

# Bailey Miller

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## Education

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### Carnegie Mellon University · PhD in Computer Science

ADVISOR: IOANNIS GKIOULEKAS

Pittsburgh, PA

August 2020 - Present

### Dartmouth College · BA in Mathematics and Computer Science (Double Major)

THESIS ADVISOR: WOJCIECH JAROSZ

Hanover, NH

August 2014 - June 2018

Thesis: A Null Scattering Framework for Rendering Spectrally and Spatially Varying Media

## Honors and Awards

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### NVIDIA Graduate Research Fellowship

2024-2025

### Best Paper SIGGRAPH

2024

### Best Student Paper Honorable Mention CVPR

2024

### NSF Graduate Research Fellowship

2020-2023

## Publications

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### Differential Walk on Spheres

Bailey Miller, Rohan Sawhney, Keenan Crane, and Ioannis Gkioulekas  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia)* 2024

### 3D reconstruction with fast dipole sums

Hanyu Chen, Bailey Miller, and Ioannis Gkioulekas  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia)* 2024

### Walkin' Robin: Walk on Stars with Robin Boundary Conditions

Bailey Miller\*, Rohan Sawhney\*, Keenan Crane<sup>†</sup>, and Ioannis Gkioulekas<sup>†</sup>  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 2024

### Objects as Volumes: A Stochastic Geometry View of Opaque Solids

Bailey Miller, Hanyu Chen, Alice Lai, and Ioannis Gkioulekas  
*Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* 2024

### Boundary Value Caching for Walk on Spheres

Bailey Miller\*, Rohan Sawhney\*, Keenan Crane<sup>†</sup>, and Ioannis Gkioulekas<sup>†</sup>  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 2023

### Walk on Stars: A Grid-Free Monte Carlo Method for PDEs with Neumann Boundary Conditions

Rohan Sawhney\*, Bailey Miller\*, Ioannis Gkioulekas<sup>†</sup>, and Keenan Crane<sup>†</sup>  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 2023

### Path-Space Differentiable Rendering

Cheng Zhang, Bailey Miller, Kai Yan, Ioannis Gkioulekas, and Shuang Zhao  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 2020

### A Null-Scattering Path Integral Formulation of Light Transport

Bailey Miller, Iliyan Georgiev, and Wojciech Jarosz  
*ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 2019

### Variance and Convergence Analysis of Monte Carlo Line and Segment Sampling

Gurprit Singh, Bailey Miller, and Wojciech Jarosz  
*Computer Graphics Forum (Proceedings of EGSR)* 2017

## Talks

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### Stochastic Graphics Primitives

VISION AND AUTONOMOUS SYSTEMS CENTER (VASC) SEMINAR

Pittsburgh, PA | October 2024

NVIDIA HIGH FIDELITY PHYSICS GROUP

remote | August 2024

## Walkin' Robin: Walk on stars with Robin Boundary Conditions

ACM SIGGRAPH

Denver, CO | August 2024

## Objects as volumes: A stochastic geometry view of opaque solids

IEEE/CVF CONFERENCE ON COMPUTER VISION AND PATTERN RECOGNITION

Seattle, WA | June 2024

## Boundary Value Caching for Walk on Spheres

ACM SIGGRAPH

Los Angeles, CA | July 2023

## A Null-Scattering Path Integral Formulation of Light Transport

IEEE VIS (SIGGRAPH INVITED PAPERS)

Vancouver, Canada | October 2019

INTERNATIONAL CONFERENCE ON TRANSPORT THEORY

Paris, France | October 2019

ACM SIGGRAPH

Los Angeles, CA | July 2019

## Variance and Convergence Analysis of Monte Carlo Line and Segment Sampling

EUROGRAPHICS SYMPOSIUM ON RENDERING

Helsinki, Finland | June 2017

## Teaching

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### Monte Carlo Geometry Processing

Summer 2024

Co-lecturer for course at the Symposium on Geometry Processing Graduate School

## Service

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### Teaching Assistant

INTRODUCTION TO DIGITAL PHOTOGRAPHY

Gelfand Weekend Series | Winter 2024

MASTERS OF SCIENCE IN COMPUTER VISION (MSCV) CAPSTONE

Carnegie Mellon | Fall 2023, Spring 2024

PHYSICS-BASED RENDERING

Carnegie Mellon | Spring 2021, Spring 2022

RENDERING ALGORITHMS

Dartmouth | Spring 2018

### Reviewer

SIGGRAPH

2023-2024

SIGGRAPH ASIA

2023-2024

PACIFIC GRAPHICS

2024

EUROGRAPHICS

2025

## Relevant Experience

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### NVIDIA

Santa Clara, CA

RESEARCH SCIENTIST INTERN

May 2024 - August 2024

- Collaborated with Rohan Sawhney, Jan Novák, Fabrice Rousselle, and Eugene d'Eon
- Investigated prior-free models for stochastic geometry to use in 3D computer visions tasks like surface reconstruction

### Apple

Cupertino, CA

SIMULATION AND MODELING INTERN

May 2023 - August 2023

- Developed new features for Hardware Technologies' in-house volume rendering engine to support complex and realistic biological systems
- Performed initial prototyping of variance reduction techniques for Hardware Technologies' target applications

### Adobe

Remote

RESEARCH SCIENTIST INTERN

May 2022 - August 2022

- Collaborated with Krishna Mullia, Miloš Hašan, Valentin Deschaintre, and Nathan Carr
- Investigated methods for encoding high-quality 3D assets by combining coarse geometric proxies with neural materials

**Blend***San Francisco, CA***SOFTWARE ENGINEER (+ INTERN DURING WINTER 2017)***August 2018 - February 2020*

- Part of a 100 person engineering team delivered a white-label lending platform that processed over \$5 billion in loans per day

**Google***Seattle, WA***SOFTWARE ENGINEERING INTERN***June 2017 - September 2017*

- Mentored by Dillon Cover as part of Google's Teleportation Group (360 video in VR)

**IrisVR***New York, NY***SOFTWARE ENGINEERING INTERN***June 2016 - August 2016*

- Mentored by Rohan Sawhney on team that built a platform for editing, viewing, and sharing architectural models in VR