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Dr. Priyanka Devi Pantula

Ph.D
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Work Experience

Assistant Professor, Department of Chemical Engineering, IIT (ISM) Dhanbad — Dec 2021 - Present

Senior Algorithm Engineer, Rapiscan, OSI Systems, Hyderabad — Aug 2021 – Dec 2021

Research Interests

Machine Learning, Nonlinear Multi-Objective Optimization, Optimization under uncertainty, Fuzzy Logic, Surrogate Optimization, Evolutionary algorithms, with applications in Process Systems Engineering, Operations Research, and Computational Biology.

Academic Details

Year	Degree	Institute	CGPA/Marks (%)
2021	Ph.D. Chemical Engg.	Indian Institute of Technology Hyderabad	9.83
2016	M.Tech. Chemical Engg.	Indian Institute of Technology Hyderabad	9.60
2014	B.Tech. Chemical Engg.	JNTU-K	81.6%

Research Grant

Explainable Deep Learning for Optimal Design and Robust Control of Coal Flotation Columns – Towards an Intelligent & Reliable Clean Coal Initiative - **SRG/2022/002267 (30,84,000 INR)** (Funded by Department of Science & Technology – Start-up Research Grant DST-SRG 2022) - *Principal Investigator.*

Research study on mineral recovery and optimization - **FRS(183)/2022-2023/CHEMICAL (15,00,000 INR)** (Funded by from IIT (ISM) Dhanbad – Faculty Research Scheme) **–** *Principal Investigator.*

Research Outcomes

- **Ph. D thesis** – Machine Learning inspired Fuzzy logic-based modeling and uncertainty handling for optimization of chemical and biological processes.

  Short abstract: Real-world highly physics-based nonlinear chemical industrial problems aimed at simultaneously maximizing productivity, minimizing cost, and ensuring safety constraints under uncertainty are solved using unsupervised deep-learning algorithms and generative modeling framework for intelligently handling unlabeled data & solving stochastic optimization problems *better than the traditional way*. While dealing with optimization problems under uncertainty, transcripting the uncertainty set accurately from the experimental data is a significant concern. To the best of our knowledge, for the first time, a new methodology has been proposed in this thesis through a novel, optimally designed, Unsupervised Deep Learning network involving Fuzzy-Logic. Such data transcription, along with the stochastic optimization methods, culminates into novel Data-Driven Optimization under Uncertainty algorithms that generate less conservative solutions than those achieved following the state-of-the-art (reported by MIT in 2016) and enable a more realistic decision-making process leading to huge industrial benefits.

- **Master's thesis** - Analysis of Adaptive Neuro-Fuzzy Inference system (ANFIS) for building parameter-free automated surrogate algorithm.

  Short abstract: The impact of heuristics involved in ANFIS design and optimization were studied in detail for

emulating and enabling real-time optimization of the long chain branching process in Poly Vinyl Acetate polymerization, which is a computationally expensive model that is built using the first principles.

- **Publications (Full list is appended at the end & Citations: 346, h-Index: 11, i10 Index: 11):**
  - ✓ **11 international peer-reviewed Journal Publications (& 1 under review)**
  - ✓ **13 international peer-reviewed Conference Proceedings**
  - ✓ **2 international peer-reviewed Book Chapters**

Internships & Achievements

- Worked as an intern in the industrial project "Dynamic Resource Management in Cloud Computing" at Tata Research Development and Design Center (TRDDC), Pune, for a period of 6 months (Jan 2020 – Jun 2020).
- Worked as a Research Fellow in DBT sponsored project titled "Development of computational software integrating multilevel image data analysis: Towards efficient clinical practices and advanced biomolecular research in ophthalmology" at IITH in 2019.
- Received the Research Excellence award for 2020 in the Department of Chemical Engineering, IIT Hyderabad, during the 12th Foundation Day of IITH.
- Received the Scholarship given by Indian Railways for securing 81.62% in Bachelor of Chemical Engineering in 2014.

Programming Skills

- Efficient in Python, MATLAB, FORTRAN, and R Programming languages.
- Worked with Deep learning libraries such as Keras, TensorFlow, and Pytorch.
- Trained in Process simulation packages such as ASPEN & ANSYS FLUENT.

Courses Teaching/Taught (at UG & PG level)

- Process Optimization
- Process Data Analytics
- Chemical Reaction Engineering
- Machine Learning
- Process Simulation Lab
- Research Methodology
- Applied Statistics in Chemical Engineering
- Numerical Methods

Academic & Administrative Activities

- Member of the editorial board of the American Journal of Applied Scientific Research and section editor for Sage Open Journal.
- Regular tutor for the Training Program on Data Science and Artificial Intelligence, certified by Intellipaat, IIT-Madras, and GITAA since May 2022.

