ANANTHA KRISHNAN

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Integrated BS-MS dual degree graduate Indian Institute of Science Education and Research Thiruvananthapuram

EXPERIENCE

Quantum Network Nonlocality without inputs using Neural Network Oracle

Ongoing — IISER TVM, Kerala, India

- Working with Prof. Anil Shaji and Dr. Debashis Saha on **Quantum Information Theory** and **Quantum Foundations** from a **Machine learning** standpoint & was awarded the Chanakya Fellowship (I-HUB QTF) under the **National Mission on Interdisciplinary Cyber Physical Systems**, of the Department of Science and Technology, Govt. of India
- I have found the best measurement setting for maximal nonlocality for X states & a convenient model in complex multipartite domains. I am in the process of publishing my results.

Superadditivity of Coherent Information in Noisy Quantum Channels

Jan 2022 – Apr 2022 — IISER TVM, Kerala, India

- Worked with Dr. Nagaiagh Chamakuri on the application of Meta-heuristic algorithms for finding quantum states (**RBM Architecture**) that showed **Superadditivity of coherent information**.
- Meta-heuristic algorithms such as genetic algorithms were significanty better conventional gradient descent because it bypassed the issue of optimization getting stuck in local optimas

Variational principles for finding quantum bound states

Aug 2019 – Dec 2019 — IISER TVM, Kerala, India

- Did a project on **Variational principles** for finding quantum bound states using Mathematica and Matlab under Prof. Anil Shaji,
- Made use of various shooting and relaxation algorithms, including the **Gauss-Seidel iterative algorithm** on electron wave function and energy

Exploring dynamics of Chua's circuit

Jan 2022 – Apr 2022 — IISER TVM, Kerala, India

- This was a group project where we set up **Chua's circuit** to study the evolution of its **classic chaotic behavior**.
- I learned how important project management skills are when it comes to research.

Signal locality, Unpredictability and Random number certification

Aug 2020 – Dec 2020 — IISER TVM, Kerala, India

- Did a presentation on **Bell's theorem** and the whole Bohr, Einstein debate, and its importance in random number generation.

Intent recognition Chatbot Platform for Mental Health applications

Ongoing — Cloud Cuckoo Land, India.

- Working on a **intent-recognizing chatbot** for mental health applications, by making use of a statistical system of emotion parameters making it possible for the platform to predict the user's emotional compulsiveness.

Effect of chemicals on the Fluctuating Asymmetry in plant leaves

Aug 2018 – Dec 2018 — IISER TVM, Kerala, India

- Studied the ffect of chemicals on the Fluctuating Asymmetry in plant leaves, under Dr. Ullasa Kondandaramaiah and Dr. Hema Somanathan.

RESEARCH INTERESTS

I am interested in Quantum Information theory and Quantum Foundation, especially from a Machine learning standpoint.
I am also interested in Science communication and interdisciplinary Biology, particularly Theoretical Neuroscience

COURSEWORK

- Courses on Classical, Statistical, and Quantum Mechanics, courses on Condensed matter physics, Electrodynamics with Special and General theories of relativity, Atomic and molecular physics, and High energy physics.
- Advanced courses on Quantum Information Theory, Quantum Foundations, Quantum Field Theory, and Quantum Many-Body Theories.
- Courses on Computational Techniques and Programming languages, Introduction to Machine Learning, Probability and Statistics, Advanced Mathematical methods, and Data and Statistical Models in Astronomy.

MASTERY

Python | MatLab | Mathematica | Java | R | C | MPI | Parallel Computing

Qiskit | QuTip | tensorflow and keras | CuPy and SymPy | Conda

EDUCATION

Integrated BS-MS Dual Degree in Physics

IISER Thiruvananthapuram

July 2018 – July 2023

CGPA - 8.34/10

Chanakya Fellow

July 2023 – Nov 2023

Senior Secondary - CBSE

SNPS

Passing year - 2017

Marks obtained - 90%

Secondary - ICSE

IJHSS

Passing year - 2015

Marks obtained - 93.33%

RESEARCH ACHIEVEMENTS

Master Thesis Defense "**Exploring Triangle Nonlocality using Machine Learning**"

May 3rd 2023 — IISER TVM, Kerala, India

Minor Thesis Defense "**Superadditivity of Coherent Information in Noisy Quantum Channels**"

July 20th 2022 — IISER TVM, Kerala, India

Genuine Quantum Network Nonlocality using X States

Soon to be peer-reviewed - check-here — IISER TVM, Kerala, India

HONORS/AWARDS

Chanakya PG Fellowship I-HUB QTF

May 2023 – Nov 2023 — NMICPS, Govt of India

Qiskit Quantum Excellence Awardee

2023 — IISER TVM, Kerala, India

ANVESHA Science Fest IInd Prize "Briggs Rauscher Oscillating Reaction"

