Yiping Miao

(341) 333-9573 | pingping@berkeley.edu | [Personal Website]

Education

University of California, Berkeley — Aug. 2022 – May 2027 (Exp.)
Ph.D. Candidate in Logic and Methodology of Science — *Joint Math, Philosophy, EECS*

- **Research Area:** Computability Theory

University of Oxford — Sept. 2021 – Sept. 2022
M.Sc. in Mathematics and Foundations of Computer Science

- **Relevant Coursework:** Computational Game Theory

Zhejiang University — Aug. 2017 – May 2021
B.Sc. in Mathematics and Applied Mathematics

Research Interests

Kolmogorov Complexity: Hausdorff dimension under the lens of computers. In particular, what is the minimal information we need to recover a random infinite binary strings.
Set Theory (Axiom and Proofs): Provability / unprovability (consistency result) of geometric measure theory statements under set theoretic axiom(s), e.g. CH, MA.
Geometric Measure Theory: I'm working with gauge functions to classify size of sets, which is a finer notion of Hausdorff dimensions.

Selected Publications & Academic Presentations

Dimension of Generic Reals (Submitted) – This paper investigates the Hausdorff measure of certain sets of generics in computability theory. Let Γ be the Turing ideal in which we take the dense open sets. The set of Γ-Cohen generics has measure positive if and only if the gauge function is not dominated by every element in Γ, under some mild restrictions on the gauge function. The set of Γ-Mathias generics and the set of Γ-Sacks generics have measure positive if and only if the gauge function eventually dominates every element in Γ. This gives some comparison between the behavior of reals in the set and the measure of the set.

Gauge of Effective Dimension (Submitted) – We characterize the gauge profiles of $\mathcal{D}_s$, the set of reals with effective dimension s, and $\mathcal{D}_{\leq s}$, the set of reals with effective dimension $\leq s$. Let $W(s)$ be the set of reals that are s- well approximable. This gives us a separation between $\mathcal{D}_{\leq s}$ and $W(2/s)$ in terms of Hausdorff measure.

Subfields of R with Arbitrary Hausdorff Dimension, from MA (In Preparation) – In his 2016 paper Mauldin proved that under CH, for all $0 \leq t \leq 1$, there exists a subfield of $\mathbb{R}$ that has Hausdorff dimension t. We modify the construction in Mauldin's paper to a two-step recursive construction and reduce the condition to MA, We also extend subfields to sets closed under certain operations.

Randomness for Two Coordinates (In Preparation) – Hausdorff dimension of a set is closely related to the Kolmogorov complexity of points in the set. This is demonstrated by the point-to-set principle devoloped by Jack Lutz, Neil Lutz... For $0 < s, t < 1$, van Lambalgen does not go through under the usual randomness notion. We define a randomness with the restriction on oracle use. Under this restriction, van Lambalgen goes through with a finer analysis on the gauge dimension of the real in the effective setting.

Invited Speaker & Presentations – Invited speaker at Computability, Complexity, Randomness (Sept. 2026); presented at Penn State University (March 2026), Logic Colloquium (British colloquium) (June 2026), ASL North America Meeting (July 2026), Nanjing University (Jan 2026), Singapore Summer School in Logic (July 2025)

Machine Learning Projects

Training AI (Single Neuron, Two-Layer Neuron, Micrograd, Two-Layer by PyTorch) (NumPy, PyTorch) [GitHub]
High-Frequency Signal Processing & Microstructure Modeling (NumPy, Pandas) [GitHub]
High-Dimensional Factor Modeling & RMT Noise Filtering (NumPy, Pandas, Scikit-Learn) [GitHub]

Teaching & Leadership

Graduate Student Instructor — UC Berkeley
Linear Algebra and Differential Equations, Calculus, Analytic Geometry and Calculus — *2022 – Present*