VISHAL G. RAMAN

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EDUCATION

University of California, Berkeley *August 2019 - Present*
B.A. Computer Science, Mathematics(GPA: 3.92)
Graduate Coursework: ***Numerical Linear Algebra****, Combinatorial Algorithms, Measure Theory and Topology, Functional Analysis,* ***Partial Differential Equations****,* ***Probability Theory****,* ***Stochastic Processes****, Dynamical Systems, Riemannian Geometry,* ***Theoretical Statistics****,* ***Deep Reinforcement Learning****, Advanced Combinatorics, Algebraic Topology,* ***High-Dimensional Data Analysis***
Undergraduate Coursework: *Algorithms and Complexity Theory,* ***Artificial Intelligence****,* ***Machine Learning****,* ***Deep Neural Networks****, Computer Vision, Computer Architecture, Database Architecture,* ***Econometrics***

WORK/RESEARCH EXPERIENCE

Hybrid Value-Policy Iterations (Cornell REU) *Summer 2022*
Advised by A. Vladimirsky. Developed and proved convergence bounds for a novel reinforcement learning algorithm called Hybrid Value-Policy Iterations, which uses a threshold to alternate between value iterations and policy iterations in order to enable global quadratic convergence while reducing overall computational complexity compared to traditional algorithms.

Semicausal Dynamic Programming (Cornell REU) *Summer 2022*
Advised by A. Vladimirsky, collaborated with M. Wang. In Optimal Control, situations arise where the Hamilton-Jacobi-Bellman PDE satisfied by the optimal value function is of mixed-type(parabolic, hyperbolic, elliptic). We propose a novel efficient algorithm for simultaneously computing the boundary and solving the PDEs of each type.

Curvature Compression (Berkeley Artificial Intelligence Research) *Spring 2022*
Advised by Y. Ma, collaborated with M. Psenka, D. Pai. This work proposes an algorithm for explicitly constructing a neural network that linearizes an embedded submanifold, from finite samples of this manifold. Our method builds from a geometric viewpoint of representation learning; we show that minimizing the extrinsic curvature of the representation yields a minimal, injective, and convex representation. Submitted to NeurIPS 2022.

Data Consulting (SAAS Berkeley) *Fall 2021 - Present*
(Spring 2022) Used and developed computer vision models to design an image-rectification network for menu images. Used by Woflow, a ML-powered task automation system to process merchant data into a scalable infrastructure.
(Fall 2021) Developed multi-armed bandit (MAB) algorithms to perform on-line A/B testing and empirically measure statistical significance of experiments. Used by CroMetrics, which uses data-driven techniques and statistical models to develop marketing strategies.

Trade-Through Toxicity (IMC Trading, Chicago) *Summer 2021*
Software Engineering Intern on the FICC/Index Strategy team; implemented the component that computes and publishes toxicity signals for several classes of products. Conducted data analysis to optimize toxicity signals for trade-through events.

Learning Physical Stochastic Dynamical Systems (Berkeley, Department of Statistics) *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.

Generalizations of Helly's Theorem (Renyi Institute in Budapest, Hungary) *Fall 2020*
Group research in convex geometry under the supervision of G. Ambrus. Studied relaxations of Helly's theorem with fractional transversals in order to characterize transversal properties of families of convex sets. Honorific Mention at XXXVI Victor Neumann-Lara Colloquium.

HONORS

William Lowell Putnam Mathematical Competition(Top 500) *Winter 2020*

Olympiad Results
American Invitation Mathematics Exam(AIME) 2x Qualifier, United States of America Physics Olympiad (USAPhO)(2x Qualifier, Honorable Mention), United States of America Computing Olympiad(USACO)(Gold)

Programming Languages: Python, Java, Matlab, C/C++, R, SQL, MongoDB, LaTeX, Haskell
Libraries/Frameworks: NumPy, pandas, TensorFlow, PyTorch, SciPy, Boost, Eigen