2018 — IISER TVM, Kerala, India

SKILL AND EXPERTISE

Minors and Specialty Areas

- **Data Science** Minor - Machine learning, Hybrid Optimization, Quantum computing algorithms.
- **Web Development** - **NodeJS** and **flask**
- **Intent Recognition** Chatbot User Interface using NLP
- **High-performance cluster computing** and **Parallel computing** using both CPUs and GPUs in MatLab and Python using **MPI**, slurm batch script and ensemble modelling.
- Experienced in programming languages such as **Python**, **Java script**, and **C**.
- Scientific languages - **MatLab**, **Mathematica**, **R Studio**, and **Qiskit**
- **NumPy**, **SciPy**, CuPy **Matplotlib**, **seaborn** and symbolic integration and analytical calculation using **Sympy**.
- Experienced in using **QuTip** for Quantum channels and Qubits.

Optimization and other Numerical techniques

- Expertise in **Machine Learning**, particularly Neural networks as a trainable model in the **RBM** architecture and also as a means of distinguishing Quantum states.
- Image processing and Curve fitting in Biological and Chemical systems.
- Used **Tensorflow** and Metaheuristic algorithms extensively.
- Familiar with shooting and relaxation methods, particularly the Gauss-Seidel iterative algorithm on electron wave function and energy.

Software skills

- Experienced in **Adobe Photoshop**, **Adobe Lightroom**, **MS Office**, **Origin Pro**, and **Blender**.
- **Blender** to illustrate biological and chemical systems.
- Has done a robotics project using the **Qbox** Toolbox.
- Experienced with the High-performance computing toolbox in Intel **OneAPI**, slurm batch script and MPI's in cluster computing.
- Experienced in using **finesse** and **Pygwinc** packages and used it in a project in **Build a Detector Workshop, LIGO-India**.

PROFESSIONAL ORGANIZATIONS

- IISER TVM Graduate
- IISc Bangalore Summer School student
- Cloud Cuckoo Land collab

COMMUNICATION AND TEAMWORK

- Clear and concise **scientific writing**.
- Made flyer and actively volunteered for **23rd NCAMP conference school** in **IISER TVM**
- Experience working in **research teams** or **collaborative projects** like with NCAMP-23 and Cloud Cuckoo Land, India.
- **Mentoring** undergraduate students or junior researchers.
- Continous learning and participation in workshops, conferences, and training programs.

LANGUAGES

- English
- Hindi
- Malayalam

CO-CURRICULAR ACTIVITIES

- **Black belt** in Shotokan
- Content Writing, Trekking, Swimming
- **Ishya 2022** Cultural fest design coordinator
- **23rd NCAMP Conference** school volunteer
- **IICM 2022** Fashion team designer
- **Ishya 2023** Rawaaz IInd prize winner
- Have coordinated multiple college science and cultural events
- **Humanities Collective** social club member
- **Movie club** coordinator
- **Anvesha** science fest member
- **IISER TVM** student mentor

WORKSHOPS AND CONFERENCES

- I am presenting my work on **Quantum Network Nonlocality using Machine learning** at the Frontier Symposium Physics 2024 in IISER Thiruvananthapuram.
- 2021 & 2023 **Qiskit Global Summer School (QGSS)** on **Quantum Machine Learning**.
- Qiskit Workshop as part of Quantum Information Theory coursework.
- Participated in Hackathon - **Datathon IndoML** 2023
- **Brain, Computation, and Learning (BCL)** 2023 workshop at IISc, Bangalore.
- **Frontier symposium in Physics** 2022 at IISER Thiruvananthapuram.
- Attended the Summer school on **Quantum Information and Quantum Technology (QIQT)** 2021
- Participated in 2021 **Build a Detector Workshop** organized by the **NewtonBhabha** and **LIGO India** partnership
- Did an exhibition on **Briggs Rausher Oscillating Reaction** in the annual science fest of IISERTVM (ANVESHA)
- Attended the **Intel one API HPC Free Training & Workshop** at IISER Thiruvananthapuram
- Attended the **MatLab workshop** on image processing, curve fitting, and parallel computing at IISER Thiruvananthapuram
- Attended the **International Workshop on HPC in Science and Engineering 2021** at IISER TVM
- Attended **Qkrishi Quantum Computing Workshop** 2023
- Participated in **IAAC** 2020, 2021, 2022 and 2023.
- Attended the **Blender workshop** by Rafeeque Mavoor at IISER Thiruvananthapuram

DECLARATION

I hereby declare that all the information provided above is true to the best of my knowledge.

REFEREES

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