

CV

Varun Kannan

Email: varunkannan2000@gmail.com

Phone: 1-630-210-6897

Website: www.qgspinor.com

LinkedIn: www.linkedin.com/in/varun-kannan-321b58207

Education

2018-09 - 2022-06: Bachelor of Science: Physics, Minor in Mathematics

University of California - San Diego - La Jolla, CA

GPA: 3.32 | 3.53 Upper Division | 3.60 Major | 3.8 Upper Division Major

Honors: Provost Honors (5 terms), Salutatorian (HS)

Research Interests

- Quantum Gravity
- Quantum Field Theory
- General Relativity
- Quantum Information
- Quantum Technology

Research Experience

Quantum Physics Research Intern

06/2021 - 09/2021

UCSD Physics Department , La Jolla, CA

Dr. Daniel Green, Associate Professor

- Assisted Professor Green in his research on quantum fluctuations in the early universe with a focus on the CMB
- Gathered, arranged and corrected research data related to the CMB to create representative graphs and summaries highlighting the key insights related to entanglement and decoherence 1-2 times a week.
- Identified issues in existing models of the CMB, analyzed related information and provided solutions to problems by proposing alternate models
- Built a consistent theoretical model of decoherence and emergent behavior of classical, statistical systems from their underpinning quantum nature
- Worked to maintain outstanding attendance record, consistently logging into virtual work meetings on time and ready to start immediately

Quantum Field Theory/Cosmology Research Honors

09/2021 - 12/2021

UCSD Physics Department , La Jolla, CA

Dr. Daniel Green, Associate Professor

- Continuation of the same topic as the internship done under Dr. Daniel Green of quantum fluctuations in the early universe, but with more independence of chosen topics.
- Gathered, arranged, and analyzed research data from various sources on the cosmological aspects of the evolution of the universe and its origin from quantum fluctuations
- Wrote a short paper summarizing my findings and proposed a possible model for decoherence in the context of this research
- Tried to represent the Bell inequality and the quantum entanglement of two particles by a variety of different models
- Presented the progress for my research weekly to Dr. Green

General Relativity Independent Study and Research

03/2021-09/2021

Dr. George Fuller

UCSD Physics Department/ Mathematics Department, La Jolla, CA

- Did an independent study of General Relativity from basics to advanced topics under the guidance of Professor Fuller
- Learned the formulation of tensors and differential geometry to model spacetime curvature, the derivation or proposal of the Einstein equations, possible solutions to the Einstein equations, the role of torsion, and an extended study of the singularity theorems
- Proposed alternate models of GR after studying different models which include torsion and considered the implications of such models
- Conducted research, gathered information from multiple sources and presented results by writing ten page paper on the singularity theorems of general relativity.
- Exceeded goals through effective task prioritization by attending a grad-level course on the same subject the following quarter.
- Created plans and communicated deadlines to complete projects on time by doing weekly review meetings and individual lectures with Professor Fuller over the course of 6 months.
- Identified issues, analyzed information and provided solutions to problems.

Publications and Related Work

- Authored a paper based on individual study along with a review from Dr. Jeffrey Rabin on the geometric interpretation of gauge theories and their applications in the formulation of theoretical models in quantum gravity
- Authored a review paper of the singularity theorems and their rigorous definition from a mathematical point of view rather than a physical approach
- Created the website, www.qgspinor.com, where I post technical writing, short review articles, derivations, and related exploratory topics in theoretical physics and mathematics.

Technical Skills

- Programming Languages: Python, Java, C#, Dart, Mathematica
- Programming related frameworks: Pandas, NumPy, Matplotlib, Flutter, Unity, Jupyter Lab
- Programming related platforms: Linux, WSL, JetBrains Rider, Android Studio

Projects/Related Work

- Quantitative Trading Model
Skills: Python, NumPy, JSON, Matplotlib, Pandas, Jupyter Lab
Designed trading strategies, including mean reversion, momentum trending, and PCA, based on data analysis of various types of stock data. Implemented data extraction, signal generation, and data modeling to create metrics which track performance of various strategies, such as Sharpe Ratio, beta, and alpha.
- Calculator App Development
Skills: Flutter, Dart, Android Studio
Developed an interactive calculator app capable of doing simple mathematical calculations. Has cross-platform capabilities and is being expanded to support calculus operations. Preparing for Android release.
- Open World Game Prototype
Skills: Unity, C#
Designed a single-player open-world demo with basic player movement abilities. Being expanded to include robust player-environment capabilities and VR based UI. Part of a larger virtual simulation developing framework.

- Java Projects and Data Structures Course
Skills: Java
Completed advanced data structures course using Java, offered online by UCSD. Applied concepts such as search trees and efficient sorting algorithms in various small-scale projects.
- Mathematical Simulation Projects
Skills: Mathematica
Designed various visual models of physical systems such as the heat equation and quantum harmonic oscillator under the supervision of Dr. Daniel Green

Courses

Physics

- Quantum Physics: 130A-B
- Statistical Mechanics: 140A
- Classical Mechanics: 110A-B
- Mathematical Physics: 105A
- Electromagnetism: 100A-C
- Physics: Circuits and Electronics: 120
- Physics: Condensed Matter/MATL Sci Lab: 133
- String Theory: 137
- General Relativity: 225A
 - (Note this was only an elective, so isn't included in major GPA)

Mathematics

- Differential Geometry: 150A-B
- Applied Linear Algebra: 102
- Elements of Complex Analysis: 120A
- Mathematical Reasoning: 109

Awards

- Provost Honors: Fall 2019, Fall 2020 - Spring 2021, Spring 2022

References

References available upon request