

Farbod Maghsoudi

Scientific Software Development — Process Systems Engineering — Optimization — Full-Stack Analytics

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Summary

A process systems engineer with a minor in computer science, specializing in scientific software development and optimization. Graduate research at McMaster operated across two dimensions: developing a composite optimization algorithm and Pyomo-based scientific computing framework for process plant modeling, and leading the architecture and implementation of a full-stack platform (React, Node.js, PostgreSQL, MongoDB) built around that research engine. Additional experience includes Python/COM automation tooling for AspenTech simulation software and a data-driven decision-support system for polymer manufacturing process control. Core stack: Python, Pyomo, Gurobi, Django, React, JavaScript, Node.js, SQL, Git, Docker.

Education

Master of Applied Science, Process Systems Engineering Jan 2024 – present
McMaster University, Hamilton, Canada GPA: 3.96/4.0
Research affiliation: McMaster Advanced Control Consortium (MACC).
Research focus: Scientific software development, hybrid plant modeling, and process optimization

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

Scientific Software Development

- **Python:** modeling and ML frameworks, Pyomo applications, and Django APIs
- **Full-stack integration:** JavaScript, React interfaces, Node.js services, API communication, and database-backed engineering applications in PostgreSQL, MongoDB
- **Tools:** Git, Docker, Sphinx, and Metabase

Optimization and Analytics

- **Optimization:** Pyomo, Gurobi, LP/MILP/NLP, stochastic programming, scheduling, RTO
- **Machine learning:** PCA, PLS, tree-based methods, SVMs, deep learning with PyTorch, NLP
- **Data workflows:** pandas, multivariate analysis, process data pipelines, and model evaluation

Process Systems and Simulation

- **Process systems engineering:** hybrid plant modeling, surrogate/reduced-order modeling, process optimization, and simulation
- **Industrial applications:** process data analysis, control-oriented modeling, manufacturing process improvement, and decision-support tools
- **Simulation tools:** Aspen Plus/HYSYS/Dynamics, COMSOL, Moldflow, and MATLAB

Honors & Awards

- **Best Presentation Award**, AIChE Spring Meeting (2025). Blue hydrogen plant operation via hybrid plant modeling.
- **Iranian Universities Entrance Exam**. Ranked 340th among approximately 150,000 participants, source-reported top 0.5 percent.

Research & Industry Experience

Graduate Researcher

Feb 2024 – present

McMaster University, Department of Chemical Engineering

Scientific software development and process optimization

- Led the design of a React-based graphical user interface for the plant optimization package, collaborating with computer science students on front-end architecture and implementation.
- Designed and implemented a Python calculational-server back-end with API endpoints enabling model generation and solver execution across local, on-premise, and remote environments.
- Built a configuration-driven, object-oriented Python framework for plant modeling and optimization using model-factory design patterns, reusable component libraries, and automated solve workflows.
- Developed a composite optimization algorithm for chemical process networks supporting switchable model abstractions for simulation and real-time optimization.
- Co-authored an *Industrial & Engineering Chemistry Research* article on composite optimization, contributing methodology, software, visualization, and original draft.

Co-founder

Sep 2023 – Jan 2024

Risen

Decision support systems for injection molding machines

- Co-founded a startup to commercialize a viscosity-based decision support and control extension system for injection molding machines; developed initial minimum viable product and technology roadmap.

R&D Engineer

Jul 2022 – Sep 2023

Amper Innovation Factory / Amper Drive

Data-driven analytics for polymer manufacturing

- Analyzed injection molding process variation using operational data, Moldflow simulation, and production-site comparison; identified melt-cushion variability as root cause of part-weight defects.
- Designed and prototyped a data-driven, viscosity-adaptive control decision system linking melt-flow index measurements to machine pressure and velocity setpoints.

Undergraduate Researcher

2023

Sharif University of Technology

Engineering software automation

- Developed four Python/COM automation plugins enabling cross-platform interoperability between Aspen Plus, Aspen HYSYS, Aspen Dynamics, and AutoCAD.
- Built GUI-driven automation workflows, DXF-to-flowsheet generation tooling, and scripted dynamic-control simulation pipelines.

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).

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