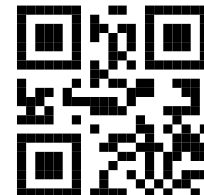


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Matt Raymond

ML + Computational Chemistry



Research Interests	<ul style="list-style-type: none">• Generative models for <i>ab initio</i> nanoparticle design• Transfer learning for small nanochemical datasets• Machine-learning-based surrogate modeling for computational nanochemistry• Nonlinear multitask feature selection	
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• Thesis Topic: <i>Generative Nanoparticle Design via Joined Foundation Models</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)	Ann Arbor, MI 08/20–04/22
	Chapman University <i>B.Sc. Computer Science, Music Minor</i> <i>GPA: 3.86, Magna Cum Laude</i>	Orange, CA 08/16–05/20
Honors and Awards	Top 15 Poster Presentation <i>Midwest Machine Learning Symposium</i> <ul style="list-style-type: none">• “Joint Optimization Significantly Improves Gradient Boosting” was selected as a “Top 15 Poster” (unranked). [Official Link] [Press Release]	Chicago, IL 04/24
	Excellence in ECE Honor Roll <i>University of Michigan</i> <ul style="list-style-type: none">• In recognition for running the SPEECS graduate student seminar during the 2023-2024 academic year. [Press Release]	Ann Arbor, MI 05/24
	Music Minor Award <i>Chapman University</i> <ul style="list-style-type: none">• In recognition of outstanding contributions to the conservatory (<i>i.e.</i>, tutoring)	Orange, CA 05/20
	Provost List, 8 semesters <i>Chapman University</i> <ul style="list-style-type: none">• ≥ 3.800 term GPA while enrolled in ≥ 12 graded credits	Orange, CA 08/16–05/20
Fellowships	J. Robert Beyster Computational Innovation Graduate Fellowship <i>University of Michigan</i> <ul style="list-style-type: none">• Tuition, stipend, and health insurance for a year.• For performing “cutting-edge research in a variety of fields linking high-performance computing.. to applications of societal importance.” [Link]	Ann Arbor, MI 07/24
	e-HAIL Summer Student Support Program <i>University of Michigan</i> <ul style="list-style-type: none">• \$12,000 stipend for summer research.	Ann Arbor, MI Summer 2024
	e-HAIL Summer Student Support Program <i>University of Michigan</i> <ul style="list-style-type: none">• \$12,000 stipend for summer research.	Ann Arbor, MI Summer 2023

