

# 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

### Assistant Professor

Brown University Computer Science Department

Providence, RI

2017 – Present

### 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

**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. *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. *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. *SIGGRAPH Asia 2020*.

**GANHopper: Multi-Hop GAN for Unsupervised Image-to-Image Translation.** Wallace Lira, Johannes Merz, Daniel Ritchie, Daniel Cohen-Or, Hao Zhang. *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. *SIGGRAPH 2019*.

**Fast and Flexible Indoor Scene Synthesis via Deep Convolutional Generative Models.** Daniel Ritchie, Kai Wang, Yu-an Lin. *CVPR 2019*.

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

**Learning to Infer Graphics Programs from Hand-Drawn Images.** Kevin Ellis, Daniel Ritchie, Armando Solar-Lezama, Joshua B. Tenenbaum. *NeurIPS 2018*. SPOTLIGHT PRESENTATION.

**Improving Shape Deformation in Unsupervised Image-to-Image Translation** Aaron Gokaslan, Vivek Ramanujan, Daniel Ritchie, Kwang In Kim, James Tompkin. *ECCV 2018*.

**Deep Convolutional Priors for Indoor Scene Synthesis** Kai Wang, Manolis Savva, Angel X. Chang, Daniel Ritchie. *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. *CVPR 2018*.

**Example-based Authoring of Procedural Modeling Programs with Structural and Continuous Variability** Daniel Ritchie, Sarah Jobalia, Anna Thomas *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. *NIPS 2016*.

**C3: Lightweight Incrementalized MCMC for Probabilistic Programs using Continuations and Callsite Caching.** Daniel Ritchie, Andreas Stuhlmüller, Noah D. Goodman. *AISTATS 2016*.

**Controlling Procedural Modeling Programs with Stochastically-Ordered Sequential Monte Carlo.** Daniel Ritchie, Ben Mildenhall, Noah D. Goodman, and Pat Hanrahan. *SIGGRAPH 2015*.

**Generating Design Suggestions under Tight Constraints with Gradient-based Probabilistic Programming.** Daniel Ritchie, Sharon Lin, Noah D. Goodman, and Pat Hanrahan. *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. *PLDI 2014.*

**Probabilistic Color-by-Numbers: Suggesting Pattern Colorizations Using Factor Graphs.** Sharon Lin, Daniel Ritchie, Matthew Fisher, and Pat Hanrahan. *SIGGRAPH 2013.*

**Example-based Synthesis of 3D Object Arrangements.** Matthew Fisher, Daniel Ritchie, Manolis Savva, Thomas Funkhouser, and Pat Hanrahan. *SIGGRAPH Asia 2012.*

**d.tour: Style-based Exploration of Design Example Galleries.** Daniel Ritchie, Ankita Arvind Kejriwal, and Scott R. Klemmer. *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. *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. *SIGGRAPH 2009.*

## TECHNICAL REPORTS

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

## INVITED TALKS

**Learning Neurosymbolic 3D Models**  
PROBPROG, *International Conference on Probabilistic Programming*    March 2020

**Everything You Need to Know About Deep Fakes**  
Full Stack at Brown, *Hack@Home*    October 2020

**Neurosymbolic 3D Models: Learning to Generate 3D Shape Programs**  
GAMES, *Graphics and Mixed Environment Seminar*    August 2020

**Toward Synthesizing Training Data for 3D Scene Understanding**  
CVPR, *3D Scene Understanding Workshop*    June 2020

**From Neural to Neurosymbolic 3D Modeling**  
CVPR, *Neurosymbolic Visual Learning & Program Induction Workshop*    June 2020

