

DANIEL RITCHIE

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EDUCATION

Stanford University

PhD, Computer Science

Dissertation: *Probabilistic Programming for Procedural Modeling and Design*

Advisors: Pat Hanrahan, Noah Goodman

Conferred September 2016

Stanford University

MS, Computer Science

Conferred April 2013

University of California Berkeley

BA, Computer Science

Conferred May 2010

EMPLOYMENT

Eliot Horowitz Assistant Professor

Brown University Computer Science Department

Providence, RI

2021 – Present

Assistant Professor

Brown University Computer Science Department

Providence, RI

2017 – 2021

Postdoctoral Researcher

Stanford University Computer Science Department

Stanford, CA

2016 – 2017

Research Intern

Adobe Creative Technologies Lab

San Francisco, CA

Summer 2011

Graduate Research Assistant

Stanford University Computer Science Department

Stanford, CA

2010 – 2016

Technical Director Intern

Pixar Animation Studios

Emeryville, CA

Summer 2009

Software Intern

Hewlett-Packard

Roseville, CA

Summer 2008

REFEREED

PUBLICATIONS

All publications listed below follow the author order conventions for visual computing (e.g. graphics, vision, machine learning): the first author is the primary implementer (typically a PhD student), and the last author is typically the direct supervisor of the first author and the principal investigator on the project. Middle authors vary in role, with students and interns typically listed before faculty and senior research scientists.

Annotation scheme for publications started while employed at Brown University (July 2017 onwards):

- **Blue bold text**: PhD student in Daniel's lab.
- **Purple bold text**: undergraduate or masters student in Daniel's lab.
- **Green bold text**: external PhD student whom Daniel closely mentored.
- **Orange bold text**: external undergraduate or masters student whom Daniel closely mentored.

Unsupervised Kinematic Motion Detection for Part-segmented 3D Shape Collections. [Xianghao Xu](#), [Yifan Ruan](#), Srinath Sridhar, Daniel Ritchie. *SIGGRAPH 2022*.

The Neurally-Guided Shape Parser: Grammar-based Labeling of 3D Shape Regions with Approximate Inference. [R. Kenny Jones](#), [Aalia Habib](#), Rana Hanocka, Daniel Ritchie. *CVPR 2022*.

PLAD: Learning to Infer Shape Programs with Pseudo-Labels and Approximate Distributions. [R. Kenny Jones](#), [Homer Walke](#), Daniel Ritchie. *CVPR 2022*.

Learning to Infer Kinematic Hierarchies for Novel Object Instances. [Hameed Abdul-Rashid](#), [Miles Freeman](#), [Ben Abbatematteo](#), George Konidaris, Daniel Ritchie. *ICRA 2022*.

Roominoes: Generating Novel 3D Floor Plans From Existing 3D Rooms. [Kai Wang](#), [Xianghao Xu](#), [Leon Lei](#), [Natalie Lindsay](#), [Selena Ling](#), Angel X. Chang, Manolis Savva, Daniel Ritchie. *Symposium on Geometry Processing (SGP) 2021*.

ShapeMOD: Macro Operation Discovery for 3D Shape Programs. [R. Kenny Jones](#), [David Charatan](#), Paul Guerrero, Niloy Mitra, Daniel Ritchie. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2021*.

Inferring CAD Modeling Sequences using Zone Graphs. [Xianghao Xu](#), [Wenzhe Peng](#), Chin-Yi Cheng, Karl D. D. Willis, Daniel Ritchie. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2021*.

Motion Annotation Programs: A Scalable Approach to Annotating Kinematic Articulations in Large 3D Shape Collections. [Xianghao Xu](#), [David Charatan](#), [Sonia Raychaudhuri](#), [Hanxiao Jiang](#), [Mae Heitmann](#), Vladimir Kim, Siddhartha Chaudhuri, Manolis Savva, Angel X. Chang, Daniel Ritchie. *International Conference on 3D Vision (3DV) 2020*.

