




RITAM GUHA

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 [Ritam-Guha](#)  [Ritam Guha](#)

Research Interests

Multi-objective Optimization, Evolutionary Computation, Machine Learning, AutoML, Interpretable AI, Timeseries Analysis and Forecasting.

Research Projects

Multi-agent War Strategy Optimization

MSU-Northrop Grumman Alliance Project

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

RegEMO: Sacrificing Pareto-Optimality for Regularity in Multi-objective Problem-Solving

Thesis Project

08/21 - 09/22

- Developed a framework to trade-off Pareto optimal solutions for different design problems with regularity in the final solutions. The resulting solutions are collectively easier to implement and particularly useful in platform-based designs in terms of scaling and maintenance
- The software has been tested over 16 real-life engineering design problems including car designs, ship designs, etc. while sacrificing less than 2% optimality and gaining regularity for all the solutions

MOAZ: A Multi-Objective AutoML-Zero Framework

MSU Internal 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

Virtual Metrology of CVD Process using Multivariate Time Series Modeling

MSU-Hemlock Alliance Project

01/22 - 12/22

- Designed and developed a complete 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

MSU-Ford Alliance Project

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

Industrial Experience

Probe Information Pvt. Ltd.

06/19 – 08/19

Software Engineer Intern

Bangalore, Karnataka, India

- Designed an automated web-scraping program (using Java Selenium framework) to store trademark registry information of every Indian company associated with the Ministry of Corporate Affairs (MCA)
- Created a basic co-occurrence matrix-based NLP program to perform company-oriented named entity recognition

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:
 - *Engineering Applications of Artificial Intelligence, Elsevier*
 - *Sadhana, Soft Computing, Springer*
 - *Mathematical Problems in Engineering, Hindawi*
 - *Genetic and Evolutionary Computation Conference (GECCO), 2023*

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**, 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