Matthew Lyle Olson
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December 2023

1 Education

June 2023 · Ph.D., Artificial Intelligence and Computer Science, Oregon State University

March 2020 · M.S., Computer Science, Oregon State University (magna cum laude)

June 2015 · B.S., Computer Science, Oregon State University (summa cum laude)

2 Publications

2.1 Journal Publications

(UNDER REVIEW) **Matthew L. Olson**, Shusen Liu, Jayaraman J. Thiagarajan, Bogdan Kustowski, Weng-Keen Wong, Rushil Anirudh. Transformer-Powered Surrogates Close the ICF Simulation-Experiment Gap with Extremely Limited Data. *Nature Machine Intelligence*, 2024.

Matthew L. Olson, Roli Khanna, Lawrence Neal, Fuxin Li, Weng-Keen Wong. Counterfactual State Explanations for Reinforcement Learning Agents via Generative Deep Learning. *Artificial Intelligence*, 2021

Andrew Anderson, Jonathan Dodge, Amrita Sadarangani, Zoe Juozapaitis, Evan New-man, Jed Irvine, Souti Chattopadhyay, **Matthew L. Olson**, Alan Fern, and Margaret Burnett. Mental models of mere mortals with explanations of reinforcement learning. *Transactions on Interactive Intelligent Systems*, 2020.

2.2 Conference Publications

(UNDER REVIEW) Shusen Liu, Haichao Miao, Zhimin Li, **Matthew L. Olson**, Valerio Pascucci, Peer-Timo Bremer. AVA: Towards Autonomous Visualization Agents through Visual Perception-Driven Decision-Making. *Eurographics Symposium on Visualization (EuroVIS)* 2024.

Matthew L. Olson, Shusen Liu, Rushil Anirudh, Jay J. Thiagarajan, Timo Bremer, Weng-Keen Wong. Cross-GAN Auditing: Unsupervised Identification of Attribute Level Similarities and Differences between Pretrained Generative Models. *The Conference on Computer Vision and Pattern Recognition (CVPR)* 2023.

Tobias Huber, Maximilian Demmler, Silvan Mertes, **Matthew Olson** and Elisabeth André. GANterfactual-RL: Understanding Reinforcement Learning Agents' Strategies through Visual Counterfactual Explanations. *The Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2023.

Jonathan Dodge, Andrew Anderson, **Matthew L. Olson**, Rupika Dikkala, and Margaret Burnett. How Do People Rank Multiple Mutant Agents? *ACM Conference on Intelligent User Interfaces (IUI)*, 2022.

Matthew L. Olson, Thuy-Vy Nguyen, Gaurav Dixit, Neale Ratzlaff, Weng-Keen Wong, Minsuk Kahng. Contrastive Identification of Covariate Shift in Image Data. *IEEE Visualization Conference (VIS)*, 2021.

Lawrence Neal, **Matthew Olson**, Weng-Keen Wong, Xiaoli Fern, Fuxin Li. Open Set Learning with Counterfactual Images. *Proceedings of the European Conference on Computer Vision (ECCV)*, 2018.

2.3 Workshop Publications

Matthew L. Olson. Deep Generative Multimedia Children's Literature. *AAAI, Workshop on Creative AI Across Modalities.* 2023.

Matthew L. Olson, Shusen Liu, Rushil Anirudh, Jayaraman J. Thiagarajan, Weng-Keen Wong, Peer-timo Bremer. Unsupervised Attribute Alignment for Characterizing Distribution Shift. *NeurIPS Workshop on Distribution Shifts*, 2021.

Prachi Rahurkar, **Matthew L. Olson**, Prasad Tadepalli. Human Adversarial QA: Did the Model Understand the Paragraph? *NeurIPS Workshop on Human And Model in the Loop Evaluation and Training Strategies.* 2020

Matthew L. Olson, Lawrence Neal, Fuxin Li, Weng-Keen Wong. Counterfactual States for Atari Agents via Generative Deep Learning. *International Joint Conference on Artificial Intelligence workshop on Explainable AI.* Macao, China, August 2019.

Arpit Christi, **Matthew Olson**, Mohammad Amin Alipour, and Alex Groce. Reduce Before You Localize: Delta-Debugging and Spectrum-Based Fault Localization. *IEEE International Workshop on Debugging and Repair.* Memphis, Tennessee, October 2018

2.4 Other Publications

Matthew L. Olson, Neale Ratzlaff, Weng-Keen Wong. Generalizing Cross Entropy Loss with a Beta Proper Composite Loss: An Improved Loss Function for Open Set Recognition. *OpenReview*, 2021.

Matthew L. Olson, Lisa Zhang, Chun-Nam Yu. Adapting pretrained language models for long document classification. *OpenReview*, 2019.