- Delivered a two-day virtual lecture in Tata Steel (Jamshedpur) for the Training Program on Data Analysis & Modeling, upon invitation by Prof. Kishalay Mitra (IIT Hyderabad), in July 2022.
- Resource person for the winter school on Optimization, Machine Learning, and Optimal control organized by the College of Engineering Pune in December 2019.
- Designed a new Departmental core course on Applied Statistics in Chemical Engineering for postgraduate level students during the Monsoon Semester, 2022-23 at IIT (ISM) Dhanbad.
- Member of the Organizing Committee for the International Conference on "Net-Zero Emission Technologies for Sustainable Development: Challenges and Opportunities (N0ET - 2022)", in December 2023, organized by IIT (ISM) Dhanbad in association with DSIR, Ministry of Science and Technology, and TEXMiN foundation, IIT (ISM) Dhanbad.
- Member of the Organizing Committee for the National Workshop on "Low-Cost Bio-Coal Technologies & its Potential Impact on Steel Industries", in May 2022, organized by IIT (ISM) Dhanbad and DSIR, Ministry of Science and Technology, Government of India.
- Member of the Anti-Ragging Squad Committee, 2022 and 2023 for the Students Welfare at IIT (ISM) Dhanbad.
- Member of the Organizing team for the International SPARC workshop on "Wind-farm Layout Optimization under uncertainty using Bayesian Optimization & Machine-Learning models" organized by University of Exeter, UK and IIT Hyderabad, India in August 2021.
- Member of the Organizing team for the "Sixth Indian Control Conference (ICC 2019)" organized by the IEEE Control Systems Society.
- Member of the Organizing team for the Sixth National Research Symposium of Chemical Engineers, "ChEmference 2015," organized by IIT Hyderabad.
- Member of the Organizing Committee for the Regional Level event "The Inter-Collegiate Hindu E-Plus Club Challenge 2012," organized by The Hindu at MVGR College of Engineering.

Full list of Publications

List of Peer-reviewed Journal Publications

1. Pantula, P. D., RajKumar N., Fazal Md., Comparison of Dynamic Data-based models for Froth Flotation process, *Minerals Engineering (Under-review).*

2. Gumte, K., Pantula, P. D., Soumitri M. S., Mitra, K., Achieving Wealth from Bio-Waste in a Nationwide Supply Chain Setup under Uncertain Environment through Data Driven Robust Optimization Approach, *Journal of Cleaner Production*, 2021 Jan 8; 291: 125702.

3. Sharma, S., Pantula, P. D., Soumitri M. S., Mitra, K., A Novel Data-driven Sampling Strategy for Optimizing Industrial Grinding Operation under Uncertainty using Chance Constrained Programming, *Powder Technology*, Jan 2021; 377: 913-923.

4. Gumte, K., Pantula, P. D., Miriyala S. S., Mitra, K., Data Driven Robust Optimization for Handling Uncertainty in Supply Chain Planning Models, *Chemical Engineering Science*, 2021 Dec 31; 246: 116889.

5. Kankanamge, D., Ubeysinghe, S., Tennakoon, M., Pantula, P. D., Mitra, K., Giri, L., Karunarathne, A., Dissociation of the G protein βγ from the Gq–PLCβ complex partially attenuates PIP2 hydrolysis, *Journal of Biological Chemistry*, 2021 Jan; 296: 100702.

6. Pantula, P. D., Mitra, K., Towards Efficient Robust Optimization using Data based Optimal Segmentation of Uncertain Space, *Reliability Engineering & System Safety*, 2020 May 1;197:106821.

7. Pantula, P. D., Miriyala, S. S., Mitra, K., An Evolutionary Neuro-Fuzzy C-means Clustering Technique, *Engineering Applications of Artificial Intelligence*, 2020 Mar 1;89:103435.

8. Inapakurthi, R. K., Pantula, P. D., Miriyala S. S., Mitra, K., Data driven robust optimization of grinding process under uncertainty, *Materials and Manufacturing Processes*, 2020 Dec 9; 35(16):1870-1876.

9. Pantula, P. D., Mitra, K., A data-driven approach towards finding closer estimates of optimal solutions under uncertainty for an energy efficient steel casting process, *Energy*, 2019 Oct 7; 189: 116253.

10. Swain, S., Gupta, R. K., Ratnayake, K., Pantula, P. D., et al. Confocal imaging and *k*-means clustering of GABAB and mGluR mediated modulation of Ca2+ spiking in hippocampal neurons, *ACS chemical neuroscience*, 2018 Jul 25; 9(12), 3094-3107.