Shape from Tracing: Towards Reconstructing 3D Object Geometry and SVBRDF Material from Images via Differentiable Path Tracing. [Purvi Goel](#), [Loudon Cohen](#), [James Guesman](#), [Vikas Thamizharasan](#), James Tompkin, Daniel Ritchie. *International Conference on 3D Vision (3DV) 2020*.

ShapeAssembly: Learning to Generate Programs for 3D Shape Structure Synthesis. [R. Kenny Jones](#), [Theresa Barton](#), [Xianghao Xu](#), [Kai Wang](#), [Ellen Jiang](#), Paul Guerrero, Niloy Mitra, Daniel Ritchie. *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia) 2020*.

GANHopper: Multi-Hop GAN for Unsupervised Image-to-Image Translation. [Wallace Lira](#), [Johannes Merz](#), Daniel Ritchie, Daniel Cohen-Or, Hao Zhang. *European Conference on Computer Vision (ECCV) 2020*.

Learning Generative Models of 3D Structures. Siddhartha Chaudhuri, Daniel Ritchie, Jiajun Wu, Kai Xu, Hao Zhang. *Eurographics 2020 State-of-the-Art Report*.

Learning Style Compatibility Between Objects in a Real-World 3D Asset Database. [Yifan Liu](#), [Ruolan Tang](#), Daniel Ritchie. *Pacific Graphics 2019*.

PlanIT: Planning and Instantiating Indoor Scenes with Relation Graph and Spatial Prior Networks. Kai Wang, Yu-an Lin, Ben Weissmann, Manolis Savva, Angel X. Chang, Daniel Ritchie. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2019.*

Fast and Flexible Indoor Scene Synthesis via Deep Convolutional Generative Models. Daniel Ritchie, Kai Wang, Yu-an Lin. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2019.*

Learning to Describe Scenes with Programs. Yunchao Liu, Zheng Wu, Daniel Ritchie, William T. Freeman, Joshua B. Tenenbaum, Jiajun Wu. *International Conference on Learning Representations (ICLR) 2019.*

Learning to Infer Graphics Programs from Hand-Drawn Images. Kevin Ellis, Daniel Ritchie, Armando Solar-Lezama, Joshua B. Tenenbaum. *Conference on Neural Information Processing Systems (NeurIPS) 2018.* SPOTLIGHT PRESENTATION.

Improving Shape Deformation in Unsupervised Image-to-Image Translation Aaron Gokaslan, Vivek Ramanujan, Daniel Ritchie, Kwang In Kim, James Tompkin. *European Conference on Computer Vision (ECCV) 2018.*

Deep Convolutional Priors for Indoor Scene Synthesis Kai Wang, Manolis Savva, Angel X. Chang, Daniel Ritchie. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2018.*

ScanComplete: Large-Scale Scene Completion and Semantic Segmentation for 3D Scans Angela Dai, Daniel Ritchie, Martin Bokeloh, Scott Reed, Jürgen Sturm, Matthias Nießner. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2018.*

Example-based Authoring of Procedural Modeling Programs with Structural and Continuous Variability Daniel Ritchie, Sarah Jobalia, Anna Thomas *Proceedings of Eurographics 2018.*

An Improved Training Procedure for Neural Autoregressive Data Completion. Maxime Voisin, Daniel Ritchie. *NIPS 2017 Bayesian Deep Learning Workshop.*

Neurally-Guided Procedural Models: Amortized Inference for Procedural Graphics Programs using Neural Networks. Daniel Ritchie, Anna Thomas, Pat Hanrahan, Noah D. Goodman. *Conference on Neural Information Processing Systems (NIPS) 2016.*

C3: Lightweight Incrementalized MCMC for Probabilistic Programs using Continuations and Callsite Caching. Daniel Ritchie, Andreas Stuhlmüller, Noah D. Goodman. *International Conference on Artificial Intelligence and Statistics (AISTATS) 2016.*

Controlling Procedural Modeling Programs with Stochastically-Ordered Sequential Monte Carlo. Daniel Ritchie, Ben Mildenhall, Noah D. Goodman, and Pat Hanrahan. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2015.*

Generating Design Suggestions under Tight Constraints with Gradient-based Probabilistic Programming. Daniel Ritchie, Sharon Lin, Noah D. Goodman, and Pat Hanrahan. *Proceedings of Eurographics 2015.* BEST PAPER HONORABLE

MENTION.

