Daniel Saeedi

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Research Areas

Agentic AI, Large Language Models, Mechanistic Interpretability, Generative & Diffusion Models

Education

Ph.D. in Electrical and Computer Engineering, *Georgia Institute of Technology* Sep 2023 - Present

- **Advisor:** Prof. Amirali Aghazadeh
- **Collaborative Specialization:** Machine Learning and Deep Learning for Science
- **Relevant Coursework:** Generative and Geometric Deep Learning (A), Statistical Machine Learning (A)

M.S. in Electrical and Computer Engineering, *Georgia Institute of Technology* May 2026

- **Advisor:** Prof. Amirali Aghazadeh
- **Thesis:** Hypothesis Generation from High-Dimensional Scientific Data Using Multi-Agent AI

B.S. in Computer Engineering, *University of Tehran GPA: A - 17.98/20* Sep 2019 - Jun 2023

- **Relevant Coursework:** Neural Networks and Deep Learning, Artificial Intelligence, Algorithm Design, Data Structures and Algorithms, Advanced Programming, Differential Equations

Technical Skills

Languages & Tools: Python, C/C++, Git, Linux
ML / DL: PyTorch, Transformers & Diffusers, scikit-learn, NumPy, Pandas
LLMs & Agentic AI: Multi-Agent Systems, LangChain, LangGraph, RAG, Fine-tuning, Prompt Engineering

EXPERIENCE

Graduate Research Assistant, Georgia Institute of Technology Sep 2023 - Present
Advisor: Prof. Amirali Aghazadeh

- Developed ASTRA, **a multi-agent AI system** that autonomously reconstructs prebiotic reaction networks and reveals organizational features of amino acid synthesis, advancing origin-of-life research.
- Developed AstroAgents, **a multi-agent AI system** that autonomously generates and tests scientific hypotheses from mass spectrometry data, advancing origin-of-life research using NASA's meteorites and soil samples. This work has garnered media coverage from Nature News, Georgia Tech News.
- Built LifeTracer, a machine learning framework that accurately classifies meteoric vs. terrestrial samples and identifies biosignatures for future sample return missions (i.e., Mars), published in PNAS Nexus.
- Developed cryoSENSE, **a compressive sensing framework** for high-throughput cryo-EM that combines sparse priors and **diffusion-based generative models** to achieve 2.5x data throughput increase while preserving atomic resolution, addressing critical bandwidth bottlenecks in structural biology. **Accepted to CVPR 2026.**
- Developed ProtoMech, **a mechanistic interpretability framework** for discovering computational circuits in protein language models using cross-layer transcoders. ProtoMech identifies compact circuits ($<$1% of the latent space) that recover up to 79% of ESM2's performance and align with known structural and functional motifs, enabling **steerable** high-fitness protein design. **Accepted to ICML 2026.**

Publications

- **D. Saeedi**, N. Pokhrel, L. Gao, C. Wen, E. Bruce, J. C. Aponte, A. Stockton, A. Aghazadeh. Autonomous Multi-Agent Reconstruction of Prebiotic Reaction Networks Reveals Organizational Features of Amino Acid Synthesis. *Preprint*, 2026. [Project Website] [Video]
- D. Tsui, K. Talreja, **D. Saeedi**, A. Aghazadeh. ProtoMech: Protein Circuit Tracing via Cross-layer Transcoders. *Mechanistic Interpretability Workshop, ICML 2026 (fast-tracked).* [Project Website]
- D. Tsui, W. Deinzer, **D. Saeedi**, A. Aghazadeh. Circuit Tracing in Autoregressive Protein Language Models. *Mechanistic Interpretability Workshop, ICML 2026.*

- **D. Saeedi***, Zain Shabeeb*, Darin Tsui*, Vida Jamali, Amirali Aghazadeh. cryoSENSE: Compressive Sensing Enables High-throughput Microscopy with Sparse and Generative Priors on the Protein Cryo-EM Image Manifold. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2026. * indicates equal contribution.[CVPR PDF] [Project Website]
- **D. Saeedi***, Zain Shabeeb*, Darin Tsui*, Vida Jamali, Amirali Aghazadeh. Generative Priors for Cryo-EM Image Reconstruction. *ICML 2026 Workshop on Generative and Agentic AI for Biology* (Poster), 2026. * indicates equal contribution.
- **D. Saeedi**, D. Buckner, T. Walton, J. C. Aponte, A. Aghazadeh. Discriminating abiotic and biotic organics in meteorite and terrestrial samples using machine learning on mass spectrometry data. *PNAS Nexus*, 4(11), pgaf334, Nov 2025. [Project Website]
- **D. Saeedi**, D. K. Buckner, J. C. Aponte, A. Aghazadeh. AstroAgents: Agentic AI for Scientific Discovery. *ICLR 2025 Workshop AgenticAI and AMS 2025 conference* (Oral Presentation), Feb 2025. [Project Website]
- D. K. Buckner, **D. Saeedi**, T. Walton, J. C. Aponte, A. Aghazadeh. Lunar and Planetary Science Conference. *Oral Presentation*, March 2025.
- José C. Aponte, Hannah L. McLain, **D. Saeedi**, Amirali Aghazadeh, Jamie E. Elsila, Daniel P. Glavin, Jason P. Dworkin. Challenges and Opportunities in Using Amino Acids to Decode Carbonaceous Chondrites and Asteroids Parent Body Processes. *Astrobiology Journal*
- **D. Saeedi**, A. Kheirandish, S. Saeedi, H. Sahour, A. A. Panahi, I. Naeeni. GT-NLP at SemEval-2025 Task 11: EmoRationale, Evidence-Based Emotion Recognition via Retrieval-Augmented Generation. *SemEval-2025* , July 2025.
- **D. Saeedi**, A. Panahi, S. Saeedi, A. Fong. Effective Data Augmentation Methods for Multi-label Classification Language Understanding Tasks. *Proceedings of 16th International Workshop on Semantic Evaluation (SemEval), 2022.*

TEACHING EXPERIENCE

Generative and Geometric Deep Learning at Georgia Tech, *Head Teaching Assistant* Fall 2024-2025

- Mentored students on course projects involving diffusion models, graph neural networks, and generative architectures
- Provided technical support and guidance on implementing state-of-the-art generative AI methods

Digital Design Lab at Georgia Tech, *Head Teaching Assistant* Spring 2024

- Managed a team of teaching assistants and supervised over 50 students in digital circuit design projects
- Led hands-on lab sessions on FPGA programming and hardware description languages

TALKS & PRESENTATIONS

- **D. Saeedi**, A. Stockton, A. Aghazadeh. AstroAgents: Agentic AI at the dawn of life. *Generative AI Summit 2025 at Georgia Tech*, Oct 2025.
- **D. Saeedi**, D. K. Buckner, J. C. Aponte, A. Aghazadeh. AstroAgents: Agentic AI for Scientific Discovery. *ICLR 2025 Workshop AgenticAI and AMS 2025 conference* (Oral Presentation), Feb 2025. [Project Website]