Vignesh Vaikundaraman

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🌐 vicky1997.github.io

Education

Ocotber 2019 – Current	**M.Sc Physics**, *Ludwig-Maximilians-Universität München, Germany*, Grade 1.9.
July 2015 – June 2019	**(B.Tech) Mechanical Engineering**, *SASTRA Deemed University, India*, Grade 7.47/10. Desh-Videsh Scholar
June.2014 – May.2015	**Senior Secondary School Leaving cerificate**, *CBSE*, India, Percentage: 91.8%.

Research Interests

Planet and Star Formation, Protoplanetary Disks, Astrophysical Fluid Dynamics and Turbulence, Radiative Processess, Numerical Methods in Astrophysics

Research Experience

May 2021 – Present

Master's Thesis, *Ludwig-Maximilians-Universität-München*, Munich, Germany.

- **Carbon destruction in protoplanetary disks using Monte Carlo models**
- Supervisor: Dr Til Birnstiel, Professor, Ludwig-Maximilians-Universität-München, Germany.
- Wrote a script to include the physics of carbon destruction to a 1-Dimensional Monte Carlo code for dust evolution.
- Code optimised using profiling tools and parallel sorting methods suitable with parallel programming. Code speed increased by more than 80 percent.
- Tools: FORTRAN, Python, OpenMP, lcov, gprof

Feb 2019 – June 2019

Research Student, *Johns Hopkins University*, Baltimore, USA.

- **Topology and Stochasticity of Magnetic Fields: A numerical investigation**
- Supervisor: Dr Ethan Vishniac, Research Professor, Department of Physics & Astronomy, Johns Hopkins University, USA
- Numerical implementation and validation of formulation of topology and stochasticity of turbulent magnetic fields.
- Formulation numerically tested and proved for phenmonena like Magnetic reconnection and Richardson diffusion in magnetohydrodynamic turbulence for a simulation of incompressible MHD data with periodic boundary conditions.
- Tools: MATLAB, Mathematical Methods

Nov.2018 – Jan 2019

Research Intern, *Indian Institute of Science Education and Research(IISER)*, Tirupati, India.

& May.2018 – July.2018

- **Study of Binary star cluster IC1848**
- Supervisor: Dr Jessy Jose, Assistant Professor, Department of Physics, IISER, Tirupati, India
- Photometric data from surveys like NEWFIRM, PanSTARRS, 2MASS and Spitzer(Optical, Near Infrared and Far Infrared data) were used to analyse the binary star cluster IC1848 also known as soul nebula.
- VOSA (Virtual Observatory SED Analyzer) was used to obtain the HR diagram for the data.
- Further analyses were done on the data in Python to obtain basic properties like average age, mass and radial distances.
- Distances were obtained from the GAIA DR2 and validated with the present values.
- Results were used to resolve the cluster into two based on the binary star system in the region.
- Tools: Python, MS Excel, VOSA, IRAF

& Sep. 2017 – Nov. 2018

Research Student, *Turbulence and Flow Control Lab, SASTRA Deemed to be University*, Thanjavur, India.

Analysis of Airflow generated by a ceiling fan system
- Experimental setup was designed and fabricated to test the flow efficiency of a set of fans in a room. Pitot tubes were used to measure the flow of air.
- Obtained data was analysed statistically in Python to map the flow of air due to a set of fans in a room.
- Tools: Experimental Methods,Python, MS Excel

Experimental Analysis of Implementing Roughness on NACA 0018 Airfoil
- Results demonstrate an effective increase in stalling angle of NACA 0018 Airfoil by 4°
- Tools and Techniques: Design and development of experimental methods using a subsonic wind tunnel, statistical analysis in MS Excel

May.2017 – July 2017

Project Trainee, *Caterpillar Private Ltd*, Chennai, India.
- Design of Jigs and Fixtures for convectional drilling machines for a possibilty of reduction of total time.
- Modification plant layout for a better flow of raw materials and end products.
- Tools: AutoCAD, PTC CREO, MS Excel.

Technical Skills

Programming Skills   **FORTRAN**, **Python**, **C**, **C++**, **MATLAB**, **Bash**, **OpenMP**, **IDL**

Tools   **Linux**, **Windows**, **LATEX**, **MS Office**, **GNUPLOT**,

Publications

Amir Jafari, Ethan Vishniac, **Vignesh Vaikundaraman**., *Power and complexity in stochastic reconnection*, Physics of Plasmas 27, 072301 (2020)

Amir Jafari, Ethan Vishniac, **Vignesh Vaikundaraman**., *Statistical analysis of stochastic magnetic fields* Phys. Rev. E 101, 022122 (2020)

Amir Jafari, Ethan Vishniac, **Vignesh Vaikundaraman**., *Magnetic Stochasticity and Diffusion*, Phys. Rev. E 100, 043205 (2019)

E. Livya, Sai Anirudh R., **Vignesh V**., Prasannavenkatesh B., Nadaraja Pillai S., *Experimental Analysis of Implementing Roughness on NACA 0018 Airfoil*, Lecture Notes in Mechanical Engineering Springer, pp 91-96 (2018)

Coursework

Essential of Advanced Astrophysics, Formation of Disks and planets

Turbulence in neutral fluids and Plasmas, Gravitational Dynamics

Radiative Processes, Stellar Atmospheres & Winds , Numerical Astrophysics Laboratory

Advanced Astrophysics Seminar "Planet Formation" , Machine Learning in Python for Physicists

Advanced Particle Physics , Non-Linear Dynamics and Chaos

Conferences & Outreach

- Invited talk on careers in Astrophysics and Space Sciences from an engineering background.
- Attended the SATCON 2 Workshop organized by AAS
- Invited lecture demonstration on Indian Classical Violin to the members of the Munich International Orchestra
- Presented research at the Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering Conference 2018
- Astronomy outreach events through the INSPIRE-DST camp for high school students.

Other Projects

Instrumentation of Radio Telescope to observe the Sun

- A small radio telescope setup was built to observe the radio image of the Sun using a dish receiver.

RC Airplane

- A radio controlled Airplane was desgined for the SAE Aerodesign Challenge
- The designed plane can carry a payload of 10"x4"x4" volume with a maximum weight of 5 kilograms

Simulation of Primordial Universe Formation

- The Image of the Cosmic Microwave Background was taken and using video editing techniques from the Adobe After Effects Software, gravity was crudely simulated.

Languages

Deutsch	A1	*Goethe-Institut Trichy, India*
English	Fluent	*TOEFL 107/120, GRE Verbal 152/170*
Tamil	Mother Tongue	
Telugu	Mother Tongue	

Extra Curricular Activites

- President of the Astronomy club of SASTRA University (2018-2019). Conducted various events and talks through the same. SEDS SASTRA Blog

- Playing violin for the past 15 years. Passed the Certificate Exam in Violin from Potti Sreeraamulu Telugu University and part of fusion band "Epitone".