

Yiyuan Luo

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Education

Ph.D. in Computer Science and Engineering, University of California Santa Cruz 2024 – 2028 (*expected*)

Advised by Prof. Vaggos Chatziafratis.

M.S. in Computer Science and Engineering, University of California Santa Cruz 2022 – 2024

B.Eng. in Computer Science and Technology, Beijing Jiaotong University 2017 – 2021

Research Experience

Empirical Representation Learning (current focus) Late 2025 – present

LLM representations and interpretability. Built **Attention Relay** [Paper] [Website] [Code], which transfers instruction-following capability from an LLM to an embedding model without training.

Theory of Contrastive Learning 2024 – 2026

Hardness, dimension, and generalization of contrastive learning from triplets: local optima (NeurIPS 2025), dimension–accuracy collapse (ICML 2026 Spotlight), and VC dimension with margin.

CSPs, Phylogenetic CSPs, and Hierarchical Clustering 2023 – 2025

Approximation, satisfiability, and refutation for tree-structured CSPs, including optimal phylogenetic reconstruction from sampled quartets (STOC 2026) and the first sharp threshold for a phylogenetic CSP.

Publications

- **Lend Me Your Eyes: Instruction-Aware Text Embeddings via Attention Relay.** Yiyuan Luo, Vaggos Chatziafratis. Under review, 2026. [Paper] [Website] [Code]
- **Optimal VC Dimension of Contrastive Learning with Margin.** Dionysis Arvanitakis, Vaggos Chatziafratis, Yiyuan Luo, Konstantin Makarychev. Preprint, 2026. [Paper]
- **Strong Refutation of Ordering, Phylogenetic, and Ordinary CSPs, and New Satisfiability and Refutation Thresholds for Triplet and Quartet Reconstruction.** Dionysis Arvanitakis, Vaggos Chatziafratis, Yiyuan Luo, Konstantin Makarychev. Preprint, 2026. [Paper]
- **Provable Accuracy Collapse of Embedding-Based Representations under Dimensionality Mismatch.** Dionysis Arvanitakis, Vaggos Chatziafratis, Yiyuan Luo. ICML 2026 (Spotlight). [Paper]
- **Optimal Phylogenetic Reconstruction from Sampled Quartets.** Dionysis Arvanitakis, Vaggos Chatziafratis, Yiyuan Luo, Konstantin Makarychev. STOC 2026. [Paper]
- **The Complexity of Finding Local Optima in Contrastive Learning.** Jingming Yan*, Yiyuan Luo*, Vaggos Chatziafratis, Ioannis Panageas, Parnian Shahkar, Stelios Andrew Stavroulakis. NeurIPS 2025. [Paper] (* equal contribution)

Service, Teaching, and Industry

- Reviewer: ICLR 2027; ICML 2025, 2026; AAAI 2026; SODA 2026, 2027; ISAAC 2024
- Teaching Assistant, UC Santa Cruz: seven courses including Machine Learning, Introduction to NLP, Modern Algorithmic Toolbox, and Analysis of Algorithms (2023 – present)
- Software Engineer Intern, TikTok (ByteDance), 2020