Javal Vyas

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Education

Imperial College London — London, UK
Ph.D. Candidate in Chemical Engineering — Sept 2024- Dec 2027

Carnegie Mellon University – Carnegie Institute of Technology — Pittsburgh, USA
Master of Science in AI Engineering in Chemical Engineering | CGPA: 3.99/4 — Aug 2022 - Dec 2023

Experience

- **Optimization and Machine Learning Researcher (Multi-agent AI systems)** — London, UK
  Ph.D. Student advised by Prof. Mehmet Mercangoz — Sept 2024 – Present
  - Developed GraphRAG system using knowledge graphs for robust sequential decision-making, enabling LLM agents to retrieve and reason over structured data for improved strategy consistency across complex planning scenarios.
  - Pioneered cut-based reprompting technique treating LLMs as stochastic policies, using optimization cuts to reduce entropy and improve decision consistency in multi-step sequential problems.
- **Engineer 2** — Pittsburgh, USA
  KeyLogic — Jan 2024 – Aug 2024
  - Accelerated large-scale MINLP optimization through neural network surrogate integration, achieving 4× speedup (1600s → 400s) with zero optimality degradation for complex scheduling problems with 116631 variables and 14186 constraints.
  - Architected robust data preprocessing and validation framework with ML-based anomaly detection, reducing model failures and improving solution consistency across diverse problem instances.

Selected Publications

M. Gill, **J. Vyas**,A. Markaj, F. Gehlhoff,M. Mercangoz, "Towards Autonomous Fault Management in Process Plants: Leveraging LLM Agents and Digital Twins", *Paper accepted at ETFA-30*(preprint).

J. Vyas, M. Mercangoz, "Autonomous Industrial Control using an Agentic Framework with Large Language Models", *Paper accepted at DYCOPS-25* (preprint).

D. Ovalle, **J. Vyas**, C.D. Laird, I.E. Grossmann, 'Using Machine Learning Surrogates to Bridge Different Time-scales for Optimization of Plant Scheduling and Supply Chain Under Disruptions", *Computer Aided Chemical Engineering (Vol. 53, pp. 1489-1494, 2024). Elsevier.* .

Presentations and Lectures

- **J. Vyas**, M. Mercangoz, 'Autonomous Industrial Control using an Agentic Framework with Large Language Models' *presented at AIChE - Spring Meeting 2025*
- D. Ovalle, **J. Vyas**, C.D. Laird, I.E. Grossmann, 'Using Machine Learning Surrogates to Bridge Different Time-scales for Optimization of Plant Scheduling and Supply Chain Under Disruptions' *presented at ESCAPE-PSE 2024*

Awards

- **Best Poster Award**: ChEMSA Research Forum — 2023

Skills

- **Languages:** Python, Julia, Matlab, C++, Git/Github, Gurobi, GAMS
- **Packages:** LangChain, LangGraph, CrewAI, Pytorch, TensforFlow, Huggingface, Pyomo, OMLT, Sklearn,
- **General Coding:** Linux, Python Package Development, Open-source Contributions (3 packages)