ISAAC LIAO

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EDUCATION

Massachusetts Institute of Technology GPA: 5.0/5.0 *Sep 2019 - Present*
BS expected in June 2023, Double major in Computer Science and Physics
Earl Haig Secondary School *Sep 2015 - Jun 2019*
Ontario Secondary School Diploma (OSSD)

RELEVANT COURSEWORK

Graduate Statistical Learning Theory, Graduate Information Theory, Computer Vision, Undergraduate Advanced Research. Built superfluid simulator using split-step method on Gross-Pitaevskii equation, with visualizations used to teach MIT Classical Mechanics II class.

RESEARCH EXPERIENCE

Meta Learned Optimization
MIT Advanced Undergraduate Research Opportunities Program (Advisor: Marin Soljačić)
Ideation, refinement, theoretical analysis, and empirical testing of novel adaptive machine learning hypergradient optimization algorithms. Writing and submission of paper for arXiv and ICLR, and rebuttal preparation during double blind review.

Few Shot Learned Image Compression
Final project in computer vision class
Ideation, refinement, theoretical analysis, and empirical testing of novel techniques for neural image compression in the one-shot regime. Use of information theory to develop channel codes for compression resembling the forward passes of VAEs and BNNs. Reinvented reparameterization gradients, hierarchical depth, and KL annealing schedules in the process, without prior knowledge of variational inference.

PUBLICATIONS

Isaac Liao, Rumen R. Dangovski, Jakob N. Foerster, Marin Soljačić. *Learning to optimize quasi-newton methods*. Submitted to The Eleventh International Conference on Learning Representations, 2023. URL `https://openreview.net/forum?id=EqDnVOyiVX`. under review.

Introduces a novel machine learning optimizer which blends learn to optimize (L2O) meta-learning techniques with quasi-Newton optimization methods using sparse neural networks. Theoretical results regarding convergence in convex and nonconvex settings and parameter-efficient representation of compositionally sparse optimizer strategies, with experimental support.

AWARDS AND HONORS

International Physics Olympiad: *Silver Medal* *Tel Aviv, Israel, July 2019*
International Physics Olympiad: *Honorable Mention* *Lisbon, Portugal, July 2018*
MIT Battlecode Competition: Champion, solo *Cambridge, MA, Jan 2022*
MIT Battlecode Competition: 7th place, solo *Cambridge, MA, Jan 2021*
MIT Battlecode Competition: Champion of Newbie division, solo *Cambridge, MA, Jan 2020*

EXTRACURRICULARS

Ice skating, game AI Programming, piano, AI@MIT Reading Group, MIT AI Alignment Club, poker