Owen Melia

Graduate Student
PhD Program in Computer Science
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Education

M.S. in Computer Science, March 2023
University of Chicago, Chicago, IL
Advisor: Rebecca Willett

B.S. in Mathematics (specialization in Economics), June 2019
University of Chicago, Chicago, IL

Publications

Owen Melia, Eric Jonas, and Rebecca Willett. Rotation-Invariant Random Features Provide a Strong Baseline for 3D Point Clouds. In *Transactions on Machine Learning Research*, 2023.

Milton Pividori, Padma S. Rajagopal, Alvaro Barbeira, Yanyu Liang, *Owen Melia*, Lisa Bastarache, YoSon Park, The GTEx Consortium, Xiaoquan Wen and Hae K. Im. PhenomeXcan: Mapping the genome to the phenome through the transcriptome. In *Science: Advances*, 2020.

Alvaro N. Barbeira, *Owen Melia*, Yanyu Liang, Rodrigo Bonazzola, Gao Wang, Heather E. Wheeler, François Aguet, GTEx Consortium, Kristin G. Ardlie, Xiaoquan Wen and Hae K. Im. Fine-mapping and QTL tissue-sharing information improve causal gene identification and transcriptome prediction performance. In *Genetic Epidemiology*, 2020.

Ongoing Research Projects

Deep Learning for Nonlinear Inverse Scattering Problems. Imaging techniques using low-frequency acoustic or electromagnetic waves allow for deep and non-destructive probing of unknown media, but recovering high-fidelity images remains computationally difficult. This project is an attempt to use deep learning to solve inverse acoustic scattering problems in a highly-nonlinear regime, where previous deep learning approaches fail and traditional reconstruction algorithms require days to complete.

Modeling Physical Symmetries in Data Assimilation. Data assimilation methods attempt to infer models of dynamical systems from incomplete or noisy observations of the system state. These dynamical systems often have intrinsic symmetries, such as translation or rotation invariance. At the same time, the machine learning community has built tools for constraining learned models to respect these symmetries. We combine the two fields of research to show that data assimilation methods are more accurate and require less data when using these machine learning techniques.

Random Features for Particle Jet Tagging. High-energy physics experiments, such as the Large Hadron Collider at CERN, observe millions of collision events per second. These experiments require filtering algorithms with microsecond latency that determine whether a given collision event should be recorded for further analysis. We propose flexible random features models which accurately separate signal from background, comply with known physical symmetries of particle collisions, and have extremely low latency at prediction time.

Professional Experience

Data Scientist, 2019-2020
University of Chicago Department of Human Genetics, Chicago, IL
Supervisor: Hae Kyung Im

Awards and Grants

(Fellowship) NSF Research Traineeship in AI-Enabled Molecular Engineering of Materials and Systems for Sustainability. 2021-2023

Service and Outreach

Volunteer, Hyde Park-Kenwood Food Pantry. 2020-Present

Teaching Experience

Teaching Assistant, Autumn 2023
University of Chicago, Chicago, IL
Mathematical Foundations of Machine Learning

Teaching Assistant, Winter 2022
Toyota Technological Institute at Chicago, Chicago, IL
Introduction to Machine Learning (Graduate)

Teaching Assistant, Autumn 2020
University of Chicago, Chicago, IL
Mathematical Foundations of Machine Learning

Course Assistant, Winter 2020
Toyota Technological Institute at Chicago, Chicago, IL
Convex Optimization (Graduate)

Course Assistant, Winter 2019
University of Chicago, Chicago, IL
Mathematical Foundations of Machine Learning

Course Assistant, Autumn 2018
University of Chicago, Chicago, IL
Abstract Linear Algebra