SHIVAM KUMAR

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MOTIVATION

I hold an integrated BS-MS degree in Physics from IISER Tirupati, with a focus on Complex Systems, Non-Linear Dynamics, Soft Matter Physics, and their intersection with Computational Physics. Currently, I am a PhD candidate at the University of Amsterdam, where my research focuses on multiscale spatiotemporal modeling of the microbiome during the first 1000 days of life. My broader interests lie in leveraging computational approaches to explore complex biological and physical systems.

EDUCATION

Indian Institute of Science Education and Research, Tirupati, India *August 2019 - July 2024*
Department of Physics, Integrated BS MS (5th year) CGPA: 7.9/10

Agrasen School, Patel Nagar, Bhurkunda, Hazaribagh, Jharkhand, India *March 2019*
Central Board of Senior Education (CBSE) Score: 89.00%

St. Ann's School, Ramgarh, Jharkhand, India. *March 2017*
Indian Certificate of Secondary Education (ICSE) Score: 94%

GRANTS, AWARDS AND ACADEMIC ACHIEVEMENTS

- RPA-PMH Matchmaking Seed Grant (2025)

  €18,000 awarded for the interdisciplinary project "**DIGEST**: *Diet Influence on Gut Microbiome and Effects on Suicide Ideation Tendencies*"

  Role: Co-PI — Collaboration between Computational Science Lab (FNWI) and Clinical Psychology Group (FMG), University of Amsterdam

- Awarded the IASc-NASI-INSA Summer Research fellowship 2022.
- Ranked in State Topper in the National Graduate Physics Examination 2022.

RELEVANT ADVANCED COURSEWORK

Complex Systems	Nonlinear Dynamics	Advanced Statistical Mechanics
Comp. Methods in Physics	Soft Matter Physics	Simulation and Modeling
Solid State Physics	Data Science II	Advanced Neuroscience

EXPERIENCE

PhD Student at Informatics Institute, University of Amsterdam — Multiscale Spatiotemporal Modelling of the Microbiome October 2024 - present
Amsterdam, Netherlands

As a PhD candidate at the University of Amsterdam, I am part of the METAHEALTH project within the Computational Science Lab. My research focuses on multiscale spatiotemporal modeling of the microbiome during the first 1000 days of life, analyzing the oral and gut microbiomes across micro, meso, and macro scales. By employing advanced computational techniques, I aim to understand how microbial communities contribute to both health and disease.

MS Thesis Project at IISER TVM — Recurrence network measures from dynamics of Multivariate Data
Semester 9 & 10
PRJ 501

In my ongoing MS Thesis project under the guidance of Prof G Ambika, at IISER TVM and Prof Ranjeev from IUCAA, I am working on multivariate data analysis using various measures such as recurrence plot and recurrence network.

IIT Gandhinagar, Department of Chemical Engineering - Summer Research Fellow May 2022 - July 2022
Principal Investigator - Prof. Prachi Thareja

Project Title: **Extensional rheometry with a handheld mobile device**

· Awarded the Summer Research Fellowship to pursue a two month research project at IIT GN. During this internship I examined the usage of a smartphone device for extensional characterization of a series of slime solution made up of glue and slime activator, taking advantage of smartphone cameras' developing high-speed video capabilities

iGEM (International Genetically Engineered Machine) 2021 May 2021 - November 2021
Principal Investigators - Dr.Raju Mukherjee, Prof B. J. Rao, Prof G. Ambika.

· Description - We are 15 undergraduate students of the Indian Institute of Science Education and Research (IISER), Tirupati participating in an international synthetic biology competition called International Genetically Engineered Machine (iGEM) in 2021. We were employing synthetic biology to design a novel contraceptive for uterus owners "OviCloak". The commensal bacteria of the fallopian tube would be genetically engineered to sense hormonal levels and secrete natural ovum specific contraceptive molecule.

· Results - The team won Gold Medal as well as was nominated for 7 awards.

WORKSHOPS AND OTHER PROJECTS

CDSA 2024 — Poster Presentation at 7th International Conference on Complex Dynamical Systems and Application 25th to 27th January
Digha Science Centre and National Science Camp

I attended conference on Complex systems and Nonlinear Dynamics at Digha Science Centre organised by the Indian Statistical Institute. I presented poster on "Multivariate data and Recurrence Measures" worked under the supervision of Prof G Ambika and Prof Ranjeev Mishra.

FS-PHY 2024 — Poster Presentation at 3rd third edition of the annual Frontier Symposium in Physics 2024 19th to 21st January
IISER Thiruvananthapuram

I attended symposium on Frontier Symposium in Physics at the IISER TVM campus organized by the School of Physics, IISER Thiruvananthapuram, Kerala, India. I presented poster on "Recurrence Measures and Multivariate data analysis" worked under the supervision of Prof G Ambika and Prof Ranjeev Mishra.

Semester Project — Dynamics on networks with distance dependent delay and noise. Semester 8
Complex Networks(PHY 420)

We want to a study on distance dependent delay in a coupled ring network and its behaviour in the presence of noise. We used spatiotemporal plot to understand the dynamics of the system under different values of distance dependent delay.

CNSD 2022 — Conference on Nonlinear Systems and Dynamics 15th to 18th December
IISER Pune

I attended conference on Complex systems and Nonlinear Dynamics in December, where I got exposure to various ongoing research topic in this field. After attending the talks at this conference I got a lot of research topics of my own where I would like to work on in future.