11. Pantula, P. D., Miriyala, S. S., Mitra, K., KERNEL: enabler to build smart surrogates for online optimization and knowledge discovery, *Materials and Manufacturing Processes*, Genetic algorithms special issue, 2017 Jul 27; 32(10):1162-71.

12. Gupta, R. K., Swain, S., Kankanamge, D., Pantula, P. D., et al. Comparison of Calcium Dynamics and Specific Features for G Protein– Coupled Receptor–Targeting Drugs Using Live Cell Imaging and Automated Analysis, *SLAS DISCOVERY: Advancing Life Sciences R&D*, 2017 Aug; 22(7):848-858.

List of International Conference Proceedings

1. Analytics Pipeline for Visualization of Single Cell RNA Sequencing Data from Brochoaveol-ar Fluid in COVID-19 Patients: Assessment of Neuro-Fuzzy C-Means and HDBSCAN. In *2022 44th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. IEEE.

2. Pantula, P. D., Miriyala, S. S., & Mitra, K., 2021, December. A Deep Unsupervised Learning Algorithm for Dynamic Data Clustering. In *2021 Seventh Indian Control Conference (ICC) (pp. 147-152)*. IEEE.

3. Ramamurthy A., Pantula, P. D., Gharote M, Lodha S., and Mitra, K., 2021, April. Multi-Objective Optimization for Virtual Machine Allocation in Computational Scientific Workflow under Uncertainty. In *2021 11th International Conference on Cloud Computing and Services Science (CLOSER)*. Virtual conference, (pp. 240-247).

4. Pantula, P. D., et al. 2020, December. Synchronicity Identification in Hippocampal Neurons using Artificial Neural Network based Fuzzy C-means Clustering. In *2020 IEEE Symposium Series on Computational Intelligence (SSCI)*. Canberra, Australia, IEEE.

5. Pantula, P. D., Miriyala, S. S., et al. 2019, December. Automation of Synchronicity Identification in Hippocampal Neurons through Intelligent Data Clustering Approach. In *2019 Sixth Indian Control Conference (ICC) (pp. 268-273)*. IEEE.

6. Gumte, K. M., Pantula, P. D., Miriyala, S. S. and Mitra, K., 2019, December. Data Driven Robust Optimization for Supply Chain Planning Models. In *2019 Sixth Indian Control Conference (ICC) (pp. 218-223)*. IEEE.

7. Pantula, P. D. and Mitra, K., 2019, June. An Evolutionary Machine Learning Approach Towards Less Conservative Robust Optimization. In *2019 IEEE Congress on Evolutionary Computation (CEC) (pp. 2990-2997)*. IEEE.

8. Pantula, P. D., Miriyala, S. S. and Mitra, K., 2019, January. A Novel ANN-Fuzzy Formulation Towards Evolution of Efficient Clustering Algorithm. In *2019 Fifth Indian Control Conference (ICC) (pp. 254- 259).* IEEE.

9. Pantula, P. D., Miriyala, S. S. and Mitra, K., 2019, January. A Chance Constrained Programming Based Multi-Criteria Decision Making Under Uncertainty. In *2019 Fifth Indian Control Conference (ICC) (pp. 359-364).* IEEE.

10. Swain, S., Pantula, P. D., et al., 2018, July. Confocal imaging of cytosolic Ca 2+ and fuzzy clustering reveal the circuit topology details underlying synchronization in hippocampal neurons. In *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 822-825).* IEEE.

11. Miriyala, S. S., Pantula, P. D., et al., 2018, July. Smart Data Analytics approach to model Complex Biochemical Oscillations in Hippocampal Neurons. In *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 5045-5048).* IEEE.

12. Pantula, P. D., Miriyala, S. S. and Mitra, K., 2017, January. Simultaneous knowledge discovery and development of smart neuro-fuzzy surrogates for online optimization of computationally expensive models. In *2017 Indian Control Conference (ICC) (pp. 260-267).* IEEE.

13. Miriyala, S. S., Pantula, P. D., Majumdar, S. and Mitra, K., 2016, January. Enabling online optimization and control of complex models through smart surrogates based on ANNs. In *2016 Indian Control Conference (ICC) (pp. 214-221).* IEEE.

List of Book Chapters

1. Pantula, P. D., Miriyala, S. S. and Mitra, K., 2018. Efficient Optimization Formulation Through Variable Reduction for Clustering Algorithms. In *Handbook of Research on Emergent Applications of Optimization Algorithms* (pp. 135-162). IGI Global.

2. Pantula, P. D., Miriyala, S. S., & Mitra, K. 2023. Stochastic optimization of industrial grinding operation through data-driven robust optimization. In *Statistical Modeling in Machine Learning* (pp. 249-267). Academic Press.