

# VISHAL G. RAMAN

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## EDUCATION

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### University of California, Berkeley

August 2019 - Present

B.A. Computer Science, Mathematics(GPA: 3.9)

**Graduate Coursework:** *High-Dimensional Data Analysis, Combinatorial Algorithms, Measure Theory and Topology, Functional Analysis, Differentiable Manifolds, Partial Differential Equations, Several Complex Variables, Probability Theory, Stochastic Processes*

**Undergraduate Coursework:** *Artificial Intelligence, Machine Learning, Computer Architecture, Theoretical Statistics, Database Architecture, Econometrics*

## WORK/RESEARCH EXPERIENCE

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### Berkeley Artificial Intelligence Research(BAIR) Lab

Fall 2021

Research in theoretical deep learning/optimization under the supervision of Yi Ma; my research focuses on understanding and extending the ReduNet framework, a "white-box" deep network for high-dimensional data with an information-theoretic objective function that gives rise to operators with precise optimization and geometric interpretation.

### IMC Trading, Software Engineering Intern

Summer 2021

Developer on the FICC/Index Strategy team; worked on the component that computes and publishes several different toxicity signals associated with trade events. Conducted data analysis to optimize parameters for trade-through toxicity signals.

### UC Berkeley, Research Intern

Spring 2021

Guided research in statistics/partial differential equations under the supervision of Tyler Maltba. Used sparse regression and physically-informed neural networks(PINN) in order to render probability density functions(PDFs) or cumulative distribution functions(CDFs) for stochastic dynamical systems.

### Renyi Institute, Research Intern

Fall 2020

Group research in convex geometry under the supervision of Gergely Ambrus. Studied relaxations of Helly's theorem in order to characterize transversal properties of families of convex sets.

## PROJECTS

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### Free Probability

Fall 2021

Advised by Dan-Virgil Voiculescu. Supervised reading studying Free Probability Theory, which generalizes the notion of independent random variables to Operator Algebras in order to study non-commutative distributions. Has a variety of applications in random matrix theory, combinatorics, quantum information theory, etc.

### Pizza Market Making

Summer 2021

Autotrader competition at IMC Trading - handles multiple correlated symbols, hitting and quoting, arbitrage detection, etc. Uses volume/price offsets, position management, Volume Weighted Average Price(VWAP) valuation.

### Geodesic Convex Optimization

Spring 2021

Reading and implementation project covering differential and Riemannian geometry, geodesic convexity, and applications to non-convex optimization problems such as computing the Brascamp-Lieb constant and the operator scaling problem.(CS 270 at Berkeley)

## HONORS

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William Lowell Putnam Mathematical Competition - Top 500

Winter 2020

American Invitational Mathematics Exam(AIME) Qualifier

Spring 2019

United States of Olympiad Physics Olympiad (USAPhO) - Honorable Mention

Spring 2019

United States of America Computing Olympiad(USACO) - Gold Division

Spring 2018

**Programming Languages:** Python, Java, C++, R, SQL, MongoDB,  $\LaTeX$

**Libraries/Frameworks:** NumPy, pandas, TensorFlow