Hossein Naderi

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SUMMARY

Machine learning engineer and full-stack builder. I work on **agentic AI systems**, the **ML models and digital-twin surrogates** they rely on, and the software that ties the two together. Currently building **SimPilot**, a multi-agent platform for engineering automation, while leading ML and digital-twin work at **Synopsys**. Ph.D. in computational modeling. Publications cited **450+ times**.

EXPERIENCE

SimPilot — Multi-Agent Platform for Engineering Automation (solo) Dec 2025 - Present

simpilot.dev | Full-stack TypeScript, AI SDK v7, AWS

- Built a **multi-agent orchestrator** (**155+ tools**, 3 LLM providers with fallback, deep-research supervisor/researcher loop with provenance) on Vercel AI SDK v7
- Designed a **typed phase loop**: 23 lifecycle phases with Zod-typed evidence gates — the agent cannot advance without producing the next phase's artifact
- Shipped end-to-end as **full-stack TypeScript** on Next.js 16 + Express, with **sandboxed Docker execution** on AWS Batch/ECS, Drizzle/Postgres, Redis, Stripe billing, OpenTelemetry + Langfuse

Senior R&D Engineer — ML & Digital Twins May 2025 - Present

Synopsys Inc., Canonsburg, PA

- Designed an **end-to-end ML pipeline** for **NeuralODE digital twins**: data prep, training, evaluation, and deployment as FMUs into production simulation tooling
- Built a **model-evaluation framework** comparing hybrid AI surrogates against legacy numerical solvers — the benchmark engineering managers actually act on

Graduate Research Assistant — Scientific ML & RL Sep 2021 - Apr 2025

University of Pittsburgh, Pittsburgh, PA

- **Reinforcement learning agents** (TRPO, PPO) for control of chaotic systems: **34% improvement** in control accuracy over prior published baselines
- Wrote a **JAX evaluation harness** for RL policy rollouts with **1000× speedup** over the previous PyTorch pipeline — cut a week-long sweep to under a day
- Built **transformer models for long-horizon prediction** of dynamical systems; sustained **<5% error** across diverse parameter regimes

SELECTED PROJECTS

- **Generative diffusion surrogates** (Navier–Stokes, Gray–Scott) — conditional diffusion as fast digital twins for PDE solvers; **>100× speedup** at comparable accuracy
- **LLM fine-tuning** on scientific-ML literature (T5/BERT, Hugging Face) — **>80% accuracy** on domain QA benchmarks

SKILLS

AI / Agents

- Vercel AI SDK / MCP
- Multi-Agent Orchestration
- LLM Fine-tuning / RL

ML / Digital Twins

- NeuralODEs / PINNs
- Diffusion / Transformers
- Surrogate Modeling

Software

- TypeScript / Python (Expert)
- Next.js / React / Node
- tRPC / Drizzle / Postgres

Infrastructure

- AWS (ECS, Batch, S3)
- Docker / Redis / Stripe
- OpenTelemetry / Vercel

EDUCATION

Ph.D., Computational Modeling & Simulation — University of Pittsburgh Sep 2021 - Aug 2025 | GPA 4.0 | CMS Fellowship

M.Sc., Aerospace Engineering — University of Tehran Sep 2016 - Sep 2019 | GPA 4.0 | Best National Thesis

B.Sc., Aerospace Engineering — K. N. Toosi University of Technology Sep 2012 - Sep 2016 | Ranked 1st in Dept.