Quicksand: A Lightweight Embedding of Probabilistic Programming for Procedural Modeling and Design. Daniel Ritchie. *The 3rd NIPS Workshop on Probabilistic Programming*, 2014.

First-class Runtime Generation of High-performance Types using Exotypes. Zach Devito, Daniel Ritchie, Matthew Fisher, Alex Aiken, and Pat Hanrahan. *Programming Language Design and Implementation (PLDI) 2014*.

Probabilistic Color-by-Numbers: Suggesting Pattern Colorizations Using Factor Graphs. Sharon Lin, Daniel Ritchie, Matthew Fisher, and Pat Hanrahan. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2013*.

Example-based Synthesis of 3D Object Arrangements. Matthew Fisher, Daniel Ritchie, Manolis Savva, Thomas Funkhouser, and Pat Hanrahan. *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia) 2012*.

d.tour: Style-based Exploration of Design Example Galleries. Daniel Ritchie, Ankita Arvind Kejriwal, and Scott R. Klemmer. *ACM Symposium on User Interface Software and Technology (UIST) 2011*.

Dynamic Local Remeshing for Elastoplastic Simulation. Martin Wicke, Daniel Ritchie, Bryan M. Klingner, Sebastian Burke, Jonathan R. Shewchuk, and James F. O'Brien. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2010*.

Interactive Simulation of Surgical Needle Insertion and Steering. Nuttapong Chentanez, Ron Alterovitz, Daniel Ritchie, Lita Cho, Kris K. Hauser, Ken Goldberg, Jonathan R. Shewchuk, and James F. O'Brien. *ACM Transactions on Graphics (Proceedings of SIGGRAPH) 2009*.

TECHNICAL REPORTS

Deep Amortized Inference for Probabilistic Programs. Daniel Ritchie, Paul Horsfall, Noah D. Goodman. *arXiv:1610.05735*, 2016.

INVITED TALKS

Learning to Represent Shapes as Programs
Symposium on Geometry Processing, *Summer School* July 2022

Programs as Representations for Inferring and Generating 3D Structures
Cornell University, *Graphics/Vision Seminar* March 2022

Conversations with Research Pioneers: Daniel Ritchie
Unity Technologies, *Conversations with Research Pioneers* December 2021

AI-assisted 3D Content Creation: Successes, Challenges, & Opportunities
Roblox, *Research Colloquium* December 2021

Learning to Infer and Generate Programs for 3D Shapes and Scenes
ICCV, *Holistic Structures for 3D Vision Workshop* October 2021
ICCV, *Structural and Compositional Learning on 3D Data Workshop* October 2021

Neurosymbolic Generative Models for Structured 3D Content
3DGV, *3D Geometry and Vision Seminar* February 2021

Learning Neurosymbolic 3D Models PROBPROG, <i>International Conference on Probabilistic Programming</i>	March 2020
Everything You Need to Know About Deep Fakes Full Stack at Brown, <i>Hack@Home</i>	October 2020
Neurosymbolic 3D Models: Learning to Generate 3D Shape Programs GAMES, <i>Graphics and Mixed Environment Seminar</i>	August 2020
Toward Synthesizing Training Data for 3D Scene Understanding CVPR, <i>3D Scene Understanding Workshop</i>	June 2020
From Neural to Neurosymbolic 3D Modeling CVPR, <i>Neurosymbolic Visual Learning & Program Induction Workshop</i>	June 2020
Neurosymbolic 3D Models MIT, <i>Vision Seminar</i>	March 2020
Learning to Generate 3D Structures Brown Department of Biostatistics, <i>Deep Learning Seminar</i>	February 2020
Deep Learning for Graph(ic)s Simon Fraser University, <i>Visual Computing Group</i>	December 2019
Learning to Generate Visual Structures Carney Institute for Brain Science, <i>Lunch Seminar</i>	October 2019
Indoor Scene Synthesis: Past, Present, and Future Shenzhen University, <i>Visual Computing Summer School</i>	July 2019
Probabilistic Programming Brown ICERM, <i>Computer Vision Semester Program</i>	February 2019
Virtual Indoor Scene Synthesis: Past, Present, and Future MIT, <i>Graphics Lunch</i>	December 2018
Toward Style-Aware Generative Models of Virtual Indoor Scenes Wayfair LLC, <i>Computer Vision / Data Science Team</i>	December 2018
Visual Program Induction Brown Applied Math, <i>Pattern Theory Seminar</i>	November 2018
Probabilistic Programming for Computer Graphics MIT, <i>PROBPROG 2018</i>	October 2018
Learning Procedural Modeling Programs from Examples MIT, <i>New England Symposium on Graphics</i>	April 2018
Microsoft Research Cambridge, <i>New England Machine Learning Day</i>	May 2018
Learning from Large-Scale Synthetic 3D Scene Data Brown University Data Science Initiative, <i>Datathon</i>	March 2018
Inferring Graphics Programs University of Washington, <i>ML+PL Workshop</i>	February 2018

