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 — Providence, RI
Brown University Computer Science Department — 2021 – Present

Assistant Professor — Providence, RI
Brown University Computer Science Department — 2017 – 2021

Postdoctoral Researcher — Stanford, CA
Stanford University Computer Science Department — 2016 – 2017

Research Intern — San Francisco, CA
Adobe Creative Technologies Lab — Summer 2011

Graduate Research Assistant — Stanford, CA
Stanford University Computer Science Department — 2010 – 2016

Technical Director Intern — Emeryville, CA
Pixar Animation Studios — Summer 2009

Software Intern — Roseville, CA
Hewlett-Packard — 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.

The Shape Part Slot Machine: Contact-based Reasoning for Generating 3D Shapes from Parts. **Kai Wang**, Srinath Sridhar, Paul Guerrero, Vladimir Kim, Siddhartha Chaudhuri, Minhyuk Sung, Daniel Ritchie. *ECCV 2022.*

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 Patttern 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 Colloqium* 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, *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

Learning to Generate Visual Structures
Carney Institute for Brain Science, *Lunch Seminar* October 2019

Indoor Scene Synthesis: Past, Present, and Future
Shenzhen University, *Visual Computing Summer School* July 2019

Probabilistic Programming
Brown ICERM, *Computer Vision Semester Program* Februrary 2019

Virtual Indoor Scene Synthesis: Past, Present, and Future
MIT, *Graphics Lunch* December 2018

Toward Style-Aware Generative Models of Virtual Indoor Scenes
Wayfair LLC, *Computer Vision / Data Science Team* December 2018

Visual Program Induction
Brown Applied Math, *Pattern Theory Seminar* November 2018

Probablistic Programming for Computer Graphics
MIT, *PROBPROG 2018* October 2018

Learning Procedural Modeling Programs from Examples
MIT, *New England Symposium on Graphics* April 2018

Microsoft Research Cambridge, *New England Machine Learning Day* May 2018

Learning from Large-Scale Synthetic 3D Scene Data
Brown University Data Science Initiative, *Datathon* March 2018

Inferring Graphics Programs
University of Washington, *ML+PL Workshop* Feburary 2018

Learning and Inferring Graphics Programs
MIT, *Vision Seminar* September 2017

Creative AI for Computer Graphics (It's More Than Just Style Transfer)
Google Brain, *Magenta Group* January 2017

Probabilistic Programming for Procedural Modeling and Design
Adobe Systems, *Creative Technologies Lab* March 2016
Brown University, *Computer Science Department* February 2016
Harvey Mudd College, *Computer Science Department* February 2016
Yale University, *Computer Science Department* February 2016

PANELIST

Advances in Software for Approximate Bayesian Inference. *NIPS 2016 Workshop on Advances in Approximate Bayesian Inference.*

TUTORIALS & WORKSHOPS

Learning to Generate 3D Shapes and Scenes October 2022
Kai Wang, Akshay Gadi Patil, Angel X. Chang, Paul Guerrero, Daniel Ritchie, Manolis Savva
ECCV 2022 Workshop

Machine Learning in Computational Design September 2022
Andrew Spielberg, Caitlin Mueller, Lydian Chilton, Rafael Gomez-Bombarelli, Vladimir Kim, Daniel Ritchie
ICML 2022 Workshop

Learning to Generate 3D Shapes and Scenes June 2021
Manyi Li, Zhenpei Yang, Angel X. Chang, Siddhartha Chaudhuri, Daniel Ritchie, Manolis Savva
CVPR 2021 Workshop

Synthetic 3D Scene Datasets: Needs & Opportunities August 2020
Daniel Ritchie, Angel Chang, Manolis Savva
SIGGRAPH 2020 Birds of a Feather

Learning 3D Generative Models June 2020
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

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 2021
Brown CSCI 1230: Introduction to Computer Graphics

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
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
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

Bryce Blinn — Brown CS ScB + ScM 2022
Next position: PhD Student, USC

Yuchen Zhou — Brown CS ScM 2022
Next position: Amazon

Zhouqi Gong — Brown CS ScM 2022
Next position: Amazon

Joshua Pierce — Brown CS ScM 2022
Next position:

