Nicholas Sharp

nmwsharp@gmail.com | www.nmwsharp.com | nmwsharp | google scholar

Education

Carnegie Mellon University · MS & PhD in Computer Science — Pittsburgh, PA
Advisor: Keenan Crane — Aug 2021
Thesis: Intrinsic Triangulations in Geometry Processing
Topics: geometry processing, computer graphics & vision, 3D machine learning

Virginia Tech · BS in Engineering Physics, Computer Science, Mathematics — Blacksburg, VA
Triple Major, *in honors* — May 2015
Minors in Physics and Statistics

Experience

NVIDIA — Seattle, WA
Senior Research Scientist — July 2022 - *ongoing*
Research in 3D geometry and machine learning, for visual computing, robotics, and industrial AI. Area lead of the geometry processing subgroup within the Spatial Intelligence Lab.

University of Toronto & Fields Institute for Mathematics — Toronto, ON
Postdoctoral Fellow — Aug 2021 - July 2022
Supervised by Alec Jacobson. Affiliated with the Vector Institute for AI.

Oculus Research / Facebook Reality Labs — Pittsburgh, PA & Redmond, WA
Research Intern — Summer 2015 & 2016, Fall 2018
Mentors: Yaser Sheikh, Takaaki Shiratori, Alexander Fix. Learned appearance modeling and 3D correspondence. Developed a multicamera scanning system.

Carnegie Mellon University — Pittsburgh, PA
Graduate Researcher — Aug 2015 - Aug 2021

Microsoft Silicon Valley — Mountain View, CA
Software Development Intern — Summer 2013

Lawrence Livermore National Lab — Livermore, CA
High Energy Density Physics Intern — Summer 2012

Johns Hopkins University Applied Physics Lab — Laurel, MD
NASA Research Intern — Summer 2011
Mentor: Mikhail Sitnov. Implemented an empirical model of the magnetosphere.

Publications

[32] Design for Descent: What Makes a Shape Grammar Easy to Optimize?
Milin Kodnongbua, Zihan Zhang, Nicholas Sharp, and Adriana Schulz
SIGGRAPH Asia 2025

[31] The Affine Heat Method
Yousuf Soliman, Nicholas Sharp
Symposium on Geometry Processing (SGP) 2025 - ***Best Paper Award***

[30] Uniform Sampling of Surfaces by Casting Rays
Selena Ling, Abhishek Madan, Nicholas Sharp, Alec Jacobson
Symposium on Geometry Processing (SGP) 2025

[29] Partfield: Learning 3d Feature Fields for Part Segmentation and Beyond
Minghua Liu, Mikaela Angelina Uy, Donglai Xiang, Hao Su, Sanja Fidler, Nicholas Sharp, Jun Gao
ICCV 2025

[28] Stochastic Preconditioning for Neural Field Optimization
Selena Ling, Merlin Nimier-David, Alec Jacobson, Nicholas Sharp
SIGGRAPH 2025

[27] Stochastic Barnes-Hut Approximation for Fast Summation on the GPU
Abhishek Madan, Nicholas Sharp, Francis Williams, Ken Museth, David I.W. Levin
SIGGRAPH 2025

[26] Putting Rigid Bodies to Rest
Hossein Baktash, Nicholas Sharp, Qingnan Zhou, Alec Jacobson, Keenan Crane
ACM Transactions on Graphics (SIGGRAPH) 2025

[25] Neurally Integrated Finite Elements for Differentiable Elasticity on Evolving Domains
Gilles Daviet, Tianchang Shen, Nicholas Sharp, David IW Levin
ACM Transactions on Graphics (SIGGRAPH) 2025

[24] SpaceMesh: A Continuous Representation for Learning Manifold Surface Meshes
Tianchang Shen, Zhaoshuo Li, Marc Law, Matan Atzmon, Sanja Fidler, James Lucas, Jun Gao, Nicholas Sharp
SIGGRAPH Asia 2024

[23] 3D Gaussian Ray Tracing: Fast Tracing of Particle Scenes
Nicolas Moenne-Loccoz*, Ashkan Mirzaei*, Or Perel, Riccardo de Lutio, Janick Martinez Esturo, Gavriel State, Sanja Fidler, Nicholas Sharp*, Zan Gojcic*
ACM Transactions on Graphics (SIGGRAPH Asia) 2024

[22] Surface-Filling Curve Flows via Implicit Medial Axes
Yuta Noma, Silvia Sellán, Nicholas Sharp, Karan Singh, Alec Jacobson
ACM Transactions on Graphics (SIGGRAPH) 2024

[21] Simplicits: Mesh-Free, Geometry-Agnostic, Elastic Simulation
Vismay Modi, Nicholas Sharp, Or Perel, Shinjiro Sueda, David I. W. Levin
ACM Transactions on Graphics (SIGGRAPH) 2024

[20] Adaptive Shells for Efficient Neural Radiance Field Rendering
Zian Wang*, Tianchang Shen*, Merlin Nimier-David*, Nicholas Sharp, Jun Gao, Alexander Keller, Sanja Fidler, Thomas Müller, Zan Gojcic
ACM Transactions on Graphics (SIGGRAPH Asia) 2023 - ***Best Paper Award***

