Raman Research Institute-Bengaluru
Karnataka, India
(+91)-8921597413
Email: hareesh9910.acad@gmail.com
Github: github.com/hareesh-ak

# Hareesh Ashok Kumar

## Education

**Indian Institute of Science Education and Research(IISER), Kolkata**,
*Master of Science*, Major in Physics,
5-year Integrated BS-MS Dual Degree, *August 2017- July 2022*
**GPA: 9.05/10.00** (Overall)

## Research Experience

**Studying Giant Unilamellar Vesicles(GUVs) in the presence of active matter**
*Supervisor : Prof Pramod Pullarkat*
*Raman Research Institute(RRI), Bengaluru* *August 2022 - Ongoing*

- A 6-month research internship in the Cell Biophysics lab at the Raman Research Institute
- Aiming to study membrane fluctuations on giant lipid vesicles in an active environment, using fluorescent microscopy.
- Used electro-formation technique to create the giant vesicles and prepared bacterial suspension to create the active environment for vesicles.

**Quantum Simulations of relativistic quantum dynamics**
*Supervisor : Prof CM Chandrashekar*
*Indian Institute of Science(IISc), Bengaluru*
*June 2021 - May 2022*

- **Masters thesis** project: tasked with designing a protocol to model the Unruh effect.
- Attempted to recreate the degradation of entanglement due to Unruh effect using different discrete-time quantum walk models.
- Used QuTiP(Python) with parallel processing to gain speedup in running simulations.

**Investigating the effects of small immigration in the Lotka-Volterra Model**
*Instructor : Prof. Pradeep Kumar Mohanty*
*October 2020–December 2020*

- Course(Non-linear dynamics) project at IISER-Kolkata: Analyzed the impact of immigration terms in the classical LV model through computer simulations, for three types of prey-predator interactions.
- Developed a GUI in Python using the Tkinter module to generate phase plots for the LV system for user-input initial conditions.
- Verified stable co-existence of the predator-prey populations as a result of immigration.

**Application of Data Analysis techniques on Gravitational wave strain data**
*Instructors : Prof. Dibyendu Nandi, Prof. Rajesh Kumble Nayak*
*and Prof. Prasanta K Panigrahi*
*November 2020–December 2020*

- Course(Space astronomy) Project at IISER-Kolkata : Delegated the steps to extract the gravitational wave signal from strain data(obtained from the Gravitational Wave Open Science Center website), as tasks to team members.
- Used MATLAB to implement bandpass filtering of strain data to isolate only the required signal frequencies using the signal processing toolbox.
- Performed match filtering using PyCBC(Python) software to identify the signal.
- Analysed and compared the signals for four different real gravitational-wave events.

**A Study on a modified logistic map**
*Supervisor : Prof. Janaki Balakrishnan*
*National Institute for Advanced Studies, Bengaluru* *May 2018-July 2018*

- Summarized different types of bifurcations in non-linear systems.
- Investigated and characterised a modified 1-D logistic map using Lyapunov exponents and bifurcation diagrams.
- Developed Python code to animate the changes in the bifurcation diagram of the system caused due to varying system parameters.
- Discovered stable period-doubling bubbles in the bifurcation diagrams in specific areas of parameter space.

## Teaching experience

**Teaching assistant for a first-year undergraduate course**
*CS1101:Introduction to computer programming, IISER-Kolkata* *January 2022-April 2022*

- Tasked with handling queries/doubts from students regarding programming assignments during lab sessions.
- Provided assistance by regularly evaluating weekly assignments and relaying students' feedback to the instructor.

## Relevant courses taken

- **Space Astronomy(Data analysis course), IISER Kolkata** Click here
- **Computational Physics, IISER Kolkata** Click here
- **Biophysics, IISER Kolkata** Click here
- **Machine Learning (Online course) at Coursera**
- **Deep Learning Specialization (Online courses, ongoing), Coursera (Autumn 2021)**

## Awards & Achievements

- Selected for Visiting Student Programme(VSP) at the Raman Research Institute(RRI)-Bengaluru to pursue a **funded research internship** for 6 months.
- Awarded **INSPIRE scholarship** for 2017-2022, by the Department of Science and Technology (DST)-India, with INR 60,000 per year and INR 20,000 to cover expenses related to summer projects for every year.
- Selected for Vijyoshi 2017- **National Science Camp** held during 10-17 December 2017.
- Successfully coordinated the event 'Junkyard Wars' as an Event-organiser in 'Inquivesta' (College Science Festival), where participants were required to build mechanical models designed to perform a specific task, from junk materials.

## Skills

**Languages**: Most experienced in Python, MATLAB;
Some experience with HTML, C++
**Softwares/Packages**: Most experienced with ImageJ, Origin, NumPy, SciPy, QuTiP;
Some experience with astropy, Qiskit, Tkinter