Abhiroop Ghosh

Sr. Software Engineer at Aspen Technology

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EDUCATION

MICHIGAN STATE UNIVERSITY
East Lansing, MI, USA
PhD in Electrical and Computer Engineering
Jan 2018 - Dec 2022

JADAVPUR UNIVERSITY
Kolkata, WB, India
Bachelor of Electrical Engineering
Aug 2012 - July 2016

CERTIFICATIONS

High Performance Computing
Michigan State University, Dec 2020
Computational Modeling
Michigan State University, May 2020

TEACHING

MIGHIGAN STATE UNIVERSITY
East Lansing, MI, USA
Graduate Teaching Assistant

- Spring 2021: Microprocessors and Digital Systems (ECE 331, online)
- Summer 2018: Computer Aided Optimal Design (ME 465)

TECHNICAL SKILLS

PROGRAMMING
Python, MATLAB, C/C++, JAVA, HTML, CSS, JavaScript
PACKAGES/FRAMEWORKS
Jupyter Notebook, NumPy, Pandas, Scikit-learn, Matplotlib, Plotly, Dash, h5py, Cython
VERSION CONTROL
Git, SVN
OPTIMIZATION
CPLEX, GUROBI, HEEDS
SIMULATION
Cadence Virtuoso, Keil µVision, Simulink
OTHERS
Linux, LaTeX, HPC systems, HDF5, Object-oriented programming, Word, Excel, PowerPoint

PROFESSIONAL EXPERIENCE

ASPEN TECHNOLOGY | Senior software engineer
Medina, MN, USA
Jan 2023 - present
Developed software for generation management systems used by multiple utility companies.

MICHIGAN STATE UNIVERSITY | PhD Researcher
East Lansing, MI, USA
Jan 2018 - Dec 2022

- Worked at the Computational Optimization and Innovation (COIN) lab under the supervision of Dr. Kalyanmoy Deb.
- Research interests: multi-objective optimization, multi-criteria decision making, meta-heuristics, machine learning, operations research.
- Dissertation topic: Developing an *interactive knowledge-driven optimization framework* leveraging machine learning to improve optimization quality and efficiency.
- Worked on multiple industry projects:

  GENERAL MOTORS
  Aug 2021 - Dec 2021
  Developed web-based dashboards for visualizing optimization results.

  FORD MOTOR COMPANY
  Jan 2021 - Sept 2021
  - Worked on methods to explain complex Deep Neural Network (DNN) policies trained via reinforcement learning.
  - Demonstrated the proposed approach on an autonomous vehicle lane change problem.

  DARPA TRADES PROJECT
  Jan 2018 - Dec 2020
  - Developed AI-driven optimization methods to learn design variable patterns among high-performance designs.
  - Proposed approach boosted optimization performance on a solid rocket design problem provided by NASA.

SIEMENS CORPORATE TECHNOLOGY
AI-driven Design Exploration Intern
Princeton, NJ, USA
May 2019 - Aug 2019

- Designed a Comprehensive Microgrid Energy Storage (CMES) solution using battery storage systems.
- Improved reliability and cost performance using a multi-level optimization architecture.

WIPRO DIGITAL
Project Engineer - AI & Cognitive Computing
Bengaluru, KA, India
Jul 2016 - Nov 2017
Developed AI-based handwritten text detection software to automate the processing of pharmacovigilance forms.

PUBLICATIONS

- **A. Ghosh**, K. Deb, E. Goodman, R. Averill, “An Interactive Knowledge-based Multi-objective Evolutionary Algorithm Framework for Practical Optimization Problems,” IEEE Transactions on Evolutionary Computation, 2022 (second round of review).
  DOI [preprint]: https://doi.org/10.48550/arXiv.2209.08604
- **A. Ghosh**, K. Deb, E. Goodman, R. Averill, “A User-guided Innovization-based Evolutionary Algorithm Framework for Practical Multi-Objective Optimization Problems,” accepted for publication in Engineering Optimization, 2022.
- **A. Ghosh** et al., "Interpretable AI Agent Through Nonlinear Decision Trees for Lane Change Problem," 2021 IEEE Symposium Series on Computational Intelligence (SSCI), 2021, pp. 01-08, DOI: 10.1109/SSCI50451.2021.9659552.
- **A. Ghosh**, K. Deb, R. Averill, E. Goodman, “Combining User Knowledge and Online Innovization for Faster Solution to Multi-objective Design Optimization Problems,” 2021 International Conference on Evolutionary Multi-Criterion Optimization (EMO), DOI: 10.1007/978-3-030-72062-9_9.
- **A. Ghosh**, E. Goodman, K. Deb, R. Averill and A. Diaz, “A Large-scale Bi-objective Optimization of Solid Rocket Motors Using Innovization,” in Proceedings of the 2020 IEEE Congress on Evolutionary Computation (CEC), DOI: 10.1109/CEC48606.2020.9185861.
- F. Tooryan, **A. Ghosh**, Y. Wang, S. Srivastava, E. Arvanitis and V. D. Angelis, "Microgrid Energy Storage Design for Reliability and Cost Performances," 2020 IEEE Power & Energy Society General Meeting (PESGM), 2020, pp. 1-5, DOI: 10.1109/PESGM41954.2020.9281865.
- S. Datta, **A. Ghosh**, K. Sanyal, S. Das, “A Radial Boundary Intersection aided interior point method for multi-objective optimization,” Information Sciences, Volume 377, 2017, Pages 1-16, ISSN 0020-0255, DOI: 10.1016/j.ins.2016.09.062.
- A. Trivedi, D. Srinivasan, K. Sanyal, **A. Ghosh**, "A Survey of Multiobjective Evolutionary Algorithms Based on Decomposition," in IEEE Transactions on Evolutionary Computation, vol. 21, no. 3, pp. 440-462, June 2017, DOI: 10.1109/TEVC.2016.2608507.

RELEVANT COURSES

- CMSE 822 (Fall 2020): Parallel Computing. GPA - 4.0. Learned the core principles and techniques of parallel computation using modern High-Performance Computing (HPC) systems. Leveraged MPI and OpenMP in C++ to simulate a 2D N-body problem.
- CSE 881 (Spring 2020): Data Mining. GPA - 4.0. Learned fundamental topics in data mining like regression, classification, clustering, and other machine learning methods.
- CMSE 802 (Fall 2019): Methods of Computational Modeling. GPA - 4.0. Learned best practices in software development like version control, unit testing, and documentation. Python combined with Jupyter Notebook was used extensively.
- ECE 802 (Fall 2018): Multi-criteria Decision Making. GPA - 4.0. Covered the state-of-the-art multi-objective optimization methods using evolutionary algorithms. Implemented multiple algorithms in Python and MATLAB throughout the course.
- CSE 841 (Fall 2018): Artificial Intelligence. GPA - 4.0. Covered unifying themes across many areas of AI research.