	Learning and Inferring Graphics Programs MIT, <i>Vision Seminar</i>	September 2017
	Creative AI for Computer Graphics (It's More Than Just Style Transfer) Google Brain, <i>Magenta Group</i>	January 2017
	Probabilistic Programming for Procedural Modeling and Design Adobe Systems, <i>Creative Technologies Lab</i> Brown University, <i>Computer Science Department</i> Harvey Mudd College, <i>Computer Science Department</i> Yale University, <i>Computer Science Department</i>	March 2016 February 2016 February 2016 February 2016
PANELIST	Advances in Software for Approximate Bayesian Inference. <i>NIPS 2016 Workshop on Advances in Approximate Bayesian Inference.</i>	
TUTORIALS & WORKSHOPS	Learning to Generate 3D Shapes and Scenes Kai Wang, Akshay Gadi Patil, Angel X. Chang, Paul Guerrero, Daniel Ritchie, Manolis Savva ECCV 2022 Workshop	October 2022
	Machine Learning in Computational Design Andrew Spielberg, Caitlin Mueller, Lydian Chilton, Rafael Gomez-Bombarelli, Vladimir Kim, Daniel Ritchie ICML 2022 Workshop	September 2022
	Learning to Generate 3D Shapes and Scenes Manyi Li, Zhenpei Yang, Angel X. Chang, Siddhartha Chaudhuri, Daniel Ritchie, Manolis Savva CVPR 2021 Workshop	June 2021
	Synthetic 3D Scene Datasets: Needs & Opportunities Daniel Ritchie, Angel Chang, Manolis Savva SIGGRAPH 2020 Birds of a Feather	August 2020
	Learning 3D Generative Models Daniel Ritchie, Florian Golemo, Angel Chang, Siddhartha Chaudhuri, Aaron Courville, Qixing Huang, Derek Nowrouzezahrai, Pedro O. Pinheiro, Sai Rajeswar, Manolis Savva, David Vasquez, Kai Xu, Hao Zhang CVPR 2020 Workshop	June 2020
	3D Scene Generation Angel Chang, Qixing Huang, Daniel Ritchie, Manolis Savva CVPR 2019 Workshop	June 2019
	Learning Generative Models of 3D Structures Siddhartha Chaudhuri, Daniel Ritchie, Kai Xu, Hao Zhang Eurographics 2019 Tutorial	May 2019
TEACHING	Instructor Brown CSCI 1230: Introduction to Computer Graphics	Fall 2021
	Instructor Brown CSCI 1470/2470: Deep Learning	Fall 2018 – 2020

Instructor Spring 2018 – 2020
Brown CSCI 2240: Interactive Computer Graphics

Instructor Fall 2017
Brown CSCI 2951-W: Creative Artificial Intelligence for Computer Graphics

Instructor Summer 2016
DARPA Probabilistic Programming for Advanced Machine Learning Summer School

Course Assistant Spring 2014
Stanford CS 348b: Image Synthesis Techniques

Course Assistant Fall 2011
Stanford CS 148: Introduction to Computer Graphics and Imaging

