T.S.Sachin Venkatesh

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Research Interests

Highly interested in computational astrophysics and cosmology. Currently studying galaxy and halo formation. Also worked on GWs, stellar evolution and radio astronomy.

Education

Bachelor of Technology in Engineering Physics Aug. 2018 - May 2022
Delhi Technological University, New Delhi, India
Overall GPA: 7/10 | Major GPA: 8.3/10

Awards and Honors

Member - DU IoE grant for establishing radio astronomy lab (INR 300,000)	2021
Special mention by DeepAI for novel work in super-resolution	2021
Scipy and PyData Global Impact scholar	2021
AWS Machine Learning and Intel edge AI scholarship	2020

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:2107.03361, ***accepted at IMECE 2021, invited extension in progress for Physics of Fluids***

Sachin Venkatesh, T. (2021). 'Coupling and recoupling of binaries in chaotic three body systems'. Communications of the Byurakan Astrophysical Observatory, 68, 121-124.

Research Experiences

Student Associate, NANOStars and PSC Oct'21 - Present
NANOGrav Mentored by Dr. Megan DeCesar

- Using pulsar and timing data data collected by telescopes like GBT, Arceibo etc. in order to analyze them and look for new pulsars that might be present in the data in a bid to learn more about special pulsar, their characteristics and other important properties.

Research Intern May'21 - Present
Center for Computational Astrophysics, FI Mentored by Dr. Rachel Somerville

- Studying dark matter halos and their properties using machine learning, Semi-Analytical Models and numerical simulations. Analysing their formation history using IllustrisTNG dark run to detect self-similarity.

Student Researcher, Fluid Mechanics group Jan'21 - Present
Delhi Technological University Mentored by Dr. R.K.Singh

- Recent project: Super-resolution reconstruction of turbulent flows with machine learning to upscale the resolution of an image or a video and enable us to reconstruct high-fidelity images from LR data.

Study of QGP and its properties using heavy-ion collisions Feb'21 - Mar'21
Joint Institute for Nuclear Research, Russia Mentored by Dr. 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 pion and kaon pairs

Modeling dust scattering and halos using GALEX data May'20 - Jan'21
Indian Institute for Astrophysics Mentored by Dr. Jayant Murthy

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

SWAN Antenna Design Challenge Jun'20 - Sep'20
IUCAA, India Mentored by Dr. T.R.Seshadri

- Designed and developed a novel broadband dual polarization antenna element suitable for astronomical observations at low radio frequencies for the SWAN initiative.

Light and Beyond Jun'20 - Aug'20
IUCAA, India Mentored by Dr. 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 Mentored by Andrés López Moreno

- Worked on an interdisciplinary project bridging key concepts of mathematics and physics like the relation between fractals, the Mandelbrot set and chaos theory. Simulated and classified stable and chaotic three body systems on MATLAB and python.

Talks and Posters

'Deep Learning techniques for spatio-temporal Super-Resolution reconstruction and how they can be extended to astronomy and astrophysics' [Talk]
CASST - The Canadian Astro-Particle Physics Summer Student Talk
SNOLAB & Queen's University, Canada August 2021

'Measure of biases in higher order precessing waveforms' [Poster]
NANOGrav Fall science meeting October 2021

'A study of Chaos in planar three body systems' [Poster]
Presision, Presidency University September 2020

Relevant Coursework

Curriculum: Classical and Quantum Mechanics, Electromagnetism, Statistical Mechanics and Condensed Matter Physics, Optics, Numerical and Computational methods, Atomic and Molecular Physics, Semiconductor Devices, Quantum Information and Computing, Microwave Engineering, Laser and Instrumentation, Cosmology and Astrophysics, Calculus, Differential Equations, Linear Algebra, Statistics

MOOCS: AstroTech, Data-driven Astronomy, Introduction into General Theory of Relativity, Statistical Mechanics: Algorithms and Computations, Particle Physics, Machine Learning

Skills

- Programming languages: Python, IDL/GDL, C++
- Operating systems: Linux, Windows, HPC architectures, CUDA
- Software: LaTeX, ds9, Git, COMSOL, MATLAB

Conferences and Workshops

- **NANOGrav Fall Science meeting** Oct'21
- **PyData Global 2021** Oct'21
- **Scipy 2021** July'21
- **EAS 2021 [Volunteer]** July'21
- **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** Oct'20
  Center for Adaptive optics, UCSC
- **Vienna Summer School on Gravitational Quantum Physics** Sep'20
  University of Vienna
- **Int'l Workshop on Astronomy and Relativistic Astrophysics** Sep'20
  University of Oklahoma

Unsupervised Projects

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.

Outreach and Mentoring

Mentor, *Major League Hacking* Jan. 2021 - present
- Appointed as a Mentor at Major League Hacking specializing in data science and analysis to help students in hackathons and in their projects

Mentor, *SPARE-DEPTH, Delhi Technological University* Dec. 2020 - present
- Mentoring sophomores and juniors on basic astronomy and astrophysics projects and courses

Outreach & Technical Communicator, *Vigyan Samagam, India* Feb. 2020
- Was involved with the LIGO-India project, the TMT and BARC's MACE telescope and coordinated logistics of public lectures