Caleb Trotz — Brown Math-CS ScB 2022
Next position: Goldman Sachs

Aalia Habib — Brown CS ScB 2022
Next position: Adobe

Vikas Thamizharasan — Brown CS ScM 2022
Next position: R&D Engineer, Activision

Selena Ling — Brown CS ScM 2021
Next position: PhD Student, University of Toronto

David Charatan — Brown Computer Engineering ScB 2021
Next position: Common Sense Machines

Andrew Peterson — Brown CS + Applied Math ScB, CS ScM 2021
Next position: Disney Animation

Maggie Wu — Brown CS + Econ ScB 2021
Next position: Microsoft

Homer Walke — Brown CS ScB 2021
Next position: PhD Student, UC Berkeley

Theresa Barton — Brown CS ScM 2021
Next position: The New York Times

Naveen Srinivasan — Brown CS ScB + ScM 2020
Next position: Amazon Lab126

Brian Oppenheim — Brown CS ScB 2020
Next position: Google

Brad Guesman — Brown CS AB + Physics AB 2020
Next position: NVIDIA

Miles Freeman — Brown CS + Applied Math ScB 2020
Next position: Winnie

Siqi Wang — Brown CS ScM 2020
Next position: PhD Student, Boston University

Loudon Cohen — Brown CS ScB + ScM 2020
Next position: NVIDIA

Purvi Goel — Brown CS ScB + ScM 2020
Next position: PhD Student, Stanford University

Natalie Lindsay — Brown CS ScB + ScM 2020
Next position: Apple

Leon Lei — Brown CS ScB + ScM 2020
Next position: Amazon

Ellen Jiang — Brown CS ScB 2020
Next position: Google Brain, Big Picture Group

Ruolan Tang — Brown CS ScM 2019
Next position: Two Sigma

Ben Weissmann — Brown CS ScB 2019
Next position: Down Dog

Mae Heitmann — Brown Math+CS ScB 2019
Next position: AirBnB

Montana Fowler — Brown CS AB + Visual Art AB 2019
Next position: PhD Student, UC Santa Cruz

Yu-An (Andy) Lin — Brown ECE ScM 2018
Next position: Microsoft

Yifan Liu — Brown CS ScM 2018
Next position: Google

Shreya Shankar — Stanford CS BS 2019
Next position: Machine Learning Engineer, Viaduct

Maxime Voisin — Stanford MS&E MS 2018
Next position: Research Assistant, Stanford University

Anna Thomas — Stanford CS BS 2018
Next position: Masters Student, University of Cambridge (Churchill Scholar)

Sarah Jobalia — Stanford CS MS 2018
Next position: Microsoft

Ben Mildenhall — Stanford CS BS 2015
Next position: PhD Student, UC Berkeley

Visitors

Hameed Abdul-Rashid — Visiting Researcher Summer 2019
Home institution: University of Southern Mississippi

External Thesis Committees

Wenzhe Peng — 2022
MIT Department of Architecture

FUNDING

Adobe Inc. — 2020 – 2022
Unrestricted Gifts
Sole PI. $99,000

NSF REU Site #2150184 — 2021
Artificial Intelligence for Computational Creativity
Sole PI. $313,000

Google exploreCSR — 2020
Unrestricted Gift
Co-PIs: James Tompkin, Jeff Huang, Amy Greenwald. $18,000

Autodesk Inc. — 2020 – 2021
Unrestricted Gifts
Sole PI. $60,000

NSF CCRI Planning #2016532 — 2020
A Community-Standard, Large-Scale Synthetic 3D Scene Dataset for Scene Analysis and Synthesis
Sole PI. $50,000

NSF CAREER #1941808 — 2020
Learning Neurosymbolic 3D Models
Sole PI. $549,999

NSF CHS Small #1907547 — 2019
Learning to Automatically Design Interior Spaces
Sole PI. $498,333

DARPA GAILA HR00111990064 — 2019
Cognitively-Motivated Word Learning in Embodied Virtual Agents
Co-PIs: Ellie Pavlick, Roman Fieman, Stefanie Tellex, Carsten Eickhoff. $954,509

Brown University OVPR 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

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 – 2022

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
Shading Technical Director