Katherine (Kate) Salesin

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I am interested in exploring ways to apply physically based rendering research from computer graphics to open problems in other scientific fields such as oceanography, atmospheric science, and astronomy. I find projects that encourage going outside and exploring the real world particularly exciting. As an artist, I also enjoy problems with creative aspects.

Education

Ph.D., Dartmouth College 2025
Computer Science

Advisor: Wojciech Jarosz

B.S. with Distinction, Cornell University 2016
Computer Science (minor in Marine Biology)

Dean's List (5/8 semesters)
Advisor: Kavita Bala

Recent Research & Teaching Experience

Lecturer . . . . . June 2025 – present
Dartmouth College

I am teaching CS 10: Problem Solving via Object-Oriented Programming in the summer term. This class teaches students how to implement key data structures and abstract data types, solve computational problems using object-oriented programming principles, and use good practices for coding.

PhD Student . . . . . Fall 2018 – Fall 2024
Dartmouth College

During my Ph.D., I conducted research on light transport simulation for computer graphics, computational photography, and remote sensing (see the publications below). For my thesis research, in conjunction with NASA, I extended the new differentiable renderer Mitsuba 3 to perform extremely realistic, polarized light transport simulations of simple atmosphere-ocean systems for remote sensing. This research brought together two communities that had been working on related problems in parallel for decades.

Research Intern . . . . . Summer 2021, Summer 2022
NASA Goddard Space Flight Center, Ocean Ecology Laboratory

In support of the PACE satellite mission, I extended the new research renderer Mitsuba 3 to perform hyperrealistic, polarized simulations of interest to the remote sensing community. The goal of this mission is to use advanced radiometric instruments, including polarimeters, to collect and analyze more data than ever before from the atmosphere and oceans.

Instructor . . . . . Jan. 2020 – Mar. 2020
Dartmouth College

I designed and ran the graduate reading course for Master's in Digital Arts students, which included writing the syllabus and assignments, running discussions, and arranging presentations by guest speakers.

Awards, Grants, & Fellowships

Future Investigators in NASA Earth and Space Science and Technology Grant . . . . . 2023 – 2025
Proposal: Differentiable polarimetric rendering for remote sensing

NASA Grant . . . . . 2022 – 2023
Proposal: Differentiable polarimetric rendering for remote sensing

2nd Place, Poster Session (Computer Science Category) 2022
Dartmouth Innovation and Technology Festival

Patrick Tsang Memorial Best TA Award 2020
Dartmouth College, Computer Science Dept.

Runner Up, Rendering Competition 2019
Dartmouth College, CS 87/187: Rendering Algorithms

Publications

Polarimetric capture and differentiable rendering.. Katherine Salesin. PhD Dissertation. link.

Unifying radiative transfer models in computer graphics and remote sensing, Part I: A survey. Katherine Salesin, Kirk D. Knobelspiesse, Jacek Chowdhary, Peng-Wang Zhai, Wojciech Jarosz. Journal of Quantitative Spectroscopy and Radiative Transfer, 314, February 2024. doi: 10/mbhx.

Unifying radiative transfer models in computer graphics and remote sensing, Part II: A differentiable, polarimetric forward model and validation. Katherine Salesin, Kirk D. Knobelspiesse, Jacek Chowdhary, Peng-Wang Zhai, Wojciech Jarosz. Journal of Quantitative Spectroscopy and Radiative Transfer, 315, March 2024. doi: 10/mbhz.

DIY hyperspectral imaging via polarization-induced spectral filters. Katherine Salesin, Dario Seyb, Sarah Friday, Wojciech Jarosz. 2022 IEEE International Conference on Computational Photography (ICCP). pp. 1-12. August 2022. doi: 10/jgzs.

Combining Point and Line Samples for Direct Illumination. Katherine Salesin, Wojciech Jarosz. Computer Graphics Forum (Proceedings of EGSR), 38(4), July 2019. doi: 10/gf6rx6.

Presentations & Posters

Unifying state-of-the-art radiative transfer models in computer graphics and remote sensing. Katherine Salesin, Kirk D. Knobelspiesse, Jacek Chowdhary, Peng-Wang Zhai, Wojciech Jarosz. Guarini Graduate Student Poster Session. Hanover, NH. April 2023.

Unifying state-of-the-art radiative transfer models in computer graphics and remote sensing. Katherine Salesin, Kirk D. Knobelspiesse, Jacek Chowdhary, Peng-Wang Zhai, Wojciech Jarosz. NASA PACE Science and Applications Team Meeting Poster Session. San Diego, CA. February 2023.