Graduate Student Instructor Fall 2009, Spring 2010
UC Berkeley CS 184: Foundations of Computer Graphics

Student Facilitator Spring 2009 – Spring 2010
UC Berkeley Undergraduate Graphics Group

Tutor Fall 2008
UC Berkeley Self-Paced Center

**RESEARCH
MENTORING**

Current Students

Kai Wang Brown CS PhD

Russell (Kenny) Jones Brown CS PhD

Xianghao Xu Brown CS PhD

Aditya Ganeshan Brown CS PhD

Arman Maesumi Brown CS PhD

Rao Fu Brown CS PhD

Bryce Blinn Brown CS ScB + ScM (expected 2022)

Yuchen Zhou Brown CS ScM (expected 2022)

Zhouqi Gong Brown CS ScM (expected 2022)

Joshua Pierce Brown CS ScM (expected 2022)

Caleb Trotz Brown Math-CS ScB (expected 2022)

Aalia Habib Brown CS ScB (expected 2022)

Yifan Ruan Brown Math-CS ScB (expected 2023)

David Han Brown CS ScB (expected 2023)

Adam Wang	Brown CS + Applied Math ScB (expected 2023)
Sean Zhan	Brown CS + Applied Math + Econ ScB (expected 2023)
Paul Biberstein	Brown CS ScB (expected 2023)
Adrian Chang	Brown CS ScB (expected 2023)
Alex Ding	Brown CS ScB (expected 2024)
Anh Truong	Brown CS ScB (expected 2024)

Alumni

Vikas Thamizharasan <i>Next position: R&D Engineer, Activision</i>	Brown CS ScM 2022
Selena Ling <i>Next position: PhD Student, University of Toronto</i>	Brown CS ScM 2021
David Charatan <i>Next position: Common Sense Machines</i>	Brown Computer Engineering ScB 2021
Andrew Peterson <i>Next position: Disney Animation</i>	Brown CS + Applied Math ScB, CS ScM 2021
Maggie Wu <i>Next position: Microsoft</i>	Brown CS + Econ ScB 2021
Homer Walke <i>Next position: PhD Student, UC Berkeley</i>	Brown CS ScB 2021
Theresa Barton <i>Next position: The New York Times</i>	Brown CS ScM 2021
Naveen Srinivasan <i>Next position: Amazon Lab126</i>	Brown CS ScB + ScM 2020
Brian Oppenheim <i>Next position: Google</i>	Brown CS ScB 2020
Brad Guesman <i>Next position: NVIDIA</i>	Brown CS AB + Physics AB 2020
Miles Freeman <i>Next position: Winnie</i>	Brown CS + Applied Math ScB 2020
Siqi Wang <i>Next position: PhD Student, Boston University</i>	Brown CS ScM 2020
Loudon Cohen <i>Next position: NVIDIA</i>	Brown CS ScB + ScM 2020

Purvi Goel <i>Next position: PhD Student, Stanford University</i>	Brown CS ScB + ScM 2020
Natalie Lindsay <i>Next position: Apple</i>	Brown CS ScB + ScM 2020
Leon Lei <i>Next position: Amazon</i>	Brown CS ScB + ScM 2020
Ellen Jiang <i>Next position: Google Brain, Big Picture Group</i>	Brown CS ScB 2020
Ruolan Tang <i>Next position: Two Sigma</i>	Brown CS ScM 2019
Ben Weissmann <i>Next position: Down Dog</i>	Brown CS ScB 2019
Mae Heitmann <i>Next position: AirBnB</i>	Brown Math+CS ScB 2019
Montana Fowler <i>Next position: PhD Student, UC Santa Cruz</i>	Brown CS AB + Visual Art AB 2019
Yu-An (Andy) Lin <i>Next position: Microsoft</i>	Brown ECE ScM 2018
Yifan Liu <i>Next position: Google</i>	Brown CS ScM 2018
Shreya Shankar <i>Next position: Machine Learning Engineer, Viaduct</i>	Stanford CS BS 2019
Maxime Voisin <i>Next position: Research Assistant, Stanford University</i>	Stanford MS&E MS 2018
Anna Thomas <i>Next position: Masters Student, University of Cambridge (Churchill Scholar)</i>	Stanford CS BS 2018
Sarah Jobalia <i>Next position: Microsoft</i>	Stanford CS MS 2018
Ben Mildenhall <i>Next position: PhD Student, UC Berkeley</i>	Stanford CS BS 2015

