

Farbod Maghsoudi

Process Systems Engineering — Modelling — Optimization — Scientific Software Development

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Summary

A chemical engineer with a minor in computer science, focused on process systems engineering, hybrid modeling through integration of machine learning and first-principles models, optimization, and scientific software development in Python. McMaster research centers on HYPRONET, a hybrid process-plant modeling and optimization environment. Prior work includes Python/COM plugin development for AspenTech simulation-suite interoperability, development of a viscosity-based closed-loop control extension system for injection molding machines, and process simulation projects in vinyl chloride production plant, pressure-swing distillation, and biomass gasification.

Education

Master of Applied Science, Chemical Engineering Jan 2024 – present
McMaster University, Hamilton, Canada GPA: 3.96/4.0
Research affiliation: McMaster Advanced Control Consortium (MACC).
Research focus: HYPRONET, hybrid plant modeling and optimization, scientific software development
Supervised by: Dr. Vladimir Mahalec

Bachelor of Science, Chemical Engineering Sep 2019 – Sep 2024
Minor, Computer Science
Sharif University of Technology, Tehran, Iran GPA: 17.24/20
Thesis: Process Simulation Calibration through interoperability of Aspen Software and Python.

Technical Expertise

Process Systems Engineering

- **Hybrid plant modeling:** surrogate, reduced-order, and rigorous process representations
- **Process optimization:** mathematical formulation, Pyomo development, planning, and RTO
- **Process design and control:** feasibility analysis, process design, and control

Machine Learning

- **Classical methods:** PCA, PLS, tree-based methods, clustering, feature selection, model tuning
- **Deep learning:** neural network architectures, training strategies, and model evaluation
- **NLP and AI systems:** natural language processing pipelines and agentic AI

Simulation and Software

- **Programming languages:** Python, Java, C++, MATLAB
- **Frameworks and tools:** Pyomo, Gurobi, PyTorch, scikit-learn, Django, Sphinx, SQL, Git, Docker
- **Domains:** optimization, modelling, machine learning, deep learning, scientific software, and DevOps
- **Simulation:** Aspen Plus/HYSYS/Dynamics, COMSOL, and Moldflow

Honors & Awards

- **Best Presentation Award**, AIChE Spring Meeting (2025). Blue hydrogen plant operation via hybrid plant modeling.
- **Gold Medal / First Place**, RAHNESHAN Nationwide Scientific Contest. Multi-layer Polyamide 6 fuel-line design to reduce oligomer degradation and injector fouling.
- **Iranian Universities Entrance Exam**. Ranked 340th among 150,000+ participants, placing in the top 0.5%.

Research & Industry Experience

Graduate Researcher

Feb 2024 – present

McMaster University, Department of Chemical Engineering

Process systems engineering and plant optimization

- Developed a composite optimization algorithm for chemical process networks, supporting both simulation and real-time optimization through switchable model abstractions.
- Designed and implemented an object-oriented Python framework for plant modeling and optimization built on the composite optimization algorithm.
- Built computation server endpoints that enabled model generation and solver execution across local, on-premise, and remote server environments.
- Co-authored an *Industrial & Engineering Chemistry Research* article on composite optimization, contributing methodology, software, visualization, and original draft.
- Led and contributed to the design of a React-based graphical user interface for the package, collaborating with computer science students on architecture and implementation.

Co-founder

Sep 2023 – Jan 2024

Risen

Viscosity-based control systems for injection molding machines

- Co-founded a startup to commercialize viscosity-based injection molding control; developed initial minimum viable product and technology roadmap.

R&D Engineer

Jul 2022 – Sep 2023

Amper Innovation Factory / Amper Drive

Polymer processing and process control

- Investigated injection molding process variation using operational data, Moldflow simulation, CAD part analysis, and production-site comparison.
- Identified melt-cushion variability as the root cause of part-weight variation; proposed closed-loop viscosity sensing as the mitigation strategy.
- Designed and prototyped a viscosity-adaptive control scheme for injection molding machines, linking melt-flow index data to machine pressure and velocity setpoints.

Undergraduate Researcher

2023

Sharif University of Technology

Process simulation automation

- Developed four Python/COM plugins to enable cross-platform automation between Aspen Plus, Aspen HYSYS, Aspen Dynamics, and AutoCAD.
- Built HYSYS-to-Aspen Plus conversion, AutoCAD/DXF-to-Aspen Plus flowsheet generation, Aspen Dynamics scripting, and HYSYS dynamic-control workflows.

Publication & Presentation

Farbod Maghsoudi, Raunak Pandey, and Vladimir Mahalec. “Composite Optimization Algorithm for Consistent Solutions of Different Plant Model Abstractions by Solving Linear Subsets of Equations.” *Ind. Eng. Chem. Res.* **65**, 1252–1267 (2026).

DOI: [10.1021/acs.iecr.5c03147](https://doi.org/10.1021/acs.iecr.5c03147).

Farbod Maghsoudi, Raunak Pandey, and Vladimir Mahalec. “Optimization of Blue Hydrogen Plant Operation via Hybrid Plant Modeling.” *AIChE Spring Meeting* (2025). Best Presentation Award.