine learning. *MNRAS* 525(4), 5204–5223 (2023). doi
- **S. Venkatesh**, G. Pundir. PERISTOLE: package that generates time delay plots caused by gravitational lensing. *Res. Notes AAS* 6, 255 (2022). doi
- **S. Venkatesh**, P. Bhatt et al. A comparative study of various deep learning techniques for spatio-temporal super-resolution reconstruction of forced isotropic turbulent flows. ASME IMECE2021-69923 (Talk + Proceedings). doi

In preparation / submitted

- **S. Venkatesh** et al. Physics-constrained Hybrid (2+1)D U-NO for autoregressive forecasting of 3D GRMHD accretion on curved spacetime. Target: PRL/PRD (2026). Approx. 5,700 H-AMR snapshots; Hybrid U-NO with metric injection, 9-objective homoscedastic loss, curriculum + K=2 unrolled training; stable multi-step rollouts for hybrid simulation+emulation BCs.
- Generalized neural-operator follow-up targeted NeurIPS 2027.

Software

- PERISTOLE — GitHub, Zenodo 10.5281/zenodo.6744000 (2022).

Research Experience

Graduate Researcher, Northwestern (Tchekhovskoy) — Jun 2025 – Present

- Lead: Hybrid (2+1)D U-NO surrogate for H-AMR; MPI preprocessing of ∼5k dumps (8 primitives + Kerr metric); multi-node H200 training; conservation/divergence-free evaluation (σ, β, Γ, $M(r)$).
- Supporting contributor: analytic binary-BH spacetime metric in H-AMR (minor role).

Graduate Researcher, Georgia Tech (Liska) — Sep 2023 – May 2025

- Physics-informed ML for H-AMR resolution/cost reduction; CoordResVAE → operator models.

Research Intern, NAOJ (Dainotti) — May 2022 – Aug 2023

- GMM+BIC clustering of Swift-BAT/BATSE GRBs; MNRAS 2023.

Data Engineer, Genpact — Jul 2022 – Jun 2023

- Production datalakes (Snowflake/SQL/PySpark); legacy-DB→Snowflake migrator (frontend+backend).

Summer Intern, CCA Flatiron — May 2021 – Aug 2021

- IllustrisTNG halo merger-tree ML and self-similarity limits.

Undergraduate Researcher, DTU Fluid Mechanics (R. K. Singh) — Feb 2020 – May 2022

- Student lead; super-resolution benchmarks for isotropic turbulence (IMECE talk, ASME mention).

Talks and Posters

- Deep learning for spatio-temporal super-resolution reconstruction. Talk, ASME IMECE, Nov 2021.
- Measure of biases in higher-order precessing waveforms. Poster, NANOGrav Fall meeting, Oct 2021. poster

Teaching and Mentoring

- Mentor + TA (parallel programming), Code/Astro, Northwestern, Jul 2024.
- Tutor, Intro Physics II (PHYS 2212, calculus-based E&M), Georgia Tech — 150 undergrads, Fall'23, Spring'24, Summer'24.
- Mentor, Major League Hacking (data science); Mentor, SPARE-DEPTH, DTU; Outreach & Technical Communicator, Vigyan Samagam (LIGO-India/TMT/MACE).

Grants, Awards, Honors

- Delhi University IoE grant for radio astronomy lab, INR 800,000 (2022).
- IAU Symposium 377 monsoon school scholarship (2023); ASME Applied-ML Honorable Mention (2022); DeepAI special mention, super-resolution (2021); SciPy + PyData Global Impact Scholar (2021, 2022).

Service and Professional Activity

- Reviewer, PEARC Systems and Systems Software, May 2025.
- Workshops/conferences: Chicagoland AI+Cosmology, Fermilab (Aug'26); Black Hole Initiative, Harvard (Mar'26); OpenSKAI (Sep'25, Sep'26); IAIFI Summer School, Harvard/MIT (Aug'25); Cosmology+sims+ML, Flatiron (Dec'24); Code/Astro (Jul'24); PyData Global (Oct'21); SciPy (Jul'21).

Skills

Languages: Python, JAX, R, SQL, C/C++, CUDA, Bash, LaTeX, Git; Platforms: Linux, HPC/Slurm, Hugging Face, Unsloth, MATLAB; Data: Snowflake, Teradata, PySpark, Flask.

References