

JACOB K. CHRISTOPHER

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Generative AI, Physics-Aware Models, Responsible AI, Differentiable Optimization

Education

University of Virginia

Ph.D. in Computer Science

Aug 2023 – Present

Charlottesville, Virginia

Syracuse University

Ph.D. Track Master of Science

Aug 2022 – July 2023

Syracuse, New York

Gordon College

Bachelor of Science in Computer Science

Aug 2019 – May 2022

Wenham, Massachusetts

Experience

University of Virginia

Graduate Research Assistant

Aug 2023 – Present

Charlottesville, Virginia

- *Mentor:* Dr. Ferdinando Fioretto
- Researching generative AI and optimization, with emphasis on scalable diffusion methods for physics-aware models.
- This work led to publications at top ML conferences (NeurIPS 2024, ICML 2025, NeurIPS 2025 Spotlight, ICLR 2026).

Cerebras Systems

Core ML Research Scientist Intern

May 2026 – Aug 2026

Toronto, Ontario

- *Mentor:* Nolan Dey, Joel Hestness
- Researching next generation diffusion language models, with emphasis on inference-time acceleration.

NASA Langley Research Center

AI Research Associate

Oct 2025 – Jan 2026

Hampton, Virginia

- *Mentor:* Dr. James Warner
- End-to-end learning for constrained flow matching models, providing state-of-the-art for hard constrained generation.
- Developed constrained generative modeling approaches for real-world deployment in wind velocity modeling.

Lawrence Livermore National Laboratory

Graduate Researcher

May 2024 – Aug 2024

Livermore, California

- *Mentor:* Dr. Bhavya Kailkhura, Dr. Brian R. Bartoldson
- Designed discrete diffusion approaches to improve controllability and accelerate natural language generation.
- Collaboration with national lab scientists resulted in publications at NAACL 2025 (Oral) and NeurIPS 2025.

Solü Technology Partners

Software Engineer Co-op

Aug 2021 – May 2022

Rochester, New York

- Built automated API testing framework and deployment pipeline for a survey platform in a SCRUM environment.

Publications

Conference Publications

SpecDiff-2: Scaling Diffusion Drafter Alignment For Faster Speculative Decoding

2026

Jacob K. Christopher*, Jameson Sandler*, Thomas Hartvigsen, Ferdinando Fioretto

MLSys 2026 (**Oral**); [arXiv:2511.00606]

Constrained Diffusion for Protein Design with Hard Structural Constraints

2026

Jacob K. Christopher, Austin Seamann, Jingyi Cui, Sagar Khare, Ferdinando Fioretto

ICLR 2026; [arXiv:2510.14989]

Training-Free Constrained Generation With Stable Diffusion Models

2025

Jacob K. Christopher*, Stefano Zampini*, Luca Oneto, Tal Ben-Nun, Davide Anguita, and Ferdinando Fioretto

NeurIPS 2025 (**Spotlight**); [arXiv:2502.05625]

Constrained Discrete Diffusion

2025

Jacob K. Christopher*, Michael Cardei*, Thomas Hartvigsen, Bhavya Kailkhura, and Ferdinando Fioretto

NeurIPS 2025; [arXiv:2503.09790]

Neuro-symbolic Generative Diffusion Models for Physically Grounded, Robust, and Safe Generation Jacob K. Christopher , Michael Cardei, Jinhao Liang, and Ferdinando Fioretto NeuS 2025 (Oral); [arXiv:2506.01121]	2025
Simultaneous Multi-Robot Motion Planning with Projected Diffusion Models Jinhao Liang, Jacob K. Christopher , Sven Koenig, and Ferdinando Fioretto ICML 2025; [arXiv:2502.03607]	2025
Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion Jacob K. Christopher , Brian R. Bartoldson, Tal Ben-Nun, Michael Cardei, Bhavya Kailkhura, Ferdinando Fioretto NAACL 2025 (Oral); [arXiv:2408.05636]	2025
Constrained Synthesis with Projected Diffusion Models Jacob K. Christopher , Stephen Baek, and Ferdinando Fioretto NeurIPS 2024; [arXiv:2402.03559]	2024
Learning Joint Models of Prediction and Optimization James Kotary, Vincenzo Di Vito Francesco, Jacob K. Christopher , Pascal Van Hentenryck, and Ferdinando Fioretto ECAI 2024; [arXiv:2409.04898]	2024

Highlighted Workshop Publications

Constrained Molecular Generation with Discrete Diffusion for Drug Discovery Jacob K. Christopher* , Michael Cardei*, Thomas Hartvigsen, Bhavya Kailkhura, and Ferdinando Fioretto Workshop on AI Virtual Cells and Instruments @ NeurIPS 2025 (Best Student Paper); [arXiv:2503.09790]	2025
Multi-Agent Path Finding in Continuous Spaces with Projected Diffusion Models Jinhao Liang, Jacob K. Christopher , Sven Koenig, and Ferdinando Fioretto The 6th International Workshop on Multi-Agent Path Finding @ AAAI 2025 (Oral); [paper]	2025
Physics-Aware Diffusion Models for Micro-structure Material Design Jacob K. Christopher , Stephen Baek, and Ferdinando Fioretto AI4Mat Workshop @ NeurIPS 2024 (Oral); [paper]	2024

Selected Honors/Achievements

- **DARPA Disruptive Idea Award (NeuS 2025)**
Neuro-symbolic Generative Diffusion Models for Physically Grounded, Robust, and Safe Generation
- **Best Student Paper @ Workshop on AI Virtual Cells and Instruments (NeurIPS 2025)**
Constrained Molecular Generation with Discrete Diffusion for Drug Discovery
- **Best Paper @ Workshop on Large Language Models for Science and Engineering (UVA 2024)**
Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion

Selected Invited Talks

- **Speculative Diffusion Decoding**
Machine Intelligence Neural Design (MIND) group at Apple
- **Scaling Diffusion Drafter Alignment for Faster Speculative Decoding**
Core-ML Team at Cerebras
- **Accelerating Language Generation through Diffusion**
Applied Research at CapitalOne

Other Experience

- **Co-Organizer, Reading Group on Responsible Generative AI (Oct 2023 – May 2025)**
Organized a department reading group for researchers to discuss advancements in responsible generative AI.
- **Teaching Assistant, Syracuse University (Fall 2022, Spring 2023)**
Led sections and assignments for Discrete Math.
- **Math/CS Instructor, Rafiki Foundation (Summer 2022)**
Taught programming and mathematics at the high school level in Mzuzu, Malawi.