Matthew G. Keeler

Contact Information

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Academic Appointments

Doctoral Student, ETH Zurich
Mechanical and Process Engineering, September 2024–Present

Graduate Research Assistant, University of Maryland
Mechanical Engineering, August 2022–August 2024

Education

University of Maryland, College Park
M.S., Mechanical Engineering, August 2022–May 2024
CGPA: 3.962
B.S., Mechanical Engineering, August 2018–May 2022
CGPA: 3.987
Summa Cum Laude (Top 2% of Graduating Class)

Research Interests

Design Theory and Methodology, Design Automation, Machine Learning, Artificial Intelligence, Optimization, Applied Mathematics

Papers in preparation

Matthew Keeler and Mark Fuge. "Fewer Triplets Than You Think: Novelty Error Converges Faster Than Triplet Violations in Ordinal Embeddings." **Journal of Mechanical Design**, Under Review. Working paper.

Full-Paper Peer-Reviewed Conference Publications

Matthew Keeler and Mark Fuge. "Fewer Triplets Than You Think: Novelty Error Converges Faster Than Triplet Violations in Ordinal Embeddings." Proceedings of **ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference**, August 2023 https://doi.org/10.1115/DETC2023-116696

Matthew Keeler, Mark Fuge, Aoren Peng, Scarlett Miller."A Picture or a Thousand Words: Design Description Crafting to Replicate Human Similarity judgments in Large Language Models." Proceedings of **ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference**, August 2024

Teaching Fellowship Experience

ENME 392: Statistical Methods for Product and Processes Development
Junior-level introductory statistics course. Integrated statistical methodology for the improvement of products and processes in terms of performance, quality and cost. Designed experimentation. Statistical process control. Software application. Laboratory activities.

Selected Coursework

ENME 440/743: Applied Machine Learning for Engineering and Design
Graduate-level course under Dr. Mark Fuge. Learned how to apply techniques from artificial intelligence and machine learning to solve engineering problems and design new products or systems. Utilized supervised, unsupervised, and reinforcement learning to design computational learning algorithms to solve difficult tasks.

ENME 691: Industrial AI
Graduate-level applied artificial intelligence course under Dr. Jay Lee. Integrated machine learning

methodology for developing prognostics and health management (PHM) systems for industrial applications. Leveraged techniques for processing big data. Developed PHM regression and classification models on real datasets from historic PHM challenges.

ENME 808E: Advanced Topics in Mechanical Engineering; Machine Learning: Theory and Applications
Graduate-level course under Dr. Nikhil Chopra. Studied the theory behind developing generalizable machine learning models and characterizing the confidence level of a model's performance. Used this theory to design machine learning pipelines to complete difficult tasks. Reported on the statistical confidence of model success.

ENME 610: Engineering Optimization
Graduate-level course under Dr. Shapour Azarm. Overview of applied single- and multi- objective optimization and decision making concepts and techniques with applications in engineering design and/or manufacturing problems. Topics included formulation examples, concepts, optimality conditions, unconstrained/constrained methods, and post-optimality sensitivity analysis. Applied theory to a semester-long real-world multi-objective engineering project.

ENME 725: Probabilistic Optimization
Graduate-level course under Dr. Steven Gabriel. Provided an introduction to optimization under uncertainty. Chance-constrained programming, reliability programming, value of information, two stage problems with recourse, decomposition methods, nonlinear and linear programming theory, probability theory. Applied these techniques to real-world problems.

ENME 605: Advanced System Control
Graduate-level course under Dr. Hosam Fathy. Provided an introduction to modern control theory for both continuous and discrete systems. State space representation was reviewed and the concepts of controllability and observability are discussed. Design methods of deterministic observers are presented and optimal control theory were formulated. Control techniques for modifying system characteristics were discussed.

ENRE 620: Advanced Methods in Reliability Modeling
Graduate-level course under Dr. Yunfei Zhao and Dr. Mohammad Modarres. Students learn representative machine learning algorithms with applications to reliability engineering, as well as model-based methods for reliability analysis, reliability model parameter estimation with both maximum likelihood approaches and Bayesian approaches, model selection, and model-based methods for health monitoring and reliability prediction. This course also covered data-driven methods for reliability analysis, including neural networks, deep neural networks, random forest, support vector machines.