Bailey Miller

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Education

Carnegie Mellon University · PhD in Computer Science — *Pittsburgh, PA*
Advisor: Ioannis Gkioulekas — *August 2020 - Present*

Dartmouth College · BA in Mathematics and Computer Science (Double Major) — *Hanover, NH*
Thesis Advisor: Wojciech Jarosz — *August 2014 - June 2018*
Thesis: A Null Scattering Framework for Rendering Spectrally and Spatially Varying Media

Work Experience

Carnegie Mellon University — *Pittsburgh, PA*
Graduate Researcher — *August 2020 - Present*
- Developing basic theory and practical algorithms for Monte Carlo PDE solvers
- Leveraging ideas from stochastic geometry to build principled surface reconstruction techniques

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*
- Worked on a 100 person engineering team to deliver a white-label lending platform that processed over $5 billion in loans per day
- Hacked on everything from permissioning systems to public APIs for syncing loan data
- Developed mostly with Typescript, Node, React, and MongoDB
- Monitored and maintained services with tools like Datadog, Splunk, and Airbrake

Google — *Seattle, WA*
Software Engineering Intern — *June 2017 - September 2017*
- Interned in Teleportation Group (mentored by Dillon Cower) where my team maintained a Unity plugin for enabling 360 video in VR
- Built a feature that allowed the Unity plugin to natively render 360 video streamed from Google's 360 video player
- Modified the 360 video player to expose texture data that could be marshalled from C++ into C# and mapped into Unity primitives

IrisVR — *New York, NY*
Software Engineering Intern — *June 2016 - August 2016*
- Mentored by Rohan Sawhney on a 6-person engineering team that built a platform for editing, viewing, and sharing architectural models in VR
- Built a Python microservice using Docker, RabbitMQ, and S3 that processed and stored 360-panoramic images used by IrisVR's mobile-VR app
- Built a C# plugin for Rhino that enabled architectural models to be imported and viewed in IrisVR's desktop VR app

Publications

[1] **Boundary Value Caching for Walk on Spheres**
Bailey Miller, Rohan Sawhney, Keenan Crane, and Ioannis Gkioulekas
ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2023

[2] **Walk on Stars: A Grid-Free Monte Carlo Method for PDEs with Neumann Boundary Conditions**
Rohan Sawhney, Bailey Miller, Ioannis Gkioulekas, and Keenan Crane
ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2023

[3] **Path-Space Differentiable Rendering**
Cheng Zhang, Bailey Miller, Kai Yan, Ioannis Gkioulekas, and Shuang Zhao
ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2020

[4] **A Null-Scattering Path Integral Formulation of Light Transport**
Bailey Miller, Iliyan Georgiev, and Wojciech Jarosz
ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2019

[5] **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

Awards

2020 **NSF Graduate Research Fellowship**

Teaching Assistant

2023 **Masters of Science in Computer Vision (MSCV) Capstone** (Carnegie Mellon University)
2022 **Special Topics: Physics-Based Rendering** (Carnegie Mellon University)
2021 **Special Topics: Physics-Based Rendering** (Carnegie Mellon University)
2018 **Rendering Algorithms** (Dartmouth College)

Talks

Boundary Value Caching for Walk on Spheres — *Los Angeles, CA*
ACM SIGGRAPH 2023 — *July, 2023*

A Null-Scattering Path Integral Formulation of Light Transport — *Vancouver, Canada*
IEEE Vis (SIGGRAPH Invited Papers) — *October, 2019*

A Null-Scattering Path Integral Formulation of Light Transport — *Paris, France*
International Conference on Transport Theory — *October, 2019*

A Null-Scattering Path Integral Formulation of Light Transport — *Los Angeles, CA*
ACM SIGGRAPH 2019 — *July, 2019*

Variance and Convergence Analysis of Monte Carlo Line and Segment Sampling — *Helsinki, Finland*
Eurographics Symposium on Rendering — *June, 2017*