

# JACOB K. CHRISTOPHER

222 Rice Hall, 85 Engineer's Way, Charlottesville, VA 22903

✉ csk4sr@virginia.edu    🔗 jacobchristopher.github.io

Generative AI, Responsible AI, Differentiable Optimization

## Education

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### 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

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### Department of Computer Science, University of Virginia

*Graduate Research Assistant*

**Aug 2023 – Present**

*Charlottesville, Virginia*

- Mentor: Dr. Ferdinando Fioretto
- Focus Areas: Generative AI, Responsible AI, Differentiable Optimization

### Lawrence Livermore National Laboratory

*Data Science Institute*

**May 2024 – Aug 2024**

*Livermore, California*

- Mentor: Dr. Bhavya Kailkhura, Dr. Brian R. Bartoldson
- Collaboration employing *discrete diffusion models* to enhance natural language generation. Focus on responsible generative AI.

### Department of Computer Science, Syracuse University

*Graduate Research Assistant*

**Jan 2023 – July 2023**

*Syracuse, New York*

- Mentor: Dr. Ferdinando Fioretto
- Focus Areas: Generative AI, Responsible AI, Differentiable Optimization

### Solü Technology Partners

*Software Engineer Co-op*

**Aug 2021 – May 2022**

*Rochester, New York*

- Working on a SCRUM Team to develop a web-based survey delivery application. Alongside another engineer, worked to research, design, and implement a comprehensive API test suite in Python for the survey delivery application. Created documentation on how to maintain, update, and utilize automated suite. Added frameworks to ensure all tests passed with each release to the dedicated AWS server. Tools used include Angular, HTML5, Kotlin, and MongoDB.

### BorgWarner

*Software Developer*

**Nov 2020 – Jan 2021**

*Rochester, New York*

- Created a product tracking GUI for an automotive manufacturing plant to interface to their existing database. Needed to improve data access, real-time reporting, and empower users to manage their own processes. Tools used include ASP.NET Core and SQL Server with JavaScript support.

## Publications

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### Conference Publications

#### Constrained Synthesis with Projected Diffusion Models

**2024**

Jacob K. Christopher, Stephen Baek, and Ferdinando Fioretto

Accepted at NeurIPS 2024; [arXiv:2402.03559]

#### Learning Joint Models of Prediction and Optimization

**2024**

James Kotary, Vincenzo Di Vito Francesco, Jacob K. Christopher, Pascal Van Hentenryck, and Ferdinando Fioretto

Accepted at ECAI 2024; [arXiv:2409.04898]

## Workshop Publications

- Multi-Agent Path Finding in Continuous Spaces with Projected Diffusion Models** **2025**  
Jinhao Liang, **Jacob K. Christopher**, Sven Koenig, and Ferdinando Fioretto  
The 6th International Workshop on Multi-Agent Path Finding; AAAI-25 Bridge: AI+ORMS; [arXiv:2412.17993]
- Speculative Diffusion Decoding for Accelerated Language Generation** **2024**  
**Jacob K. Christopher**, Brian R. Bartoldson, Tal Ben-Nun, Michael Cardei, Bhavya Kailkhura, and Ferdinando Fioretto  
ENLSP Workshop @ NeurIPS 2024; Best Paper Award @ UVA LLM Workshop; [paper]
- Constrained Synthesis with Projected Diffusion Models** **2024**  
**Jacob K. Christopher**, Stephen Baek, and Ferdinando Fioretto  
ML4Molecules Workshop @ ELLIS 2024; ML4PS Workshop @ NeurIPS 2024; [arXiv:2402.03559]
- Physics-Aware Diffusion Models for Micro-structure Material Design** **2024**  
**Jacob K. Christopher**, Stephen Baek, and Ferdinando Fioretto  
Spotlight at AI4Mat Workshop @ NeurIPS 2024; [paper]

## Preprints

- Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion** **2024**  
**Jacob K. Christopher**, Brian R. Bartoldson, Tal Ben-Nun, Michael Cardei, Bhavya Kailkhura, and Ferdinando Fioretto  
[arXiv:2408.05636]
- Multi-Agent Path Finding in Continuous Spaces with Projected Diffusion Models** **2024**  
Jinhao Liang, **Jacob K. Christopher**, Sven Koenig, and Ferdinando Fioretto  
[arXiv:2412.17993]
- Analyzing and Enhancing the Backward-Pass Convergence of Unrolled Optimization** **2023**  
James Kotary, **Jacob K. Christopher**, My H. Dinh, and Ferdinando Fioretto  
[arXiv:2312.17394]

## Selected Honors/Achievements

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- **Oral @ The 6th International Workshop on Multi-Agent Path Finding (AAAI 2025):** *Multi-Agent Path Finding in Continuous Spaces with Projected Diffusion Models*
- **Spotlight @ AI for Accelerated Material Design Workshop (NeurIPS 2024):** *Constrained Synthesis with Projected Diffusion Models*
- **Best Paper @ UVA LLM Workshop 2024:** *Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion*
- University of Virginia: *UVA Computer Science Scholar (2023-24)*
- Gordon College: *Magna Cum Laude, Global Honors Program*

## Teaching

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- Introduction to Discrete Math (Syracuse University: Fall 2022, Spring 2023)

## Service/Reviewing

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- **Reviewer - ICML 2024; ENLSP Workshop @ NeurIPS 2024**
- **Program Committee Member - AAAI 2024**

## Volunteering/Organizing

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- Reading Group on Responsible Generative AI, University of Virginia** **Oct 2023 - Present**  
*Co-Organizer* *Charlottesville, Virginia*
- Organizing the reading group on responsible generative AI at the University of Virginia where members of various research groups that work on responsible AI/generative AI come together to discuss recent advancements and future directions of work.

- Rafiki Foundation** **May 2022 - July 2022**  
*Math and Computer Science Tutor* *Mzuzu, Malawi*
- Led high school class for introductory computer programming. Tutored students in mathematics, physics, and other STEM disciplines.