Scholarship	Chancellor’s Scholarship, 8 semesters <i>Chapman University</i>	Orange, CA 08/16–05/20
Journal Papers	<p>M. Raymond, P. Elvati, J. C. Saldinger, J. Lin, X. Shi, and A. Violi. “Machine Learning Models for Sticking Probability Prediction of Si Nanoparticles In Non-Thermal Plasma”. In: <i>Plasma Sources Science and Technology</i> (2024). In Submission</p> <p>M. Raymond, J. C. Saldinger, P. Elvati, C. Scott, and A. Violi. “Universal Feature Selection for Simultaneous Interpretability of Multitask Datasets”. In: <i>Information Fusion</i> (2024). In Submission</p> <p>J. C. Saldinger, M. Raymond, P. Elvati, and A. Violi. “Domain-agnostic predictions of nanoscale interactions in proteins and nanoparticles”. In: <i>Nature Computational Science</i> 3.5 (May 2023), pp. 393–402. issn: 2662-8457. DOI: 10.1038/s43588-023-00438-x</p>	
Workshop Papers	M. Raymond , A. Violi, and C. Scott. “Joint Optimization of Piecewise Linear Ensembles”. In: <i>IEEE International Workshop on Machine Learning for Signal Processing</i> . Accepted. 2024	
Preprints	<p>M. Raymond, P. Elvati, J. C. Saldinger, J. Lin, X. Shi, and A. Violi. <i>Machine Learning Models for Sticking Probability Prediction of Si Nanoparticles In Non-Thermal Plasma</i>. 2024</p> <p>M. Raymond, A. Violi, and C. Scott. “Joint Optimization of Piecewise Linear Ensembles”. In: <i>IEEE International Workshop on Machine Learning for Signal Processing</i>. Submitted. 2024. arXiv: 2405.00303</p> <p>M. Raymond, J. C. Saldinger, P. Elvati, C. Scott, and A. Violi. <i>Universal Feature Selection for Simultaneous Interpretability of Multitask Datasets</i>. 2024. arXiv: 2403.14466</p>	
Invited Talks	<p>From Proteins to Nanoparticles: Domain-Agnostic ML for the Nanoscale <i>University of Michigan, Tools and Technology Seminar Series</i> Ann Arbor, MI 3/25</p> <p>Joined Diffusion Models for Nanoparticle Generation <i>Chapman University, Fowler School of Engineering Seminar Series</i> Orange, CA 11/24</p> <p>Machine Learning Models for Nanoparticle Growth in Nonthermal Plasmas <i>University of Minnesota, Dusty Plasma Workshop (DPW)</i> Minneapolis, MN 05/24</p>	
Posters	<p>Joint Optimization of Piecewise Linear Ensembles <i>IEEE Machine Learning for Signal Processing Workshop</i> London, UK 09/24</p> <p>Machine Learning for Knowledge Transfer in Nanomedicine <i>e-Heath and AI (e-HAIL) Student Symposium</i> Ann Arbor, MI 09/24</p> <p>Joint Optimization Significantly Improves Gradient Boosting <i>Dusty Plasma Workshop (DPW)</i> Minneapolis, MN 05/24</p> <p>ML Boosts Efficiency in Atomic Nonthermal Plasma Simulations <i>Midwest Machine Learning Symposium (MMLS)</i> Minneapolis, MN 05/24</p> <p>Joint Optimization of Linear Ensembles <i>Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS)</i> Ann Arbor, MI 03/24</p> <p>A Taste of Your Own Medicine: Tracing Butyrate Production In The Gut <i>e-Heath and AI (e-HAIL) Student Symposium</i> Ann Arbor, MI 09/23</p> <p>Preventative Healthcare via Accessible Data Tools <i>Chapman University Student Scholar Symposium</i> Orange, CA 05/20</p>	
Software	<p>JOPLen, Global Refinement, and Friedman Refitting • Python implementations of “Joint Optimization of Piecewise Linear Ensembles,” Global Refinement, and Friedman Refitting [Link] 09/ 2024</p> <p>BoUTS and MultiBoost • Python implementation of “Boosted Universal and Task-Specific Feature Selection” and MultiBoost. [Link] 06/24</p> <p>NeCLAS • Python implementation of “Neural Coarse-graining for Location Agnostic Sets” [Link] 08/22</p>	