NDSD — Discussion on Neuroscience, Data Science and Dynamics 7th to 10th February
ICTS — TIFR

I attended discussion meeting on Discussion on Neuroscience, Data Science and Dynamics in February, where I got to interact with various researchers across the globe and discuss their research work on respective field.

Semester Project — Dynamics of Coupled system with time delay. Semester 7
Complex Systems(PHY 410)

We want to study the stability of the system adapted by it when a variable time delay is applied and further to find the correlation of coupling strength with this time delay. The nature of synchronization will be described using Maximum Stability Function (MSF).

Course Project — Nonlinear Dynamics of Birdsong Semester 6
Nonlinear Dynamics(PHY 326)

· The nonlinear dynamics due to the oscillation of the pair of labia was studied considering it as a two mass model. We described the change in the dynamics behavior based on a Hopf bifurcation, i.e., at a critical pressure value a stable equilibrium of the system becomes unstable and the dynamics undergo a change from a stable fixed point to a limit cycle attractor.

Term Project — Quantum Mechanics of Magnetoreception Semester 6
Quantum Mechanics - II(PHY 321)

· Reviewed the theoretical basis and experimental implementation of radical pair mechanism. We tried to gain some deeper insight into the topic of the mechanism of the magnetic compass sense in migratory birds. We studied the singlet and triplet conversion, an integral part of radical pair mechanism.

Course Project — Classical Brachistochrone on curved surface Semester 5
Classical Mechanics(PHY 311)

· The Classical Brachistochrone on curved surface was formulated applying variational calculus. We described a general method using variational principles to obtain such Lagrangian. We also plotted the brachistochrone for three different surfaces under the influence of gravity.

Graphic Designer: Minuscules August 2020

· Worked as an Graphic Designer in Minuscules a collaboration among students from IISER Tirupati aiming to disseminate knowledge and awareness about insects and other arthropods in order to promote their conservation.

COMPUTATIONAL SKILLS

Python	Java	C/C++ (Basic)	MATLAB	Fortran
Julia	Cytoscape	HTML	CSS	Javascript

ACADEMIC ACHIEVEMENTS

Awarded Excellence in Extra Curricular Activities Award March 2023

· Awarded Excellence in Extra Curricular Activities in campus throughout my academic years as a Cultural Secretary at IISER Tirupati in 2022.

Awarded 1st place in Ideathon 1.0 June 2020

· Awarded 1st place in Ideathon 1.0 as team "SARScastic COVIDnate": Innovative Solutions to Fight COVID-19, organized by Institute Innovation Council (IIC) of Indian Institute of Science Education and Research (IISER), Tirupati in the year 2020.

Qualified Graduate Aptitude Test in Engineering (GATE) 2024

· Qualified Graduate Aptitude Test in Engineering (GATE) 2024 organized by IISc Bengaluru with All India Rank (AIR) 2789 in the January 2024.

Qualified JEE Advanced 2019

· Qualified JEE Advanced in the year 2019.

Qualified JEE MAIN 2019

· Qualified JEE MAIN with 97.8 percentile in the year 2019.

Awarded Jagran Genius Award 2017

· Jagran Genius Award 2017 which was conducted by Dainik Jagran

POSITIONS OF RESPONSIBILITY

Cultural Secretary - IISER Tirupati January 2022 - December 2022

· Organized and coordinated IICM (Inter IISER Cultural Meet) 2022 at IISER Pune, Promoting cultural activities on Ethnic day, Independence Day, Spicmacay and other festivals, managing all club activities and providing annual report.

Co-coordinator Fovea - Photography Club, IISER Tirupati August 2020 - January 2022

· Organized and coordinated various photography club activities like student talks, workshops etc. Organized multiple competitions on interesting themes.

Organizing Team: Synapse December 2021
A Neuroscience Symposium

· Worked in organizing team for Synapse 2021, an annual neuroscience symposium jointly organised by IISER Tirupati and IISER Thiruvananthapuram.

Organizing Team: Revival March 2021 - April 2021
Inter IISER Cultural Meet

· Worked in organizing team for ARTiculate, a competition conducted as a part of Revival, an redemption of (Inter IISER Cultural Meet) IICM 2021 edition.

Question Framing and Design Team: Abhiprajna August 2020 - September 2020
Abhiprajna

· Worked as a Question framer and Graphic Designer for Abhiprajna, a National Science quiz event organized by the students of IISER Tirupati, for 2020 and 2021 editions.

SKILLS

- **Operating Systems:** Microsoft Windows 11, Windows 10.

- **Scripting Languages:** LaTeX.
- **Writing Tool:** Microsoft Office, Google Suite, Origin.
- **Graphic Design Software:** Adobe Illustrator, Adobe Character Animator, Canva.
- **Podcast Editing Software:** Audacity.
- **Video Editing Software:** Adobe Premier Pro, Da Vinci Resolve, VSDC.

EXTRA-CURRICULAR

- Learned Guitar at Bangiya Sangeet Parishad (2015-2016), practicing for more than eight years.
- Won Second Prize in Battle of Bands in IICM 2022 at IISER Pune.
- Having ten years of experience in writing Calligraphy.
- I often do pencil sketching.