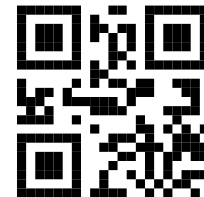Current as of 2024/05/25
mattrmd@umich.edu
mraymond.info

Matt Raymond
ML + Computational Chemistry

Education	**University of Michigan**	Ann Arbor, MI
	Ph.D. Signal/Image Processing and Machine Learning	08/22–04/26
	GPA: 3.92	

- Co-advised by Drs. Angela Violi and Clayton Scott
- Thesis Topic: *Generative Nanoparticle Design Via Transfer Learning*

	University of Michigan	Ann Arbor, MI
	M.Sc. Computer Science	08/20–04/22
	GPA: 3.91	

- Member of the VioliGroup computational biochemistry lab (3 semesters, 2 summers)

	Chapman University	Orange, CA
	B.Sc. Computer Science, Music Minor	08/16–05/20
	GPA: 3.86, *Magna Cum Laude*	

Honors and Awards	**Excellence in ECE Honor Roll**	Ann Arbor, MI
	University of Michigan	05/24

- In recognition for running the SPEECS graduate student seminar during the 2023-2024 academic year.

	Music Minor Award	Orange, CA
	Chapman University	05/20

- In recognition of outstanding contributions to the conservatory

	Provost List, 8 Semesters	Orange, CA
	Chapman University	08/16–05/20

- $\geq$3.800 term GPA while enrolled in $\geq$12 graded credits

Journal Articles

P. Elvati, J. C. Saldinger, **M. Raymond**, J. Lin, X. Shi, and A. Violi. "Machine learning models for Si nanoparticle growth in nonthermal plasma". In: *Journal of Physical Chemistry D* (2024). Submitted

M. Raymond, A. Violi, and C. Scott. "Joint Optimization of Piecewise Linear Ensembles". In: *IEEE International Workshop on Machine Learning for Signal Processing*. Submitted. 2024

M. Raymond, J. C. Saldinger, P. Elvati, C. Scott, and A. Violi. "Universal Feature Selection for Simultaneous Interpretability of Multitask Datasets". In: *Information Fusion* (2024). Submitted

J. C. Saldinger, **M. Raymond**, P. Elvati, and A. Violi. "Domain-agnostic predictions of nanoscale interactions in proteins and nanoparticles". In: *Nature Computational Science* 3.5 (May 2023), pp. 393–402. ISSN: 2662-8457. DOI: 10.1038/s43588-023-00438-x

Preprints

M. Raymond, A. Violi, and C. Scott. "Joint Optimization of Piecewise Linear Ensembles". In: *IEEE International Workshop on Machine Learning for Signal Processing*. Submitted. 2024. eprint: 2405.00303 (cs.LG)

M. Raymond, J. C. Saldinger, P. Elvati, C. Scott, and A. Violi. *Universal Feature Selection for Simultaneous Interpretability of Multitask Datasets*. 2024. arXiv: 2403.14466 [cs.LG]

Upcoming

M. Raymond, A. Violi, and C. Scott. "Joint Optimization of Piecewise Linear Ensembles". In: *IEEE International Workshop on Machine Learning for Signal Processing*. Submitted. 2024

Talks	**Machine Learning Models for Nanoparticle Growth in Nonthermal Plasmas**	Minneapolis, MN
	Dusty Plasma Workshop (DPW)	05/24

Posters	**Joint Optimization Significantly Improves Gradient Boosting**	Minneapolis, MN
	Dusty Plasma Workshop (DPW)	05/24

