

# Sachin Venkatesh Thakku Saravana Kumar

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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	<b>Bachelor of Technology in Engineering Physics</b> Delhi Technological University, New Delhi, India - Overall GPA: 7.22/10 (till 7 <sup>th</sup> semester)   Major GPA: 9.18/10 (last 60 credits) - Thesis - ‘Constraining model parameters of the universe through observational data’ (in progress)	Aug. 2018 - May 2022	
Awards and Honors	Member - DU IoE grant for establishing radio astronomy lab (INR 300,000) Special mention by DeepAI for novel work in super-resolution Scipy and PyData Global Impact scholar AWS Machine Learning and Intel edge AI scholarship	2021 2021 2021 2020	
Publications	<b>Sachin Venkatesh, T.</b> , 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, <b><i>accepted at IMECE 2021, invited extension in progress for Physics of Fluids</i></b>  <b>Sachin Venkatesh, T.</b> (2021). ‘Coupling and recoupling of binaries in chaotic three body systems’. Communications of the Byurakan Astrophysical Observatory, 68, 121-124.		
Research Experiences	<b>Peering into the Radio Universe - DU IoE project</b> <i>Delhi University</i>  - Working on the establishment of a radio astronomy lab at DU as a student member for both research and outreach purposes. Currently fabricating different antennae and related electronic circuits to learn more about the Sun and Jupiter.  <b>Student Associate, NANOSTars and PSC</b> <i>NANOGrav</i>  - Using pulsar and timing data data collected by telescopes like GBT, Arceibo etc. and analyzing them to look for new pulsars and learn more about their characteristics and other important properties.  <b>Research Intern</b> <i>Center for Computational Astrophysics, FI</i>  - 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.  <b>Student Researcher, Fluid Mechanics group</b> <i>Delhi Technological University</i>	Nov’21 - Present Mentored by Dr. T.R.Seshadri     Oct’21 - Present Mentored by Dr. Megan DeCesar     May’21 - Present Mentored by Dr. Rachel Somerville     Jan’21 - Present 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 nucleosynthesis 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.

**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]

- International Mechanical Engineering Congress & Exposition, ASME      November 2021

- 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 Computing, Microwave Engineering, Laser and Instrumentation, Cosmology and Astrophysics

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

<b>Skills</b>	<ul style="list-style-type: none"> <li>• Programming languages: Python, IDL/GDL, C++</li> <li>• Operating systems: Linux, Windows, HPC architectures, CUDA</li> <li>• Software: LaTeX, ds9, Git, COMSOL, MATLAB</li> </ul>	
<b>Conferences and Workshops</b>	<ul style="list-style-type: none"> <li>• <b>NANOGrav Fall Science meeting</b> Oct'21</li> <li>• <b>PyData Global 2021</b> Oct'21</li> <li>• <b>Scipy 2021</b> July'21</li> <li>• <b>EAS 2021 [Volunteer]</b> July'21</li> <li>• <b>ESCAPE Summer School on Data Science for Astronomy, Astroparticle and Particle Physics</b> June'21 ESFRI - European Strategy Forum on Research Infrastructures</li> <li>• <b>Sokendai Asia winter school</b> Jan'21 NAO, Japan</li> <li>• <b>IV Joint ICTP-Trieste/ICTP-SAIFR School on Cosmology</b> Jan'21 International Centre for Theoretical Physics</li> <li>• <b>CfAO fall retreat</b> Oct'20 Center for Adaptive optics, UCSC</li> <li>• <b>Vienna Summer School on Gravitational Quantum Physics</b> Sep'20 University of Vienna</li> <li>• <b>Int'l Workshop on Astronomy and Relativistic Astrophysics</b> Sep'20 University of Oklahoma</li> </ul>	
<b>Unsupervised Projects</b>	<p><b>Heavy Element Nucleosynthesis in GW170817</b> 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</p> <p><b>Applying machine learning to CERN experiments</b> 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.</p> <p><b>Radio Astronomy Data Analysis</b> 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.</p>	
<b>Outreach and Mentoring</b>	<p><b>Mentor, Major League Hacking</b> 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</p> <p><b>Mentor, SPARE-DEPTH, Delhi Technological University</b> Dec. 2020 - present - Mentoring sophomores and juniors on basic astronomy and astrophysics projects and courses</p> <p><b>Outreach &amp; Technical Communicator, Vigyan Samagam, India</b> Feb. 2020 - Was involved with the LIGO-India project, the TMT and BARC's MACE telescope and coordinated logistics of public lectures</p>	