Grant Writing	e-HAIL Summer Student Support Funding <i>University of Michigan</i> <ul style="list-style-type: none"> \$12,000 over four months 	Ann Arbor, MI 01/24
	e-HAIL Summer Student Support Funding <i>University of Michigan</i> <ul style="list-style-type: none"> \$12,000 over four months 	Ann Arbor, MI 01/23
Teaching	Programming Instructor <i>Coding Minds Academy</i>	Irvine, CA 07/20–11/20
	STEM Tutor <i>Chapman University</i> <ul style="list-style-type: none"> Group tutoring for Calculus 1-3, Discrete Math, Visual Programming, Assembly Language, Data Structures and Algorithms, Programming Languages, Genetic Biology, and Molecular Genetics 	Orange, CA 09/19–05/20
	Supplemental Instructor for Data Structures and Algorithms <i>Chapman University</i> <ul style="list-style-type: none"> Held office hours and supplemental lectures each week 	Orange, CA 09/19–12/19
	Music tutor <i>Chapman University</i> <ul style="list-style-type: none"> Private tutoring for Music Theory, Music History, Aural Skills, and Music Technology Led group review sessions for music history 	Orange, CA 01/17–05/20
Research Experience	Directed Study & Research <i>Dr. Scott and Dr. Violi</i> <ul style="list-style-type: none"> Multitask feature selection, optimization, and protein-nanoparticle interaction prediction Assist in grant writing and student hiring Advise computational biochemists on machine learning methodology and literature Supervised roles: Geometric Deep Learning, Deep Gaussian Processes, Active Learning 	Ann Arbor, MI 01/21–present
	Directed Study & Research <i>Dr. Meibodi</i> <ul style="list-style-type: none"> Developed a 3d, web-based collaboration tool for live annotation of architectural designs Utilized Babylon.js, Node.js, React, and Redis 	Ann Arbor, MI 07/20–11/21
	Directed Study & Research <i>Dr. Linstead</i> <ul style="list-style-type: none"> Continued work on ISS Archeology project (see “Projects”) 	Orange, CA 03/20–05/20
Work Experience	Data Science Intern <i>Toyoda Gosei</i> <ul style="list-style-type: none"> Hired, but the internship was canceled because of COVID-19 	Troy, MI 05/20
	Instrument Programmer <i>Lotus Instruments</i> <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 	Long Beach, CA 09/19–11/19
	Software Engineering Intern <i>Toyoda Gosei</i> <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 	Troy, MI 05/19–08/19
Service	Coordinator, Signal Processing in EECS (SPEECS) seminar <i>University of Michigan</i> <ul style="list-style-type: none"> <code>websites.umich.edu/~speecsseminar/</code> 	Ann Arbor, MI 08/23–05/24
	Coordinator, Machine learning theory reading group <i>University of Michigan</i>	Ann Arbor, MI 01/22–02/22

- sites.google.com/umich.edu/mltheory/home

Planning Committee Member, Engineering Research Symposium

University of Michigan

- Schedule PDF Booklet

Ann Arbor, MI

07/20–02/21

Coordinator, COVID-19 Study Group

Chapman University

Virtual

05/21–07/21

- Study group for students who lost summer internships due to COVID-19
- Used MIT OpenCourseWare for:
 - Operating System Engineering (MIT 6.828)
 - Microeconomic Theory and Public Policy (MIT 14.03)
 - Probabilistic Systems Analysis and Applied Probability (MIT 6.041)

Vice-President, FPV Drone Club

Chapman University

Orange, CA

01/20–05/20

Other Activities

Proofreading Linear Algebra Textbook

Cambridge University Press

Ann Arbor, MI

05/23–09/23

- Proofread draft of “Linear Algebra for Data Science, Machine Learning, and Signal Processing” 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

Class Projects

The Implicit Bias of Gradient Descent on Separable Multiclass Data

U-M Course: EECS 598, 559

Ann Arbor, MI

12/22, 05/23

- Developed a conjecture and proof sketch for extending *The implicit bias of gradient descent on separable data* to include multiclass PERM losses
- Showed numerically that our conjecture holds for certain well-known loss functions

Real-Time Distributed Learning in Connected & Autonomous Vehicles (CAVs)

U-M Course: EECS 571

Ann Arbor, MI

12/21

- Designed distributed learning protocol for sparse gradient propagation
- Implemented simulated learning environment in Tensorflow
- Demonstrated superior generalization, with fewer assumptions than Federated Learning

Domain Exploration Through Artificial Curiosity

U-M Course: EECS 545

Ann Arbor, MI

12/20

- 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

Needlecast: On-the-Fly Reconfiguration of Spacecraft Flight Software

U-M Course: EECS 587

Ann Arbor, MI

12/20

- 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

Preventative Healthcare via Accessible Data Tools

Chapman Course: CPSC 353

Orange, CA

05/20

- Developed a web application to rank businesses and other establishments by the number of COVID-19 cases in their area
- Utilized REST APIs and front-end web development to develop a user-friendly interface

AI-Driven Contemporary Archaeology for the International Space Station

Chapman Course: CPSC 393

Orange, CA

01/20

- 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