[19] TexFusion: Synthesizing 3D Textures with Text-Guided Image Diffusion Models
Tianshi Cao, Karsten Kreis, Sanja Fidler, Nicholas Sharp*, Kangxue Yin*
ICCV 2023 (Oral)

[18] ATT3D: Amortized Text-to-3D Object Synthesis
Jonathan Lorraine, Kevin Xie, Xiaohui Zeng, Chen-Hsuan Lin, Towaki Takikawa, Nicholas Sharp, Tsung-Yi Lin, Ming-Yu Liu, Sanja Fidler, James Lucas
ICCV 2023

[17] Data-Free Learning of Reduced-Order Kinematics
Nicholas Sharp, Cristian Romero, Alec Jacobson, Etienne Vouga, Paul G. Kry, David I.W. Levin, Justin Solomon
SIGGRAPH 2023

[16] Flexible Isosurface Extraction for Gradient-Based Mesh Optimization
Tianchang Shen, Jacob Munkberg, Jon Hasselgren, Kangxue Yin, Zian Wang, Wenzheng Chen, Zan Gojcic, Sanja Fidler, Nicholas Sharp*, Jun Gao*
ACM Transactions on Graphics (SIGGRAPH) 2023

[15] Surface Simplification using Intrinsic Error Metrics
Hsueh-Ti Derek Liu*, Mark Gillespie*, Benjamin Chislett*, Nicholas Sharp, Alec Jacobson, Keenan Crane
ACM Transactions on Graphics (SIGGRAPH) 2023

[14] VectorAdam for Rotation Equivariant Geometry Optimization
Selena Ling, Nicholas Sharp, Alec Jacobson
Conference on Neural Information Processing Systems (NeurIPS) 2022

[13] Spelunking the Deep: Guaranteed Queries on General Neural Implicit Surfaces via Range Analysis
Nicholas Sharp, Alec Jacobson
ACM Transactions on Graphics (SIGGRAPH) 2022 - Best Paper Award

[12] DiffusionNet: Discretization Agnostic Learning on Surfaces
Nicholas Sharp, Souhaib Attaiki, Keenan Crane, Maks Ovsjanikov
ACM Transactions on Graphics (SIGGRAPH) 2022

[11] Integer Coordinates for Intrinsic Geometry Processing
Mark Gillespie, Nicholas Sharp, Keenan Crane
ACM Transactions on Graphics (SIGGRAPH Asia) 2021

[10] Intrinsic Triangulations in Geometry Processing
Nicholas Sharp
PhD Thesis, Carnegie Mellon University

[9] Geometry Processing with Intrinsic Triangulations
Nicholas Sharp, Mark Gillespie, and Keenan Crane
ACM SIGGRAPH Courses 2021

[8] You Can Find Geodesic Paths in Triangle Meshes by Just Flipping Edges
Nicholas Sharp and Keenan Crane
ACM Transactions on Graphics (SIGGRAPH Asia) 2020

[7] A Laplacian for Nonmanifold Triangle Meshes
Nicholas Sharp and Keenan Crane
Symposium on Geometry Processing (SGP) 2020 - Best Student Paper Award

[6] PointTriNet: Learned Triangulation of 3D Point Sets
Nicholas Sharp and Maks Ovsjanikov
European Conference on Computer Vision (ECCV) 2020

[5] Navigating Intrinsic Triangulations
Nicholas Sharp, Yousuf Soliman, and Keenan Crane
ACM Transactions on Graphics (SIGGRAPH) 2019

[4] The Vector Heat Method
Nicholas Sharp, Yousuf Soliman, and Keenan Crane
ACM Transactions on Graphics (SIGGRAPH) 2019

[3] Variational Surface Cutting
Nicholas Sharp and Keenan Crane
ACM Transactions on Graphics (SIGGRAPH) 2018

[2] Pathways on Demand: Automated Reconstruction of Human Signaling Networks
Anna Ritz, Christopher L Poirel, Allison N Tegge, Nicholas Sharp, Kelsey Simmons, Allison Powell, Shiv D Kale, and TM Murali
npj Systems Biology and Applications 2016

[1] Xtalk: A Path-Based Approach for Identifying Crosstalk Between Signaling Pathways
Allison N Tegge, Nicholas Sharp, and TM Murali
Bioinformatics, 2016

Awards

2025 **Best Paper Award** Symposium on Geometry Processing 2025
2023 **Best Paper Award** SIGGRAPH Asia 2023
2022 **Best Paper Award** SIGGRAPH 2022
2022 **SGP Software Award** Symposium on Geometry Processing 2022
2021 **Fields Institute for Mathematics Postdoctoral Fellowship**
2020 **Best Paper Award (student paper)** Symposium on Geometry Processing 2020
2016 **NSF Graduate Research Fellowship**
2015 **Finalist** CRA Undergraduate Researcher Award
2015 **World Finalist** ACM ICPC Competitive Programming Contest in Marrakech, Morocco
2014 **World Finalist** ACM ICPC Competitive Programming Contest in Ekaterinburg, Russia
2014 **Meritorious Winner** Mathematical Contest in Modeling