DIY hyperspectral imaging via polarization-induced spectral filters. Katherine Salesin, Dario Seyb, Sarah Friday, Wojciech Jarosz. 2022 IEEE International Conference on Computational Photography (ICCP). Pasadena, CA (Virtual). August 2022.

DIY hyperspectral imaging via polarization-induced spectral filters. Katherine Salesin, Dario Seyb, Sarah Friday, Wojciech Jarosz. Dartmouth Innovation and Technology Festival Poster Session. Hanover, NH. May 2022.

Forward and inverse polarized light rendering with Mitsuba 2. Ocean Ecology Laboratory Seminar. NASA Goddard Space Flight Center (Virtual). August 2021.

DIY hyperspectral imaging via polarization-induced spectral filters. Katherine Salesin, Dario Seyb, Wojciech Jarosz. 2021 IEEE International Conference on Computational Photography (ICCP). Haifa, Israel (Virtual). May 2021.

Combining Point and Line Samples for Direct Illumination. Eurographics Symposium on Rendering. Strasbourg, France. July 2019.

Further Experience

Station Leader ..... May 2019, Apr. 2023
Science Day at Dartmouth

Science Day at Dartmouth is an annual event where graduate students teach kids about their research through fun, hands-on activities. I designed a computer graphics station that taught kids some of the science behind their favorite movies and video games, and we acted out ray tracing in real life!

Teaching Assistant ..... Sept. 2018 – June 2019
Dartmouth College

CS 10: Problem Solving via Object-Oriented Programming
CS 98: Senior Design and Implementation Project

Data Visualization Scientist ..... Summer 2018
Photonic Sentry

Photonic Sentry is a Global Good/Intellectual Ventures start-up that has created a laser that zaps mosquitoes, psyllids, and other pests out of the air. I created tools for logging, organizing, and visualizing live research data from lasers and cameras. Data typically included system statuses, bug stats, and bug flight paths.

Deckhand/Educator ..... Apr. 2017 – Nov. 2017
Call of the Sea

I sailed on schooner Seaward on San Francisco Bay and along the California coast with students grade 3-12. I created interactive lesson plans and taught basic marine biology, ecology, modern and historical navigation, scientific data collection, and seamanship.

Sailing Intern ..... Nov. 2016 – Dec. 2016
Sea Education Association

I sailed on SSV Robert C. Seamans in the South Pacific near New Zealand as part of SEA Semester's Ocean Exploration program. I taught college students the fundamentals of sailing, seamanship, celestial and modern navigation, and oceanographic research on a tall ship.

Teaching Assistant ..... Aug. 2015 – May 2016
Cornell University

CS 4620: Introduction to Computer Graphics
CS 5625: Interactive Computer Graphics

Research Assistant ..... Summer 2014 – Spring 2015
Cornell University, Computer Science Dept.

I assisted Prof. Steve Marschner on a project to create a realistic wood texture authoring tool. I prepared wood samples and measured their reflective properties using a spherical gantry.

Service & Professional Activities

Executive Committee Member . . . . . 2022 – 2024
WiGRAPH (Women in Computer Graphics Research)

Spotlight Coordinator . . . . . 2020 – 2022
WiGRAPH (Women in Computer Graphics Research)

Undergraduate Mentor 2021, 2022
SIGGRAPH Research Career Development Committee

Judge 2021, 2024
Rendering Competition, CS 87/187: Rendering Algorithms, Dartmouth College

Station Leader 2019, 2023
Science Day at Dartmouth

Judge 2019, 2022
Dartmouth Spring Hackathon

Member . . . . . 2015 – 2016
WICC (Women in Computing at Cornell)

Member . . . . . 2019 – present
ACM SIGGRAPH

Selected Classes

These are some of the classes I have taken at a graduate level during my PhD.

Computer Graphics • Rendering Algorithms • Computational Photography • Machine Learning & Statistical Analysis • Deep Learning • Physical Computing • GPU Programming and High-Performance Computing

Art Portfolio

I knit, sew, and quilt in my spare time. These are a selection of my designs that have been published and exhibited.

Sprinkle Quilt 2025
Billings Farm & Museum Quilt Exhibition

Plicata (Hat Knitting Pattern) 2023
Brooklyn Tweed Winter 2023 Collection

Vol. 1: Water (Knitted Accessories Collection) 2022
Self-published on Ravelry