T.S.SACHIN VENKATESH

+91-9560255265 | tssachin.venkatesh@gmail.com | linkedin.com/in/sachin-venkatesh | github.com/centarsirius

Undergraduate student pursuing Engineering Physics, with strong fundamentals in advanced astronomy, numerical & computational methods, atomic & molecular physics and mathematical physics. Armed with good programming skills in Python, MATLAB and IDL/GDL. Interested towards working in Astrophysics, particularly in data analysis and modeling of galactic objects, deriving inferences and applying theoretical and experimental methods to explore fundamental questions about the properties of the universe and it's different epochs. Also interested in the evolution and feasibility of different cosmological models.

EDUCATION

Delhi Technological University August 2018 - May 2022
B.Tech in Engineering Physics, Department of Applied Physics CGPA: 7/10

Bal Bhavan Public School *2011 - 2018*
AISSCE (CBSE XIIth) 2018 82.2%
AISCE (CBSE Xth) 2016 CGPA: 10/10

EXPERIENCE

Summer intern, Center for Computational Astrophysics May'21 - Present
Flatiron Institute, Simons Foundation *Mentor: Rachel Somerville*

Studying dark matter halos and their properties using machine learning, Semi-Analytical Models and numerical simulations

Student Researcher, Fluid Mechanics group Jan'21 - Present
Delhi Technological University *Mentor: R.K.Singh*

Supervised by Prof. Raj Kumar Singh at Fluid Mechanics Group, we carry out both theoretical and experimental research in areas of Computational Fluid Mechanics, Scientific Machine Learning, Airfoils and Turbulence.

Study of QGP and its properties using heavy-ion collisions Feb'21 - Mar'21
Joint Institute for Nuclear Research *Mentor: Krystian Roslon*

Generation and analysis of heavy-ion collisions events like pPb and Au-Au using the MC generator - Therminator 2 to study Quark-Gluon Plasma and its properties using and pairs

Modeling dust scattering and halos using GALEX data May'20 - Jan'21
Indian Institute of Astrophysics *Mentor: Jayant Murthy*

Working on the evolution and nucleosysnthesis of O and B type stars and the effect of cosmic dust on scattering and star formation rates. Also working on analysis of halos around bright stars and deriving inferences from them.

SWAN Antenna Design Challenge 2020 June'20 - Sept'20
Inter-University Centre for Astronomy and Astrophysics *Mentor: T.R.Seshadri*

Designed and developed a novel broadband dual polarization antenna element suitable for astronomical observations at low radio frequencies for phase-2 of the SWAN initiative using different simulation software like WIPL-D, HFSS, COMSOL and MATLAB.

Light and Beyond June'20- Sept'20
International Centre for Theoretical Sciences *Supervisor: Rajaram Nityananda*

Attended a month long summer school on optics and photonics followed by smaller peer groups working on specialized topics. Worked on gravitational lensing, specially the use of machine learning and other smart algorithms to detect exoplanets and other extragalactic objects shielded by lenses.

Fractals, chaos and their applications August'20
International Science Engagement Challenge *Mentor: Andrés López Moreno*

Worked on an interdisciplinary project bridging key concepts of mathematics and physics. Explored the relation between fractals, the Mandelbrot set and Julia sets, moved to Lorenz attractor and chaos theory. Simulated and classified stable and chaotic three body problems on MATLAB and python.

PROJECTS (SELECTED)

G2Net Gravitational Wave Detection July'21 - Present

G2Net is a network of Gravitational Wave, Geophysics and Machine Learning with a common goal of tackling challenges in data analysis and noise characterization for GW detectors using advanced simulation techniques and machine learning

Super-resolution reconstruction of turbulent flows with machine learning Jan'21 - Present

Super-resolution upscales the resolution of an image or a video and enables us to reconstruct high-fidelity images from LR data. We use various frameworks like ESPCN, ESRGAN and TecoGAN to reconstruct HR flow fields from LR data keeping in mind the need for low resource consumption and rapid output

Heavy Element Nucleosynthesis in GW170817 July'20 - Oct'20

Investigating the evidence for neutron rich nucleosynthesis processes in the EM Data of GW170817 event using data from FERMI and cross correlating the data obtained from LIGO

Applying machine learning to CERN experiments April'20 - May'20

A chain of 5 mini-projects to infer from the data generated by CERN openlab available online. Used several machine learning algorithms for Z boson mass measurement, particle detection, detector optimization, rare decay search and electromagnetic shower search.

Radio Astronomy Data Analysis July'19 - Nov'19

Recorded observations of various radio sources in the sky (Cygnus A, The Sun etc.) using the SWAN Radio Telescope and analyzed the data. Worked on data analysis of observation of the Vela Pulsar.

PUBLICATIONS

- Sachin Venkatesh, T., Srivastava, R., Bhatt, P., Tyagi, P., Singh, R. (2021). 'A comparative study of various Deep Learning techniques for spatio-temporal Super-Resolution reconstruction of Forced Isotropic Turbulent flows'. arXiv e-prints, arXiv:2107.03361, accepted for publication in IMECE2021, extension in progress
- Sachin Venkatesh, T. (2021). 'Coupling and recoupling of binaries in chaotic three body systems'. Communications of the Byurakan Astrophysical Observatory, 68, 121-124.
- Sachin Venkatesh, T., Vikranth, V. (2020). Investigating the relation between chaos and the three body problem. arXiv e-prints, arXiv:2008.12756.
- Presented a Poster at Presision 2020, an undergraduate symposium organized by Presidency University, India titled 'A study of Chaos in planar three body systems'

WORKSHOPS AND SEMINARS

- **Scipy 2021** July'21
  granted Scipy scholarship
- **ESCAPE Summer School on Data Science for Astronomy, Astroparticle and Particle Physics** June'21
  ESFRI - European Strategy Forum on Research Infrastructures
- **Sokendai Asia winter school** Jan'21
  NAO, Japan
- **IV Joint ICTP-Trieste/ICTP-SAIFR School on Cosmology** Jan'21
  International Centre for Theoretical Physics
- **CfAO fall retreat - Machine learning and other simulations for AO** Oct'20
  Center for Adaptive optics, UCSC
- **Vienna Summer School on Gravitational Quantum Physics** Sep'20
  University of Vienna
- **International Workshop on Astronomy and Relativistic Astrophysics** Sep'20
  University of Oklahoma
- **Sagan Exoplanet Summer Workshop 2020** July'20
  NASA ExScI, Caltech
- **Summer school on Nanophotonics and Metamaterials** July'20
  ITMO University, 3 credits - 108 hours course

ACHIEVEMENTS

- Special mention by DeepAI for novel work in superresolution
- Appointed as a Mentor at Major League Hacking specializing in data science and analysis to help students in hackathons and in their projects
- AWS machine learning scholarship recipient
- Intel Edge AI scholarship recipient
- Honorary mentions - Science Journalism, Pravega 2019, IISc

MISC

- **Science Outreach and Technical Communicator** Was involved with the LIGO-India project, the TMT and BARC's MACE telescope as a science communicator during Vigyaan Samagam: Mega Science Exhibition held in New Delhi during Feb'20
- **SPARE-DEPTH DTU** Co-head (academic department) of the University's Physics club. Currently mentoring sophomores on basic astronomy and astrophysics projects and courses.