Himanshu Chaudhary

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EDUCATION

California Institute of Technology **2020 –**
Phd (Physics) *Pasadena, US*

Indian Institute of Science **2019 – 2020**
MS (Physics major) *Bengaluru, India*

Indian Institute of Science **2015 – 2019**
BSc (Physics major Maths minor) *Bengaluru, India*

Higher Secondary Examination(ISC) **2015**
Seth M.R. Jaipuria *Lucknow, UP, India*

High School Examination(CBSE) **2013**
Central Academy *Allahabad, UP, India*

PUBLICATIONS

- Benchmark for the Determination of the Positronium Formation Fraction in Interstellar Media, Daniel G. Cocks et al. 2019 ApJ 878 123
- A Software Simulator for Noisy Quantum Circuits, Apoorva D. Patel et al., arXiv:1908.05154
- Cosmic Censorship of Trans-Planckian Field Ranges in Gravitational Collapse, Himanshu Chaudhary, Chethan Krishnan, arXiv:2003.05488

FELLOWSHIPS/AWARDS

- KVPY Fellowship (2015-2020)
- Chennupati and Vidya Jagadish Fellowship and Scholarship Awards (2019)

PROGRAMMING LANGUAGES

- C++
- Mathematica
- Matlab
- Python
- Julia

PROJECTS

Better initial data and gauges for high mass ratio BBH simulations — Caltech, 2023-

- **Guide/Collaborators**: SXS collaboration
- **Description**: In high mass ratio simulations the smaller black hole usually has a very small horizon which makes grid structure very complicated. Using better gauges combined with better initial data we can increase the coordinate size of the horizon thus simplifying the grid therefore making other parts of the code more efficient.

New gauge conditions for simulating BBH collisions — Caltech, 2022-

- **Guide/Collaborators**: SXS collaboration
- **Description**: The smaller black hole horizon gets very deformed in the current simulation(SpEC) of high mass ratio BBH. This is undesirable because numerically resolving such systems is costly. Current understanding is that this is caused by our gauge choices and a better choice of gauge can solve this issue. I am current trying to use the gauge driver formalism to find and enforce a better gauge condition.

A faster implementation to find the black hole spins during simulations — Caltech, 2021-2022

- **Guide/Collaborators**: SXS collaboration
- **Description**: Finding the spin of a black hole amounts to assembling and solving a generalized eigenvalue problem. By switching to iterative algorithms we were able to effectively reduce the time complexity of the whole algorithm by $O(N)$, N being the size of our linear system. This resulted in very significant speedups during the later stages of the simulation.

Cosmic Censorship of Trans-Planckian Field Ranges in Gravitational Collapse — IISc, 2019-2020

- **Guide/Collaborators**: Chethan Krishnan
- **Description**: This project explored the possible relations between the $O(1)$ field movement during the gravitational collapse of a scalar field and one of the swampland conjectures. It was found that the $O(1)$ field movement is always hidden behind an apparent horizon.

Quantum Computing library for Noisy Quantum Circuits — IISc, 2019

- **Guide/Collaborators**: Apoorva D. Patel
- **Description**: I was part of the group formed by Prof. Apoorva D. Patel to make a Quantum Computing Library for Noisy Quantum Circuits using IBM Qiskit library as a backend. This library is currently being used in QSim.

Determining the cause of spontaneous contractions in uterine tissue during labor — IISc, 2018-2019

- **Guide/Collaborators**: Rahul Pandit, Alok Nayak
- **Description**: The idea of this project was to find factors that lead to spontaneous yet rhythmic contraction during the labor. We used the single-cell model developed by Tong et al. as the starting point, added passive cells to their model, and arranged them in a grid to form a model of uterine tissue.

Simulating Positron transport through interstellar medium — Australian National University, 2018-2019

- **Guide/Collaborators**: Joshua Machacek, Daniel Cocks
- **Description**: We developed code to determine the positronium formation fraction due to Positrons moving through interstellar media.