**Neurosymbolic 3D Models**  
MIT, *Vision Seminar*    March 2020

**Learning to Generate 3D Structures**  
Brown Department of Biostatistics, *Deep Learning Seminar*    February 2020

**Deep Learning for Graph(ic)s**  
Simon Fraser University, *Visual Computing Group*    December 2019

	<b>Learning to Generate Visual Structures</b> Carney Institute for Brain Science, <i>Lunch Seminar</i>	October 2019
	<b>Indoor Scene Synthesis: Past, Present, and Future</b> Shenzhen University, <i>Visual Computing Summer School</i>	July 2019
	<b>Probabilistic Programming</b> Brown ICERM, <i>Computer Vision Semester Program</i>	February 2019
	<b>Virtual Indoor Scene Synthesis: Past, Present, and Future</b> MIT, <i>Graphics Lunch</i>	December 2018
	<b>Toward Style-Aware Generative Models of Virtual Indoor Scenes</b> Wayfair LLC, <i>Computer Vision / Data Science Team</i>	December 2018
	<b>Visual Program Induction</b> Brown Applied Math, <i>Pattern Theory Seminar</i>	November 2018
	<b>Probabilistic Programming for Computer Graphics</b> MIT, <i>PROBPROG 2018</i>	October 2018
	<b>Learning Procedural Modeling Programs from Examples</b> MIT, <i>New England Symposium on Graphics</i>	April 2018
	Microsoft Research Cambridge, <i>New England Machine Learning Day</i>	May 2018
	<b>Learning from Large-Scale Synthetic 3D Scene Data</b> Brown University Data Science Initiative, <i>Datathon</i>	March 2018
	<b>Inferring Graphics Programs</b> University of Washington, <i>ML+PL Workshop</i>	February 2018
	<b>Learning and Inferring Graphics Programs</b> MIT, <i>Vision Seminar</i>	September 2017
	<b>Creative AI for Computer Graphics (It's More Than Just Style Transfer)</b> Google Brain, <i>Magenta Group</i>	January 2017
	<b>Probabilistic Programming for Procedural Modeling and Design</b> Adobe Systems, <i>Creative Technologies Lab</i>	March 2016
	Brown University, <i>Computer Science Department</i>	February 2016
	Harvey Mudd College, <i>Computer Science Department</i>	February 2016
	Yale University, <i>Computer Science Department</i>	February 2016
<b>PANELIST</b>	Advances in Software for Approximate Bayesian Inference. <i>NIPS 2016 Workshop on Advances in Approximate Bayesian Inference.</i>	
<b>TUTORIALS &amp; WORKSHOPS</b>	<b>Synthetic 3D Scene Datasets: Needs &amp; Opportunities</b> Daniel Ritchie, Angel Chang, Manolis Savva SIGGRAPH 2020 Birds of a Feather	August 2020
	<b>Learning 3D Generative Models</b> Daniel Ritchie, Florian Golemo, Angel Chang, Siddhartha Chaudhuri, Aaron Courville, Qixing Huang, Derek Nowrouzezahrai, Pedro O. Pinheiro, Sai Rajeswar, Manolis Savva,	June 2020

David Vasquez, Kai Xu, Hao Zhang  
CVPR 2020 Workshop

**3D Scene Generation**

June 2019

Angel Chang, Qixing Huang, Daniel Ritchie, Manolis Savva  
CVPR 2019 Workshop

**Learning Generative Models of 3D Structures**

May 2019

Siddhartha Chaudhuri, Daniel Ritchie, Kai Xu, Hao Zhang  
Eurographics 2019 Tutorial

**TEACHING**

**Instructor**

Fall 2018 – 2020

Brown CSCI 1470/2470: Deep Learning

**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

Theresa Barton

Brown CS PhD

Russell (Kenny) Jones

Brown CS PhD

Xianghao Xu

Brown CS PhD

Dylan Tian

Brown CS ScB + Visual Art AB (expected 2021)

Homer Walke

Brown CS ScB (expected 2021)

Bryce Blinn

Brown CS ScB (expected 2021)

Maggie Wu	Brown CS + Econ ScB (expected 2021)
Andrew Peterson	Brown CS + Applied Math ScB, CS ScM (expected 2021)
David Charatan	Brown Computer Engineering ScB (expected 2021)
Caleb Trotz	Brown Math-CS ScB (expected 2022)
David Han	Brown CS ScB (expected 2023)

## Alumni

Naveen Srinivasan <i>Next position:</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:</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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#### FUNDING

<b>Google exploreCSR</b> Unrestricted Gift Co-PIs: James Tompkin, Jeff Huang, Amy Greenwald. \$18,000	2020
<b>Adobe Inc.</b> Unrestricted Gift Sole PI. \$20,000	2020
<b>NSF CCRI Planning #2016532</b> A Community-Standard, Large-Scale Synthetic 3D Scene Dataset for Scene Analysis and Synthesis Sole PI. \$50,000	2020
<b>Autodesk Inc.</b> Unrestricted Gift Sole PI. \$30,000	2020
<b>NSF CAREER #1941808</b> Learning Neurosymbolic 3D Models Sole PI. \$549,999	2020
<b>NSF CHS Small #1907547</b> Learning to Automatically Design Interior Spaces Sole PI. \$498,333	2019
<b>DARPA GAILA HR00111990064</b> Cognitively-Motivated Word Learning in Embodied Virtual Agents	2019

Co-PIs: Ellie Pavlick, Roman Fieman, Stefanie Tellex, Carsten Eickhoff. \$954,509

**Brown University OVR Research Seed Fund Award** 2019  
Building a Large Dataset of Articulated 3D Object Models  
Sole PI. \$42,500

**NSF CRII #1753684** 2018  
Learning Procedural Modeling Programs for Computer Graphics from Examples  
Sole PI. \$175,000

<b>AWARDS &amp; HONORS</b>	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

<b>SERVICE</b>	<b>Program Committee Member / Area Chair</b>
	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 – 2020  
SIGGRAPH Asia: 2016 – 2020  
CVPR: 2019, 2020  
UIST: 2016  
NeurIPS: 2016, 2018, 2019  
Eurographics: 2017, 2018, 2019  
Graphics Interface: 2019  
ICCV: 2019  
ECCV: 2020  
ICML: 2018  
ICLR: 2018

**Journal Reviewer**  
ACM TOG: 2019  
TVCG: 2016, 2019  
Computer Graphics Forum: 2017, 2020  
Pattern Recognition: 2019  
Computer Aided Design: 2016  
Transactions on Games: 2020

**Grant Reviewer**  
NSF Proposal Reviewer: 2018

<b>PATENTS</b>	<b>Methods and Apparatus for Comic Creation (US 20130073952 A1)</b>
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**FILM CREDITS** **Day & Night**  
Pixar Animation Studios  
*Shading Technical Director*

2010