Deepanshu

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Objectives

- To enrich learning and contribute to research domain of data-driven optimization and related applications
- To address real-world problems involving human-informed optimization and criteria-based decision-making

Timeline: Education & Work Experience

Indian Institute of Technology Madras, Chennai, Tamil Nadu, India
M.S. + Ph.D. in Engineering Design | **CGPA: 9.01/10** — Since Jul 2019
Thesis Supervisor: Prof. Palaniappan Ramu & Prof. Kalyanmoy Deb

Vedanta Aluminium Limited, Jharsuguda, India | **Full-time Job**
Graduate Engineer Trainee, Assistant Manager (O&M, Aluminium Smelter) — Jun 2016–Aug 2018

Mercedes Benz R&D, Bengaluru, India | **Internship**
Student Intern, Product Design and Development Department, Suspension Team — Jun 2015–Aug 2015

Bharat Pumps & Compressors Limited, Allahabad, India | **Industrial Training**
Student Trainee, Industrial visit and inspection of Manufacturing Unit — May 2014–Jun 2014

National Institute of Technology Kurukshetra, Haryana, India
B.Tech. in Mechanical Engineering | **CGPA: 9.56/10** — Jul 2012–Jun 2016

Course Projects

- Bayesian Online Change-point Detection (Course Project, 2021)
- Text Document Classification Using Self-Organizing-Maps (Research Project 2021)
- Identification of Approximate Models for LTI Multi-scale Systems (Course Project, 2020)
- Likelihood Ratios for Out-of-Distribution (OOD) Detection (Course Project, 2020)

Teaching

- **Teaching Assistant** at Department of Engineering Design, IIT Madras — Jul-Nov 2021
  Optimization in Engineering Design (ED6002): **HW and Quiz preparation, Tutorials, Evaluations**
- **Teaching Assistant** at Department of Engineering Design, IIT Madras — Jan-May 2022
  Computational methods in Design (ED5015): **HW and Quiz preparation, Tutorials, Evaluations**
- **Teaching Assistant** at Department of Engineering Design, IIT Madras — Jan-May 2023
  Computational methods in Design (ED5015): **HW and Quiz preparation, Tutorials, Evaluations**

Research Interests

- **Decision Making:** Visualization-aided interactive and informed multi-criteria decision making (MCDM), evolutionary multi-objective robust optimization and decision-making
- **Machine Learning:** Applied Statistics, basics of Machine Learning and Deep Learning techniques
- **Visual Analytics:** Design space exploration, Pareto front exploration, region of interest (RoI) identification, interpretable self-organizing maps (iSOM), PCP, RadViz, etc.

- **Uncertainty Quantification:** Extreme events, reliability-based design, probabilistic techniques
- **Optimization:** Gradient-based and heuristics-based algorithms, evolutionary algorithms, single-objective, multi-objective, and many-objective optimization

Publications

1. **Yadav, D.**, Sekar, K., & Ramu, P. (2024). Adaptive sampling based estimation of small probability of failure using interpretable Self-Organising Map. *Structural Safety, 102470.*

2. **Yadav, D**., Ramu, P., & Deb, K. (2023). Visualization-aided Multi-criteria Decision-making Using Interpretable Self-organizing Maps (iSOM) Following Pareto Race. *Applied Soft Computing.*

3. **Yadav, D**., Nagar, D., Ramu, P., & Deb, K. (2023). Visualization-aided Multi-criteria Decision-making Using Interpretable Self-organizing Maps. *European Journal of Operational Research, 309(3), 1183-1200.*

4. Pannerselvam, K., **Yadav, D.**, & Ramu, P. (2022). Scarce Sample-Based Reliability Estimation and Optimization Using Importance Sampling. *Mathematical and Computational Applications, 27(6), 99.*

5. Lee, I., Lee, U., Ramu, P., **Yadav, D.**, Bayrak, G., & Acar, E. (2022). Small Failure Probability: Principles, Progress and Perspectives. *Structural and Multidisciplinary Optimization, 65(11), 326.*

Conference Proceedings

1. **Yadav, D**., Ramu, P., & Deb, K. (2024, July). An Updated Performance Metric for Preference-Based Evolutionary Multi-Objective Optimization Algorithms. In *The Genetic and Evolutionary Computation Conference (GECCO 2024).* Association for Computing Machinery (ACM). **Accepted**

2. **Yadav, D**., Ramu, P., & Deb, K. (2023, July). Multi-objective Robust Optimization and Decision-Making Using Evolutionary Algorithms. In *The Genetic and Evolutionary Computation Conference (GECCO 2023).* Association for Computing Machinery (ACM).

