

Soheyl Massoudi

Postdoctoral Researcher - Artificial Intelligence in Engineering Design - ETH Zurich

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Profile

Mechanical engineer developing AI methods that generate and evaluate executable engineering models, tools, and optimization code. Research spans robust design of coupled physical systems, surrogate modeling, parametric CAD, LLM agents, engineering benchmarks, and reinforcement learning for reusable solver generation.

Appointments

Postdoctoral Researcher, ETH Zurich | IDEAL Lab | Nov 2024-present

Research on requirements-to-model workflows, tool-using AI agents, simulation and optimization, benchmarked agent evaluation, and reusable solver generation.

Doctoral Researcher, EPFL | Laboratory for Applied Mechanical Design | Apr 2020-Oct 2024

Developed surrogate-assisted methods for multidisciplinary and robust optimization of gas-bearing turbocompressors, together with automated simulation and parametric CAD tools.

Aerospace Design Intern, Aerys | 2019

Airframe design and aerodynamic analysis for a vertical-take-off-and-landing aircraft.

Physics Education and Tutoring | 2016-2020

Developed EPFL Physics I learning material, coordinated tutoring activities, and taught International Baccalaureate mathematics and physics.

Education

Ph.D. in Energy, EPFL | 2024

Laboratory for Applied Mechanical Design. Thesis: Empowering turbocompressor design with AI: a unified approach to robustness and all-at-once optimization.

M.Sc. in Mechanical Engineering, EPFL | Minor in Energy | 2020

B.Sc. in Mechanical Engineering, EPFL | 2017

Academic Leadership and Funding

- Workshop Co-Chair, Design Computing and Cognition 2026. Hands-on workshop on benchmarking AI in engineering design. [Programme](#)
- Swiss AI Initiative Small Compute Grants. Two competitive GPU-hour allocations on the CSCS Alps supercomputer for LLM fine-tuning and reinforcement-learning experiments.
- EPFL Technology Transfer Office Enable Grant and EPFL Vice Presidency for Innovation XGrant, 2018.

Teaching and Mentoring

- ETH Zurich: Supervised two Master's semester projects and eleven BSc theses; co-supervised the nine-student AISCO Focus Project team on AI for solar-car optimization.
- EPFL: Supervised nine Master's semester projects; teaching assistant for Applied Mechanical Design and Thermal Power Cycles and Heat Pumps.

Research Software and Artifacts

- Neural Solver Synthesis: GRPO training, fixed-code evaluation, models, datasets, and experiment traces for reusable optimization programs. [Repository](#)
- Design-State Graph: Multi-agent evaluation and open experimental traces for conceptual systems engineering. [Article](#)
- DARTS-NetGAB: Interactive learned simulation connected to automated system-level CAD generation. [Article](#)
- ParaturboCAD: Open Python/CadQuery pipeline for parametric turbocompressor assemblies. [Repository](#)
- ARMID: Surrogate-assisted optimization across coupled compressor, rotor, and bearing subsystems. [Article](#)

Methods and Tools

Multi-objective optimization; reinforcement learning for code; LLM fine-tuning and evaluation; distributed training; HPC experiment management; ensemble neural networks; surrogate modeling; systems design; Python; MATLAB; CadQuery; LangGraph; scientific computing.

Publications and Research Outputs

Journal Articles

- Agentic Large Language Models for Conceptual Systems Engineering and Design. Soheyl Massoudi and Mark Fuge. Journal of Mechanical Design, 2026. DOI
- Dimensionless group-driven ensemble neural networks for robust design optimization in engineering. Soheyl Massoudi and Jürg Schiffmann. Journal of Computational Design and Engineering, 2025. DOI
- DARTS-NETGAB: Design Automation and Real-Time Simulation Using Neural Network Ensembles for Turbocompressors on Gas-Bearings. Soheyl Massoudi, Joseph Bejjani, Timothy Horvath, Doğukan Üstün, and Jürg Schiffmann. Journal of Mechanical Design, 2025. DOI
- Robust design optimization of gas-lubricated herringbone grooved journal bearings: Surrogate modeling and experimental validation. Soheyl Massoudi, Cameron Bush, and Jürg Schiffmann. Tribology International, 2025. DOI
- An Integrated Approach to Designing Robust Gas-Bearing Supported Turbocompressors Through Surrogate Modeling and Constrained All-At-Once Multi-Objective Optimization. Soheyl Massoudi, Cyril Picard, and Jürg Schiffmann. Journal of Mechanical Design, 2024. DOI
- Robust Design of Herringbone Grooved Journal Bearings Using Multi-Objective Optimization With Artificial Neural Networks. Soheyl Massoudi and Jürg Schiffmann. Journal of Turbomachinery, 2023. DOI
- Robust design using multiobjective optimisation and artificial neural networks with application to a heat pump radial compressor. Soheyl Massoudi, Cyril Picard, and Jürg Schiffmann. Design Science, 2022. DOI
- Quasi-elastic neutrino reactions on carbon and lead nuclei. Mohammad Hedayatipoor, James Finlay, Soheyl Massoudi, Charles Nokes, and Marc de Montigny. Journal of Physics G: Nuclear and Particle Physics, 2018. DOI