Visitors

Hameed Abdul-Rashid <i>Home institution: University of Southern Mississippi</i>	Visiting Researcher Summer 2019
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External Thesis Committees

	Wenzhe Peng <i>MIT Department of Architecture</i>	2022
FUNDING	Adobe Inc. Unrestricted Gifts Sole PI. \$99,000	2020 – 2022
	NSF REU Site #2150184 Artificial Intelligence for Computational Creativity Sole PI. \$313,000	2021
	Google exploreCSR Unrestricted Gift Co-PIs: James Tompkin, Jeff Huang, Amy Greenwald. \$18,000	2020
	Autodesk Inc. Unrestricted Gifts Sole PI. \$60,000	2020 – 2021
	NSF CCRI Planning #2016532 A Community-Standard, Large-Scale Synthetic 3D Scene Dataset for Scene Analysis and Synthesis Sole PI. \$50,000	2020
	NSF CAREER #1941808 Learning Neurosymbolic 3D Models Sole PI. \$549,999	2020
	NSF CHS Small #1907547 Learning to Automatically Design Interior Spaces Sole PI. \$498,333	2019
	DARPA GAILA HR00111990064 Cognitively-Motivated Word Learning in Embodied Virtual Agents Co-PIs: Ellie Pavlick, Roman Fieinan, Stefanie Tellex, Carsten Eickhoff. \$954,509	2019
	Brown University OVR Research Seed Fund Award Building a Large Dataset of Articulated 3D Object Models Sole PI. \$42,500	2019
	NSF CRII #1753684 Learning Procedural Modeling Programs for Computer Graphics from Examples Sole PI. \$175,000	2018
AWARDS & HONORS	Eliot Horowitz Assistant Professorship	2021
	NSF CAREER Award	2020
	Eurographics Best Paper Honorable Mention	2015
	Stanford Graduate Fellowship	2010
	UC Berkeley EECS Departmental Citation	2010
	UC Berkeley Computer Science Highest Achievement Award	2010
	CRA Outstanding Undergraduate Researcher Honorable Mention	2010
	UC Berkeley Edward Frank Kraft Scholarship	2007

PROFESSIONAL SERVICE **Program Committee Member / Area Chair**

SIGGRAPH: 2021, 2022
SIGGRAPH Asia: 2018, 2019
SIGGRAPH Asia Courses: 2020
NeurIPS: 2019
ICLR: 2021
Eurographics: 2020, 2021

Conflict of Interest Coordinator

SIGGRAPH Asia: 2020

Conference Proceedings Reviewer

SIGGRAPH: 2016 – 2022
SIGGRAPH Asia: 2016 – 2022
CVPR: 2019 – 2022
UIST: 2016
NeurIPS: 2016, 2018, 2019
Eurographics: 2017 – 2019
Graphics Interface: 2019
ICCV: 2019, 2021
ECCV: 2020
ICML: 2018
ICLR: 2018

Journal Editor

Computer Graphics Forum (Associate Editor): 2021 – 2024

Journal Reviewer

ACM TOG: 2019, 2022
TVCG: 2016, 2019, 2021
Computer Graphics Forum: 2017, 2020, 2022
Pattern Recognition: 2019
Computer Aided Design: 2016
Transactions on Games: 2020
IEEE TPAMI: 2022

Grant Reviewer

NSF Proposal Reviewer: 2018, 2020, 2021

DEPARTMENT SERVICE	PhD Admissions Committee Member	2017 – 2021
	Diversity & Inclusion Committee Chair	2021 – 2022

PATENTS **Methods and Apparatus for Comic Creation** (US 20130073952 A1)

FILM CREDITS	Day & Night	2010
	Pixar Animation Studios	
	<i>Shading Technical Director</i>	