

Samarth Kumar

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Physics undergraduate with strong theoretical and computational foundations, with proficiency in numerical calculations and computer simulations. interested in working in quantum and particle physics.


Education

Indian Institute of Technology Kanpur <i>Bachelor of Science in Physics with a double major in Statistics and Data Science</i>	2021 – Present CPI: 8.9/10
Gyanshree School Noida <i>All India Competetive Exam</i>	2017 – 2021 Top 1% in India



Awards & Honors

Haldiram Merit Scholarship <i>First ever recipient of the Haldiram Merit Scholarship</i>	2021-Present
SPARK, Fellowship <i>Research Internship Program, Indian Institute of Technology Roorkee</i>	Summer 2023
Academic Achievement Award <i>Within the top 10% of students</i>	2022-2023

Publications

Kumar, S., Gupta, N., Ghosh, S., Ghosh, A. Introduction to quantum thermodynamic cycles. J Chem Sci 135, 36. 

Research Experience

Quantum Thermodynamics <i>Quantum Thermodynamics Group IIT Kanpur, Prof. Arnab Ghosh</i>	July, 2022 – Present Kanpur, India
<ul style="list-style-type: none">Published an introductory article in the Physical Chemistry Journal of the Indian Academy of Sciences.The paper introduces Quantum Thermodynamics, directly creating a parallel to classical thermodynamics.	
Radiation Detection and Spectroscopy  <i>RDS Labs IIT Roorkee, Dr. Anil Kumar Gourishetty</i>	May 2023 – July 2023 Roorkee, India
<ul style="list-style-type: none">Engaged in developing a model for a detector array, specifically focusing on coincidence summing corrections.Used the GEANT4 toolkit to ensure a faithful representation of the array's response to gamma rays.Developed proficiency in ROOT for data visualization and acquired hands-on experience with Solidwork.Successfully simulated 4π icosahedron array geometry, and calculated detector efficiency for ^{22}Na Isotope.	
Translational Neuroscience  <i>Neuroscience and Technology Lab IIT Kanpur, Dr. Pragathi Balasubramani</i>	September, 2022 – July, 2023 Kanpur, India
<ul style="list-style-type: none">The project aimed to elucidate medication's longitudinal cognitive and behavioural effects on mental health.Established a data analysis pipeline to examine experimental data from a drug study comprehensively.Executed data preprocessing, visualization, and employed statistical tests to identify significant results.	

Industry Experience

Fron End-Development <i>Quazar Technologies Pvt. Ltd.</i>	December 2022 Delhi, India
<ul style="list-style-type: none">Developed an n-body Newtonian gravitational force simulator using object-oriented programming in C++.Spearheaded the creation of a GUI and its integration to the driver for a spin-coater using the FLTK toolkit.Achieved the goal within the specified time frame while showcasing proficiency in diverse technical domains.	

Projects

- TCS Quantum Computing Challenge** December 2023 – Present
TATA Consulting Services *India*
- Aided in the creation of a modified QUBO method to address a network flow problem for the airline industry.
 - Led a team to create a novel algorithm, leveraging qGANs in an innovative approach for stock price prediction.
- Quantum Information Reading Group** April 2023 – Present
Science Coffee House, IIT Kanpur *Kanpur, India*
- Contributed to a student-led reading group dedicated to exploring theoretical quantum information.
 - Engaged in discussions encompassing diverse topics such as entanglement, the CHSH game, and Bell states.
- Low Cost Gamma Ray Detector** ☞ September 2023 – November 2023
Dr. A. K. Kelkar, Dr. Krishnacharya K., Indian Institute of Technology *Kanpur, India*
- Headed a team in developing a cost-effective gamma-ray spectrometer utilizing Arduino UNO and Python.
 - Engineered a data acquisition system using a peak detector circuit and implemented real-time plot generation.
- Computational Genomics** ☞ July 2023 – November 2023
Dr. Hamim Zafar, Indian Institute of Technology *Kanpur, India*
- Specialized in clustering, dimensionality reduction, imputation, sequencing, and multi-omics integration.
 - Collaborated on a multi-modal variational autoencoder, using deep generative models to learn cell embedding.
 - Executed a clustering pipeline - from preprocessing to applying Leiden clustering - utilizing the scanpy library.
- Rainfall Prediction** ☞ July 2023 – November 2023
Dr. M. K. Verma, Indian Institute of Technology *Kanpur, India*
- Developed a deep learning model for rainfall forecasting in Indian cities using ten-year airport weather data.
 - Implemented a grid search algorithm to optimize the model hyperparameters in a systematic manner.
- Stamatics** ☞ June, 2022 – July, 2022
Mathematics and Statistics Society, IIT Kanpur *Kanpur, India*
- Facilitated a student-mentored reading project aimed to provide an introduction to higher mathematics.
 - Formulated an introductory article on the topic of 'Non-Orientable Surfaces' emphasising the Mobius strip.

Specialized Skills

Python Libraries and Toolkits: NumPy, SciPy, Pandas, Matplotlib, TensorFlow, Scanpy, Qiskit, Cirq
C/C++ Toolkits and Frameworks: FLTK, Cern-GEANT4, Cern-ROOT
Other Softwares: Matlab, Ansys, Fusion, Solidworks, LaTeX

Relevant Courses

† Ongoing

Physics: Quantum, Classical and Statistical† Mechanics, Optics, Electrodynamics, Experimental Physics, Computational Physics, Special Relativity

Computer Science: Data Structures and Algorithms, High-Performance Computing and Application, Machine Learning†

Mathematics: Linear Algebra, Statistics and Probability, Mathematical Methods
Other: Introduction to Electronics, Computational Genomics

Licenses & certifications

- Quantum Information (IBM)** ☞ January 2024
- Quantum Computing (QWorld)** ☞ ☞ January 2024
- Machine Learning (DeepLearning.AI)** ☞ ☞ ☞ July 2023

References

Dr. Arnab Ghosh
Assistant Professor, Department of Chemistry
Indian Institute of Technology, Kanpur
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Dr. Anil Kumar Gourishetty
Associate Professor, Department of Physics
Indian Institute of Technology, Roorkee
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