# Bharathkumar Radhakrishnan

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## EDUCATION

**University of Geneva**                                               **2021 - 2025**

*Doctor of Philosophy in Theoretical Physics*
- Performed research in computational and theoretical physics, with a focus on applying convex optimisation and Monte Carlo techniques to problems in string theory and quantum gravity
- Organised weekly seminars and group meetings, and managed visits by researchers from other universities
- Presented technical findings to both scientific and non-technical audiences
Relevant courses: Physics Applications of AI
Extracurriculars: Vice President of PhD Association of University of Geneva (2023-2024)

**California Institute of Technology (Caltech)**                      **Oct 2024 - Mar 2025**

*Visiting PhD Student in Physics*
- Collaborated with the Quantum Fields and Strings research group to improve existing convex optimisation methods for better applicability to the PhD project

**Indian Institute of Science Education and Research (IISER) Mohali**   **2016 - 2021**

*Bachelor of Science, Master of Science in Physics*
GPA: 9.8/10 Ranked: 2/55
Relevant courses: Quantum Mechanics, Quantum Information Theory, Linear Algebra and Group Theory, Real Analysis, Differential Equations, Probability and Statistics, Complex Analysis, Differential Geometry, Riemannian Geometry, Fluid Dynamics, Representaion Theory
Extracurriculars: Founded Coding Club of IISERM, Convener of Physics Club at IISERM, Main Organiser of Annual Open Day 2019

## HONORS & ACHIEVEMENTS

**Published three papers in highly respected peer-reviewed journals, with two more in preparation**
- Link to Google Scholar
**CNR Rao Foundation Prize and Academic Excellence Prize**
- Awarded for best performance in Physics major in Spring 2017 and Spring 2019.
**Awarded full scholarship for bachelors and masters by the Government of India**
**Awarded a research grant to conduct independent research for 6 months at Caltech**

## PhD RESEARCH EXPERIENCE

**Wormholes From Approximate CFTs**                                    *Ongoing*

- Conducted research on the statistical emergence of wormholes by analyzing density fluctuations in Conformal Field Theory using random matrix theory.

- Developed parallelised C++ code to generate samples from high (100+) dimensional probability distributions using Markov Chain Monte Carlo methods on a HPC.

- Optimised handling of large numbers using multi-precision libraries without compromising speed, enabling the generation of approximately 500 million samples per hour.

- Designed an efficient data storage and analysis pipeline using Apache Arrow, processing over 2 million time-series records; increased disk efficiency by 3x and analysis efficiency by 5x compared to traditional CSV files

**Constraints on String Theories with Boundaries**                     *Ongoing*

- Created a mathematical framework utilising convex optimization and semidefinite programming to determine validity of boundaries in string theory-related models.

- Developed highly optimized code to integrate Mathematica, Python, and C++ for automating the conversion of complex mathematical functions into well-defined optimization problems, interfacing with a semidefinite program solver tailored for high-energy physics applications.

## SKILLS

Python, C++, OpenMP, Mathematica, Linux, SLURM, Apache Arrow, Pandas, Matplotlib, Latex, Git, PyTorch