3. **Yadav, D**., Ramu, P., & Deb, K. (2023, July). Finding Robust Solutions for Many-Objective Optimization Using NSGA-III. In *Congress on Evolutionary Computation (CEC 2023). IEEE.*

4. **Yadav, D.**, Ramu, P., & Deb, K. (2022, December). Visualization-aided Multi-criterion Decision-making Using Reference Direction Based Pareto Race. In *2022 IEEE Symposium Series on Computational Intelligence (SSCI) (pp. 125-132). IEEE.*

Conference/Symposium Presentations Click here

1. **Yadav D.**, Ramu P. & Deb K. (2023), "Incorporating Qualitative Preferences in Evolutionary Multi-Criteria Decision-Making", In *The 6th National Conference on Multidisciplinary Design, Analysis and Optimization (NCMDAO 2023) December 6-8, 2023, IIT Guwahati.* **Conference**

2. **Yadav D.**, Raj M. & Ramu P., (2023), "Visualization-aided Design Space Exploration of MDO Problems", In *The 6th National Conference on Multidisciplinary Design, Analysis and Optimization (NCMDAO 2023) December 6-8, 2023, IIT Guwahati.* **Conference**

3. Rishwanth M., Kishore V.V., Srinivasan, A.N., Mani V., **Yadav D.**, & Ramu P. (2023), "iSOM-derived Explainable Outcomes for Engineering Applications", In *The 6th National Conference on Multidisciplinary Design, Analysis and Optimization (NCMDAO 2023) December 6-8, 2023, IIT Guwahati.* **Conference**

4. **Yadav D.** & Ramu P. (2023), "Multi-Criteria Decision-making (MCDM) using interpretable Self-organizing Maps (iSOM)", In *International System Realization Partnership (ISRP) 2023 Symposium, Design Engineering in the Age of Industry 5.0, Cranfield University.* **Symposium**

5. **Yadav D.**, Ramu P. (2023), "A Novel Sensitivity Analysis Method Using Self Organizing Maps (SOM)", In 15^{th} *World Conference of Structural and Multi-disciplinary Optimization (WCSMO-15).* **Conference**

6. **Yadav D.** (2021), "iSOM Enabled Targeted Sampling for Extremes Prediction", 2^{nd} *International Symposium on Data Analytics Risk & Technology, RBCDSAI, IIT Madras.* **Symposium**

7. **Yadav D.**, Ramu P. (2021), "iSOM Enabled Targeted Sampling for Tail Modeling ", 4^{th} *National Conference on Multidisciplinary Design, Analysis, and Optimization, IIT Madras.* **Conference**

Academic Collaborations

- **COINLab: Computational Optimization and Innovation Laboratory** 2021-current
  Headed by: *Prof. Kalyanmoy Deb, Koenig Endowed Chair Professor, Electrical and Computer Engineering, Michigan State University, USA* (**2 Journal publication, 3 Conference proceedings**)
- **IDO: Innovative Design Optimization Laboratory** 2021-2022
  Headed by: *Prof. Ikjin Lee, Department of Mechanical Engineering, Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea* (**1 Journal publication**)
- **TOBB University of Economics and Technology** 2021-2022
  Headed by: *Prof. Erdem Acar, Department of Mechanical Engineering, TOBB University of Economics and Technology, Ankara, Turkey* (**1 Journal publication**)

Academic and Professional Achievements

- Awarded with **Student Travel Grant** by *Association of Computing Machinery (ACM) to attend GECCO, 2024* 2024
- **Institute Research (IR) Award**, a biannual award by *IIT Madras for Excellence in Research* 2024
- Awarded with **Student Travel Grant** by *Association of Computing Machinery (ACM) to attend GECCO, 2023* 2023
- Awarded with **International Immersion Experience (IIE) Travel Grant** by IIT Madras 2023
- Awarded with **Student Travel Grant** by *IEEE Computational Intelligence Society (CIS) to attend SSCI IEEE, 2022* 2022
- Awarded as **Innovative Employee of the Month** for Kaizen project '*Modification of Airlift Hatch locking arrangement*' at Vedanta Aluminium Ltd. 2017
- Qualified **Graduate Aptitude Test in Engineering (GATE)** Exam (among top 2.0%) 2016, 2018
- Secured overall **3rd** rank in Mechanical Engineering Department, NIT Kurukshetra 2012–2016
- Awarded for securing the overall **highest GPA (10/10)** in a semester (8^{th}), NIT Kurukshetra 2012–2016
- Qualified **JEE mains (then AIEEE)** exam (among top 0.6%) 2012

Competitions

- **Shell.ai Hackathon for Sustainable and Affordable Energy: EV Charging Network Challenge** 2022
  *- **Goal:** To Optimally locate the EV charging stations based on charging supply information and forecast the demand for the year 2023*
  - Formulated a Mixed Integer Non-liner Programming (MINLP) problem and solved it using MINLP solver
- ***Bright Optimizer: International Student Competition in Structural Optimization (ISCSO)*** *2021*
  *- **Goal:** To optimize the design of a truss structure by minimizing the weight under stress and deflection constraints*
  - Given space truss structure was optimized ($\sim$ 75% of the winner's weight) using mixed integer GA

Industrial Projects

- Design and fabrication of '*locking arrangement in feed pipe*' to reduce the alumina wastage (5S Project) 2018
- Design and fabrication of '*forklift attachment*' for lowering the load/machine (Kaizen Project) 2018
- Modification of '*airlift hatch*' locking arrangement (Kaizen Project) 2017