Conference Papers

- EngiBench: A Framework for Data-Driven Engineering Design Research. Florian Felten, Gabriel Apaza, Gerhard Bräunlich, Cashen Diniz, Xuliang Dong, Arthur Drake, Milad Habibi, Nathaniel J. Hoffman, Matthew Keeler, Soheyl Massoudi, Francis G. VanGessel, and Mark Fuge. NeurIPS 2025 Datasets and Benchmarks Track, 2025. Record
- ParaturboCAD: Automated Parametric Geometry Construction for Gas-Bearing Supported Turbocompressor Design With Python. Soheyl Massoudi, Joseph Bejjani, Timothy Horvath, Doğukan Üstün, and Jürg Schiffmann. Volume 3B: 50th Design Automation Conference (DAC), 2024. DOI
- DARTS-NETGAB: Design Automation and Real-Time Simulation Using Neural Networks Ensembles for Turbocompressors on Gas-Bearings. Soheyl Massoudi, Joseph Bejjani, Timothy Horvath, Doğukan Üstün, and Jürg Schiffmann. Volume 3B: 50th Design Automation Conference (DAC), 2024. DOI
- An Integrated Approach to Designing Robust Turbocompressors on Gas Bearings Through Surrogate Modeling and Constrained Multi-Objective Optimization. Soheyl Massoudi, Cyril Picard, and Jürg Schiffmann. Volume 3B: 49th Design Automation Conference (DAC), 2023. DOI
- Robust Design of Herringbone Grooved Journal Bearings Using Multi-Objective Optimization With Artificial Neural Networks. Soheyl Massoudi and Jürg Schiffmann. Volume 13D: Turbomachinery — Multidisciplinary Design Approaches, Optimization, and Uncertainty Quantification; Radial Turbomachinery Aerodynamics; Unsteady Flows in Turbomachinery, 2023. DOI

Preprints

- EngiAI: A Multi-Agent Framework and Benchmark Suite for LLM-Driven Engineering Design. Gioele Molinari, Florian Felten, Soheyl Massoudi, and Mark Fuge. arXiv, 2026. DOI
- Beyond Inference-Time Search: Reinforcement Learning Synthesizes Reusable Solvers. Soheyl Massoudi, Gabriel Apaza, Milad Habibi, and Mark Fuge. arXiv preprint, 2026. DOI
- GLUE: Coordinating Pre-Trained Generative Models for System-Level Design. Tim Aebersold, Soheyl Massoudi, and Mark Fuge. arXiv preprint, 2025. DOI
- ARRID: ANN-based Rotordynamics for Robust and Integrated Design. Soheyl Massoudi and Jürg Schiffmann. Preprint, 2022. DOI

Datasets

- Agentic LLM traces for Conceptual Systems Engineering & Design. Soheyl Massoudi and Mark Fuge. Zenodo, 2025. DOI
- ParaturboCAD Dataset of R134a HGJB Supported Centrifugal Compressors Optimized Across Varied Mass Flows. Soheyl Massoudi, Joseph Bejjani, Timothy Horvath, Doğukan Üstün, and Jürg Schiffmann. Zenodo, 2024. DOI

Doctoral Thesis

- Empowering turbocompressor design with AI: a unified approach to robustness and all-at-once optimization. Soheyl Massoudi. PhD Thesis, 2024. DOI