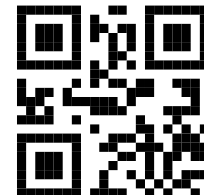


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Matt Raymond
ML, Nanochemistry, Computer Science



Education	University of Michigan <i>Ph.D. Signal/Image Processing and Machine Learning</i> <i>GPA: 3.92</i> <ul style="list-style-type: none">• Co-advised by Drs. Angela Violi and Clayton Scott• President of the student signal processing seminar: websites.umich.edu/~speecsseminar/• Thesis Topic: <i>Generative Modeling of Nanoparticles Via Transfer Learning</i>	Ann Arbor, MI 08/22–04/26
	University of Michigan <i>M.Sc. Computer Science</i> <i>GPA: 3.91</i> <ul style="list-style-type: none">• Member of the VioliGroup computational biochemistry lab (3 semesters, 2 summers)• President of the Machine Learning Theory Reading Group, 1 semester	Ann Arbor, MI 08/20–04/22
	Chapman University <i>B.Sc. Computer Science, Music Minor</i> <i>GPA: 3.86</i> <ul style="list-style-type: none">• Member of the Provost List, 8 semesters• Recipient of the Chancellor's Scholarship, 8 semesters• Tutor and Supplemental Instructor for Computer Science and Math, 4 semesters	Orange, CA 08/16–05/20
Papers	Machine Learning Models for Nanoparticle Growth in Nonthermal Plasma <i>TBD</i> <ul style="list-style-type: none">• Develop surrogate ML models for estimating sticking coefficients of silane nanoparticles in nonthermal plasma• Supervised undergraduate students<ul style="list-style-type: none">– Jonathan Lin and Zewei Yu• Currently cleaning results and preparing paper for publication	Ongoing
	Multitask Learning of Universal Features for Chemistry Datasets <i>TBD</i> <ul style="list-style-type: none">• Develop novel multitask impurity function for gradient boosted trees• Extend Scikit-Learn to include our method (using Python and Cython)• Track experiments using Data Version Control and test using PyTest• Outperform MultiBoost and Dirty LASSO on 7 diverse chemistry datasets, including proteins, nanoparticles, and small molecules• Show that multiple chemical scales can be represented using a few universal features	Ongoing
	Domain-Agnostic Predictions of Nanoscale Interactions in Proteins and Nanoparticles <i>Nature Computational Science (cover Article)</i> <ul style="list-style-type: none">• Developed a Deep Learning framework for predicting generalized nanoscale interactions• Implemented permutation-invariant Neural Network using Tensorflow (TF)• Migrated competitors code from TensorFlow (TF) 1 to TF 2 for testing• Paper DOI: 10.1038/s43588-023-00438-x, Code DOI: 10.24433/CO.8157811.v1	04/23
Conferences	Joint Optimization of Piecewise Linear Ensembles <i>Michigan Student Symposium for Interdisciplinary Statistical Sciences</i>	28/03/24
	Hybrid MD-ML for Efficient Modeling of Particle Growth in Non-Thermal Plasma <i>APS Annual Gaseous Electronics Meeting</i>	2023
Posters	A Taste of Your Own Medicine: Tracing Butyrate Production in The Gut <i>University of Michigan EHAIL Symposium</i> <ul style="list-style-type: none">• Bacterial butyrate production is associated with improved gut health, but the mechanisms are not well understood	09/23

- Analyzed proprietary gut microbiome data from Michigan Medicine using Python
- Utilized Fused Graphical LASSO to identify microbial interactions
- Recovered known interactions and identified novel interactions for *in vitro* testing

Work Experience	<p>Directed Study & Research 01/21–present <i>Dr. Scott and Dr. Violi</i></p> <ul style="list-style-type: none"> • Perform novel research in sparse structured multitask feature selection • Advise computational biochemists on machine learning methodology and literature • Supervise student researchers; Geometric Deep Learning and Deep Gaussian Processes <p>Instrument Programmer Long Beach, CA 09/19–11/19 <i>Lotus Instruments</i></p> <ul style="list-style-type: none"> • Developed controls for government-contracted, custom gas chromatography instruments • Analyzed documentation and created custom libraries for serial data transfer <p>Software Engineering Intern Troy, MI 05/19–08/19 <i>Toyoda Gosei</i></p> <ul style="list-style-type: none"> • Saved 2,000 man-hours and \$60,000 per year through automated purchase order tracking • Implemented a web-based asset tracking software using full-stack ASP.NET • Collaborated with Cost Management to solidify requirements and return on investment
Books	<p>Linear Algebra for Data Science, Machine Learning, and Signal Processing Ann Arbor, MI 05/23–09/23 <i>Cambridge University Press</i></p> <ul style="list-style-type: none"> • Proofread and edited textbook draft for Dr. Jeffery Fessler • Independently verified proofs and suggested improvements for clarity and correctness • Caught L^AT_EX typesetting errors • Available 2024 from Cambridge University Press
Projects	<p>The Implicit Bias of Gradient Descent on Separable Multiclass Data Ann Arbor, MI 12/22, 05/23 <i>U-M Course: EECS 598, 559</i></p> <ul style="list-style-type: none"> • Developed a conjecture and proof sketch for extending <i>The Implicit Bias of Gradient Descent on Separable Data</i> to include multiclass PERM losses • Showed numerically that our conjecture holds for certain well-known loss functions <p>Real-Time Distributed Learning in Connected & Autonomous Vehicles (CAVs) Ann Arbor, MI 12/21 <i>U-M Course: EECS 571</i></p> <ul style="list-style-type: none"> • Designed distributed learning protocol for sparse gradient propagation • Implemented simulated learning environment in Tensorflow • Demonstrated superior generalization, with fewer assumptions than Federated Learning <p>Domain Exploration Through Artificial Curiosity Ann Arbor, MI 12/20 <i>U-M Course: EECS 545</i></p> <ul style="list-style-type: none"> • Developed simulated Martian terrain for training and evaluation • Beginning with Shmidhuber’s theoretical basis for artificial curiosity, developed an implementation using convolutional auto-encoders • Defined heuristic “Explorational Value” for evaluating path explored by model • Performed evaluation against naive models to illustrate effectiveness of artificial curiosity <p>Needlecast: On-the-Fly Reconfiguration of Spacecraft Flight Software Ann Arbor, MI 12/20 <i>U-M Course: EECS 587</i></p> <ul style="list-style-type: none"> • Collaborated with NASA staff to draft specifications for protocols • Designed a library for booting NASA core Flight System (cFS) applications on-the-fly • Implemented Needlecast as a plug-and-play header file for NASA core cFE • Developed a simulated network switch and web interface for straightforward debugging <p>AI-Driven Contemporary Archaeology for The International Space Station Orange, CA 01/20 <i>U-M Course: EECS 587</i></p> <ul style="list-style-type: none"> • Analyzed project requirements with Dr. Walsh (co-PI of ISS Archeology) • Compiled facial training dataset for 240 ISS astronauts • Utilized convolutional neural networks to label astronauts’ faces in NASA photo archives