	ML Boosts Efficiency in Atomic Non Thermal Plasma Simulations *Midwest Machine Learning Symposium (MMLS)*	Minneapolis, MN 05/24
	Joint Optimization of Linear Ensembles *Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS)*	Ann Arbor, MI 03/24
	A Taste of Your Own Medicine: Tracing Butyrate Production in The Gut *University of Michigan e-HAIL Symposium*	Ann Arbor, MI 09/23
	Preventative Healthcare Via Accessible Data Tools *Chapman University Student Scholar Symposium*	Orange, CA 05/20
Teaching	**Programming Instructor** *Coding Minds Academy*	Irvine, CA 07/20–11/20
	STEM Tutor *Chapman University* • 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
	TA for Data Structures and Algorithms *Chapman University* • Held office hours and supplemental lectures each week	Orange, CA 09/19–12/19
	Music Tutor *Chapman University* • 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
Fellowships	**E-HAIL Summer Student Support Program** *University of Michigan*	2024
	E-HAIL Summer Student Support Program *University of Michigan*	2023
Scholarship	**Chancellor's Scholarship, 8 Semesters** *Chapman University*	Orange, CA 08/16–05/20
Service	**Coordinater, Signal Processing in EECS (SPEECS) Seminar** *University of Michigan* • `websites.umich.edu/~speecsseminar/`	Ann Arbor, MI 08/23–05/24
	Coordinator, Machine Learning Theory Reading Group *University of Michigan* • `sites.google.com/umich.edu/mltheory/home`	Ann Arbor, MI 01/22–07/22

	Coordinator, COVID-19 Study Group
	Chapman University
	• 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)
		Virtual
		05/21–07/21

	Vice-President, FPV Drone Club *Chapman University*	Orange, CA 01/20–05/20
Grant Writing	**E-HAIL Summer Student Support Funding** *University of Michigan* • $12,000 over four months	Ann Arbor, MI 01/24
	E-HAIL Summer Student Support Funding *University of Michigan* • $12,000 over four months	Ann Arbor, MI 01/23

Research Experience	**Directed Study & Research**	Ann Arbor, MI
	Dr. Scott and Dr. Violi	01/21–present
	• 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	

Directed Study & Research — Ann Arbor, MI
Dr. Meibodi — 07/20–11/21
- Developed a 3d, web-based collaboration tool for live annotation of architectural designs
- Utilized Babylon.js, Node.js, React, and Redis

Directed Study & Research — Orange, CA
Dr. Linstead — 03/20–05/20
- Continuued work on ISS Archeology project (see "Projects")

Work Experience

Data Science Intern — Troy, MI
Toyoda Gosei — 05/20
- Hired, but the internship was canceled because of COVID-19

Instrument Programmer — Long Beach, CA
Lotus Instruments — 09/19–11/19
- Developed controls for government-contracted, custom gas chromatography instruments
- Analyzed documentation and created custom libraries for serial data transfer

Software Engineering Intern — Troy, MI
Toyoda Gosei — 05/19–08/19
- 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

Other Activities

Proofreading Linear Algebra Textbook — Ann Arbor, MI
Cambridge University Press — 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 LaTeX typesetting errors
- Available 2024 from Cambridge University Press

Computer Skills

Languages	Libraries	Programs
Python/Cython	**JAX**	Git
C/C++	**PyTorch**	GitHub actions
MATLAB	**PyTorch Geometric**	VMD
Julia	**TensorFlow**	Blender
SQL	**Scikit-learn**	Inkscape
Bash	Pandas	Jupyter
HTML/CSS/SASS	MatPlotLib	Docker
JavaScript	NumPy	Conda
CUDA	**CuPy**	**Slurm**
LaTeX	**OpenMP**	
TikZ	**MPI**	
	Node.js	
	React	
	LangChain	
	CVXPy	
	RDKit	

Projects

The Implicit Bias of Gradient Descent on Separable Multiclass Data — Ann Arbor, MI
U-M Course: EECS 598, 559 — 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) Ann Arbor, MI
U-M Course: EECS 571 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 Ann Arbor, MI
U-M Course: EECS 545 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 Ann Arbor, MI
U-M Course: EECS 587 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 Orange, CA
Chapman Course: CPSC 353 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 Orange, CA
Chapman Course: CPSC 393 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