T.S.SACHIN VENKATESH

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Undergraduate student pursuing Engineering Physics, with strong fundamentals in advanced physics, numerical & computational methods, statistics and mathematical physics. Armed with good programming skills in Python, MATLAB and IDL/GDL. Interested towards working high fidelity data analysis and modeling of real world problems, deriving inferences and applying theoretical and experimental methods to explore possible solutions. Also interested in open source and have been active in the open source community.

EDUCATION

Delhi Technological University   August 2018 - May 2022
B.Tech in Engineering Physics, Department of Applied Physics   CGPA: 6.9/10

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 Monte Carlo generator - Therminator 2 to study Quark-Gluon Plasma and its properties using   and   pairs

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

Worked on 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 using IDL/GDL with advanced statistics and probability with aid from high resolution data analysis of science images.

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. It aims to create a broad network of scientists who have agreed on 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

Upscale turbulence simulations from low fidelity to high fidelity using state of the art techniques like TecoGAN, SRGAN , transfer learning and the flow of the data in low resource settings.

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.

Industrial Machine Learning (Nanodegree, Udacity) March'20 - May'20

Got hands-on experience on python libraries. Implemented supervised algorithms like Dec Trees, Naive Bayes, SVM, Ensemble Methods and unsupervised algorithms like K-Means, Hierarchical and Density Clustering, Gaussian Mixture Models and Cluster Validations, Random Projections and Deep Learning.

Quantum Computing - The Coding School Aug'20 - April'21

A year long quantum computing semester course by The Coding School, sponsored by IBM and taught by professors and experts from MIT in collaboration with IBM

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.

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 for instrumentation** 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

PUBLICATIONS AND MANUSCRIPTS

- 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'

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.