




RITAM GUHA

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Research Interests

Machine Learning, Real-time Bidding, Off-policy Evaluation, AutoML, Timeseries Analysis and Forecasting, Interpretable AI, Multi-objective Optimization, Evolutionary Computation, Co-evolutionary Algorithm.

Research Experience

Multi-agent War Strategy Optimization

Northrop Grumman

06/23 - 05/24

- Designed a multi-objective competitive co-evolutionary optimization algorithm to improve the performance of a two-agent attacker-defender war strategy setting
- Developed an automated decision-making algorithm to select the final strategies for both sides while considering the robustness and objective scores of different strategies

Virtual Metrology of a Long Batch Process using Multivariate Time Series Modeling

Hemlock Semiconductor Corporation

01/22 - 12/22

- Designed and developed a complete deep learning-based data pipeline to perform time series simulation and forecasting of a long batch process at Hemlock Semiconductor Corporation. The final software was able to perform data processing, anomaly detection, modeling, and estimate the process outputs with 90% certainty
- Deployed the final deep-learning model using Azure Cloud to the company server for internal virtual metrology

Interpretable AI Agent Through Nonlinear Decision Trees for Lane Change Problem

Ford Motor Company

06/21 - 08/21

- Co-developed an interpretable AI system that approximates the black box logic running behind a reinforcement learning agent, developed by Ford Motor Company for controlling an autonomous vehicle in a simulated environment of highway driving
- Analyzed the resulting interpretations of the agent and came up with simple rules to explain the actions of the agent. These intuitive and simplistic rules helped our collaborators understand the system

MOAZ: A Multi-Objective AutoML-Zero Framework

MSU Project

04/22 - 12/22

- Created a multi-objective variant of AutoML-Zero which synthesizes machine learning algorithms from scratch using 65 high-school level operators
- Analyzed the proposed framework over linear regression problems where it achieved 87.4% improvement in reducing the algorithm complexity and 82% improvement in the speed of convergence over its predecessor

Industrial Experience

Expedia Group

05/24 - 07/24

Machine Learning Science Intern

Seattle, Washington, USA

- Developed an off-policy evaluation pipeline that assessed various bidding policies offline, achieving a value prediction error rate of less than 2% and 99% accuracy in directional prediction. This implementation significantly reduced the occurrence of inconclusive A/B tests
- Formulated a counterfactually optimal model that demonstrated significant improvements over the BAU approach in key performance indicators (KPIs), including a 9% increase in installs, a 12% increase in return on ad spend (ROAS), a 12% increase in clicks, an 8% increase in gross profit, and a 4% reduction in spend

Education

Michigan State University

Ph.D. in Computer Science and Engineering, GPA-4.0/4.0, Supervisor: Dr. Kalyanmoy Deb

Jan 2021 – Present

East Lansing, Michigan

Jadavpur University

B.E. in Computer Science and Engineering, GPA-9.23/10

July 2016 – June 2020

Kolkata, India

Professional Affiliations

- Student member of IEEE since August 2019
- Served as a reviewer for multiple journals and conferences:
 - *Genetic and Evolutionary Computation Conference (GECCO), 2023*
 - *Engineering Applications of Artificial Intelligence, Elsevier*
 - *Sadhana, Soft Computing, Springer*
 - *Mathematical Problems in Engineering, Hindawi*

Achievements

- Received cloud computing fellowship to deploy my research on cloud infrastructure from Michigan State University
- Currently serving as an Engineering Graduate Leader at Michigan State University and organizing research symposiums and professional events
- Received recognition from London Journal Press (UK) in the form of an honorary Rosalind membership
- Published 20+ research papers in renowned journals under the banner of Springer, Elsevier and IEEE

Technical Skills

Languages: Python, C++, MATLAB

Developer Tools: VS Code, PyCharm

Technologies/Frameworks: MacOS, Linux, GitHub, Pandas, Numpy, Matplotlib, Pymoo

Publications

- **Guha, Ritam** and Kalyanmoy Deb. Compromising pareto-optimality with regularity in platform-based multi-objective optimization. *IEEE Transactions on Evolutionary Computation*, 2023
- **Guha, Ritam**, Wei Ao, Stephen Kelly, Vishnu Boddeti, Erik Goodman, Wolfgang Banzhaf, and Kalyanmoy Deb. Moaz: A multi-objective automl-zero framework. In *Proceedings of the Genetic and Evolutionary Computation Conference*, pages 485–492, 2023
- **Ritam Guha**, Anirudh Suresh, Jared DeFrain, and Kalyanmoy Deb. Virtual metrology in long batch processes using machine learning. *Materials and Manufacturing Processes*, 0(0):1–12, 2023
- **Guha, Ritam** and Kalyanmoy Deb. Regemo: Sacrificing pareto-optimality for regularity in multi-objective problem-solving. In *2023 International Conference Series on Evolutionary Multi-Criterion Optimization (EMO)*, 2022
- Abhiroop Ghosh, Yashesh Dhebar, **Guha, Ritam**, Kalyanmoy Deb, Subramanya Nagesh Rao, Ling Zhu, Eric Tseng, and Dimitar Filev. Interpretable ai agent through nonlinear decision trees for lane change problem. In *2021 IEEE Symposium Series on Computational Intelligence (SSCI)*, pages 01–08. IEEE, 2021
- Ghosh Manosij, **Ritam, Guha**, Ram Sarkar, and Ajith Abraham. A wrapper-filter feature selection technique based on ant colony optimization. *Neural Computing & Applications*, 32(12):7839–7857, 2020