3 Experience

3.1 Professional

Machine Learning Research Scientist, Lawrence Livermore National Labs: May 2023 - Present

- First authored a top-tier journal paper under review at *Nature Machine Intelligence*
- Improved predictions in the extreme few shot learning setting on sim-to-real fusion experiment data
- Designed a novel Vision Transformer based Masked Autoencoder to handle multi-modal data
- Increased simulation speed by over 4000x by using deep surrogate models for scientific simulations
- Built a Chatbot (Llama2) with Retrieval Augmented Generation using Kubernetes, Docker, and FastAPI
- Used ChatGPT4-V to tune visualizations parameters (e.g., UMAP/T-SNE) with no human intervention

Graduate Research Assistant, Oregon State University: Sept. 2017 - June 2023

- Developed techniques to explain results of Deep Learning algorithms applied to Computer Vision and Reinforcement Learning.
- Designed user studies and developed user interfaces using C#, JavaScript, D3, and Flask.
- Create state of the art algorithms for improving open set detection in neural networks.
- Mentored multiple senior capstone projects over a variety of machine learning topics.
- Collaborate closely with colleagues in the DARPA Explainable Artificial Intelligence project.
- Founded and led the Artificial Intelligence Graduate Student Associations with over 200 members
- Reviewed dozens of conference/journal paper submissions, top reviewer for NeurIPS 2022

Machine Learning Research Intern, Lawrence Livermore National Labs: June '21 - Dec. '22

- Created a novel method on understanding and auditing GANs beyond summary statistics
- Ran massively parallelized experiments on hundreds of GPUs
- Designed new algorithms for identifying unique and shared attributes between two datasets
- Built state of the art generative models for approximating data distributions (i.e. StyleGAN2)

ML Olson Consulting for Lexum and Medema: March 2021, March 2022

- Improved semi-supervised multi-label accuracy of Saskatchewan court cases by 18% using LongFormer.
- Reduced error of part manufacturing time predictions by 37% using tabular data with Pycaret.

Machine Learning Research Intern, Bell-Labs: June 2019 - August 2019

- Won the robotics competition at the Unix 50th anniversary international event.
- Utilized state of the art language models to perform 4G/5G patent classification.
- Developed new deep learning models to process arbitrary length sequential data.

Software Engineer, HP Inc. : July 2015 - September 2017

- Developed and maintained .Net desktop application for a multi-million dollar fleet of printer test tools.
- Became team lead for the motion control software on the R&D and production tools.
- Created Software for real-time, rotary encoder, error correction .
- Collaborated with different teams in India, Singapore, Barcelona, and Ireland to develop new Thermal Inkjet technologies.
- Travelled to Singapore to perform tool installation and training.

3.2 Undergraduate

Undergraduate Researcher, Oregon State University: March 2014 - June 2015

- Investigated Delta Debugging for the Siemens suite using Python and bash.
- Calculated Software Fault Localization's coefficients for the suite using Java.

AX-12A Robotic Arm User Interface for Oregon State University Senior Project: September 2014 - June 2015

- Collaborated with ICS Inc. and team members to produce an original design document.
- Developed the client-side interface for the Robot Arm using Qt and JavaScript.

Software Engineering Intern, Hewlett Packard Enterprise: June 2014- September 2014

- Created a Java GUI for the networking utility Scapy.
- Explored patent opportunities in the field of Digital Image Correlation.
- Used and tested Intel's Data Plane Development Kit to increase networking performance.

2013 FSGP Champion Solar Car CS Team Captain, Oregon State University: April 2013 - September 2014

- Programmed the C# app, vb app, and MySQL database that ran the driver interface.
- Led team in developing a new Telemetry system and updated computer system.
- Collaborated with other teams through email, phone, and meetings.

Computer Science Teaching Assistant, Oregon State University: January 2013 - June 2015

- Led students through organized lab time and extended study sessions. Graded student's assigned demonstrations.
- Helped students by explaining programming concepts and debugging homework.

IT student worker, OSU College of Science: September 2012 - February 2014

- Helped support University based computers, networks, and printers within the College of Science.
- Provided customer service for over 2000 employees and students

3.3 Mentorship 2022

- *Detecting Cheating In Video Games With Machine Learning.* Srikar Valluri, Bradley Gore and Ethan Ng. Applied Pretrained Deep Convolution neural networks to identify video clips of cheaters and non-cheaters.
- *Serial Image Analysis.* Alec Sautter, Austin McCalley, Benjamin Lee, Hugh MacWilliams, Kyle Huang and Samuel Somatis. Detected the change of coastal plant species photographs over time using machine learning.
- *Machine Learning Applied to Magnetic Flux Datasets.* Zinn Morton, Allen Chan, Beniamin Condrea, Matthew Sterrett and Justin Flesch. Used state-of-the-art unsupervised anomaly detection and visualization for identifying change-points in magnetic melts.
- *Natural Language Processing for AI Incident Resolution.* Nicholas Broce, Jason Scott-Hakanson, Nicholas Olson and Yesha Jhala. Used a LongFormer deep pretrained network for enabling search in a database of AI-related articles.
- *White Shark Video Processing: Using Machine Learning to Understand White Shark Behaviors.* Harper Swenson, Zhangyao Zhou and Kaavya Subramanian. Built a tree-based machine learning model using Pycaret to identify the activities of sharks.

3.4 Languages & Tools

Python, JavaScript, bash, C#, C++, C, Java

Pytorch, NumPy/SciPy, Tensorflow, Kubernetes, Docker, Latex, Git, Perforce

3.5 Honors

- 2023 First AI PhD in USA from OSU
- 2022 NuerIPS top reviewer
- 2019 UnixWorld Challenge, Outstanding Achievement in Robotic Orchestration, Bell Labs, New Jersey.
- 2013 and 2014 Computer Science Scholarship, Oregon State University College of Engineering.
- 2011 Honor Scholarship, Clackamas Community College.

3.6 Training

- Deep Learning Specialization
- Project Management Fundamentals
- Dynamic Leadership
- Influence in the Workforce
- Visual Studio Live Industry Training