Rajeshkumar K

Curriculum Vitae

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Research Interests

Computational Physics, Numerical methods, Game Theory, Nonlinear Dynamics and Complex Systems, Chaos theory

Education

Jun. 2019 - Present **BS-MS Dual Degree in Physics**, *Indian Institute of Technology*, Madras, CGPA - 7.87/10 (till 6 semesters).

Apr. 2017 - May 2019 **All India Senior School Certificate Examination**, *Kendriya Vidyalaya No.2*, Puducherry, 95.80% (PCMB).

Apr. 2016 - Apr. 2017 **Senior School Examination**, *Kendriya Vidyalaya No.2*, Puducherry, CGPA - 10/10.

Projects

Inter-IIT Tech Meet 2021 **Back-end for ISRO Astrosat Visualisation Tool**, *IIT Guwahati*.

- Created the python based back-end for Astrosat visualisation tool which handles the data and processes them for use by the front-end.
- Implemented *adaptive step size algorithm* to query SIMBAD for obtaining citation bibcodes for erraneous input database.

May 2020 - Feb. 2021 **Chaos and Dynamics**, *Horizon IITM*.

- Studied basics of numerical methods for ODE, and implemented libraries for various *numerical integration schemes*.
- Made aesthetic visualisation of various non-integrable chaotic systems such as *two-body problem*, *three-body problem*, *apsidal precession of mercury*, using Blender.

May 2020 - Feb. 2021 **Estimation of Hubble Parameter**, *Horizon IITM*.

- Studied methods of Cosmic Distance Ladder, especially *Tully-Fisher Relation*.
- Used FITS data from NASA Extra-galactic Database to perform data analysis for obtaining the luminosity vs. rotational velocity plot.
- Created semi-automatic script for fitting spectroscopic data with *multiple-gaussian model*, with graphical aids.

Honours and Awards

- Recipient of the **Innovation in Science Pursuit for Inspired Research** (INSPIRE) scholarship. A program funded and managed by Department of Science and Technology, India. It is offered to top 1.0% of the students pursuing natural sciences in the country on competitive basis.

Technical Skills

Programming Languages	Python, Bash, C++, JavaScript
Packages	Pandas, Numpy, Matplotlib, SciPy
Operating Systems	Linux (Arch, Ubuntu, Mint), Windows
Tools / Frameworks	LaTeX, Mathematica, Blender, Git, Regex, Inkscape, Illustrator, SAOImage DS9, NEC2

Relevant Coursework (upto 7th semester)

Physics

- Foundation of Computational Physics
- Thermodynamics and Kinetic Theory
- Introduction to Biological Physics
- Quantum Mechanics
- Ultrafast Lasers and Applications
- Classical Mechanics
- Statistical Mechanics†
- Condensed Matter Physics I
- Electromagnetic Theory†
- Atomic and Molecular Physics†

Mathematics

- Multivariate Calculus
- Series and Matrices
- Differential Geometry of Curves and Surfaces
- Probability, Statistics and Stochastic Processes
- Linear Algebra
- Mathematical Physics 1 (Differential Equations)
- Mathematical Physics 2 (Complex Analysis, Green's Functions and Group Representations)
- Measure theory and Integration†

Others

- Electronics
- Principles of Economics
- Life Sciences
- Literature and Life

(† Ongoing Courses)

Schools and Workshops

Aug. 2021 **Networks and Dynamical Systems Workshop**, *Complex Systems and Dynamics Group, IITM (Online)*.

May. 2022 - Present **Curves and Surfaces: Geometry and Physical Applications Summer School**, *ICTS-TIFR (Online)*.

Outreach

Service

Apr. 2021 - Apr. 2022 **Head**, *Horizon - the Physics and Astronomy club of IIT Madras*.
I am currently heading the student-run community for Physics and Astronomy enthusiasts at IIT Madras (under CFI). We encourage and conduct various activites to cater to the student body such as lectures, workshops, projects, trips and competitive events.

Aug. 2021 - Mar. 2022 **Mentor**, *Estimation of Hubble Parameter, Horizon IITM*.
I am mentoring the project team for estimating Hubble parameter by using luminosity of Type 1A supernovae.

Aug. 2021 - Mar. 2022 **Mentor**, *Visualization and Dynamics of Chaotic Systems, Horizon IITM*.
I am mentoring the project team for making a visualisation tool for dynamical systems, especially chaotic systems. Current progress include learning the tools and methods (JavaScript, P5.js, Numerical methods) and weekly discussions on relevant literature.

Talks

July 2021 **Instructor**, *Horizon's CFI Summer School 2021*.
I conducted 5 sessions for the summer school in the topics: *Linux and Version Control*, *Introductory Python*, *Linear Algebra for Quantum Mechanics*, *Applications of Schrödinger equation*. The repository for the summer school is available here.

Extra-curricular Skills

- I am proficient in 3D design and animations in Blender, especially for visualization. I have extensive experience with graphic design and scientific illustrations.