In the News

2025 **SciShow - Putting Rigid Bodies to Rest** YouTube feature "How to Make Fair DnD Dice from ANY Shape" (>200k views) [link]
2025 **ArsTechnica - Putting Rigid Bodies to Rest** article "Your next gaming dice could be shaped like a dragon or armadillo" [link]
2024 **Two Minute Papers - Gaussian Ray Tracing** YouTube feature (200k+ views) [link]
2023 **Two Minute Papers - Flexicubes** YouTube feature (70k+ views) [link]
2022 **SIGGRAPH Interview - Spelunking the Deep** [link]
2022 **New York Times - Variational Surface Cutting** article on Nervous System Art Studio and our collaboration "They're Taking Jigsaws to Infinity and Beyond" [link]

Invited Talks and Tutorials

* denotes talks delivered virtually

Representations for Fitting and Learning Surfaces

Nov 2025	*ILM/Lucasfilm*	online*
Mar 2025	*SIGGRAPH Program Committee Workshop*	Vancouver, BC
Feb 2025	*Oberwolfach Workshop on Mathematical Imaging and Surface Processing*	Oberwolfach, Germany

Adam Is A Weird Optimization Algorithm

Dec 2023	*SIGGRAPH Asia Program Committee Workshop*	Sydney, Australia

Learning Representations for Physical Systems

Oct 2023	*MIT Vision Seminar*	Boston, MA*
Aug 2023	*SIGGRAPH 2023*	Los Angeles, CA

Spelunking the Deep: Guaranteed Queries on General Neural Implicit Surfaces via Range Analysis

Apr 2023	*Brown Visual Computing Seminar*	Providence, RI*
Feb 2023	*UW Graphics*	Seattle, WA
Sep 2022	*Amherst MLFL*	Amherst, MA*
Oct 2022	*IEEE Vis Invited Talks*	Oklahoma City, OK*
Aug 2022	*Oberwolfach Workshop on Mathematical Imaging and Surface Processing*	Oberwolfach, Germany
Aug 2022	*SIGGRAPH 2022*	Vancouver, BC

DiffusionNet: Discretization Agnostic Learning on Surfaces

Aug 2022	*SIGGRAPH 2022*	Vancouver, BC

Robust and Reliable Geometry Processing

July 2025	*Summer Geometry Initiative Tutorials*	online*
July 2024	*Summer Geometry Initiative Tutorials*	online*
July 2023	*Summer Geometry Initiative Tutorials*	online*
Oct 2022	*Evocation Summer School*	online*
July 2022	*Summer Geometry Initiative Tutorials*	online*
Oct 2021	*STAG Graduate School*	online*

Geometry Processing with Intrinsic Triangulations

Aug 2021	*ACM SIGGRAPH Courses (SIGGRAPH 2021)*	online*
June 2021	*International Meshing Roundtable Courses (IMR 2021)*	online*

Geometric Perspectives on 3D Deep Learning

Feb 2022	*Google Brain Toronto*	Toronto, ON*

Intrinsic Triangulations in Geometry Processing

Apr 2021	*UCSD Visual Computing Seminar*	San Diego, CA*
Mar 2021	*GAMES Seminar*	online*
Nov 2020	*Stanford Geometric Computation Group*	Stanford, CA*
Nov 2020	*Adobe Research*	San Jose, CA*
Oct 2020	*Toronto Geometry Colloquium*	Toronto, ON*
Oct 2019	*STREAM Group, LIX, École Polytechnique*	Paris, France

Robustness in Geometry Processing: from Laplacians to Learning

Feb 2021	*NVIDIA Toronto AI Lab*	Toronto, ON*

Robust Geometry Processing and Nonmanifold Laplacians

July 2020	*MIT Graphics Seminar*	Cambridge, MA*

Geometric Computing with geometry-central

July 2020	*SGP 2020 Graduate School*	Utrecht, NL*

Variational Surface Cutting

June 2018	*IST Austria*	Klosterneuburg, Austria

You Can Find Geodesic Paths in Triangle Meshes by Just Flipping Edges

Nov 2020	*ACM SIGGRAPH Asia 2020*	Daegu, SK*

PointTriNet: Learned Triangulation of 3D Point Sets

Aug 2020	*ECCV 2020*	online*

A Laplacian for Nonmanifold Triangle Meshes

July 2020	*SGP 2020*	Utrecht, NL*

Navigating Intrinsic Triangulations

Aug 2019	*ACM SIGGRAPH 2019*	Los Angeles, CA

The Vector Heat Method

Aug 2019	*ACM SIGGRAPH 2019*	Los Angeles, CA

Variational Surface Cutting

Aug 2018	*ACM SIGGRAPH 2018*	Vancouver, BC

Machine Learning Models for Terrestrial Space Weather Forecasting

July 2014	*SIAM Annual Meeting, Undergraduate Research Session*	Chicago, IL

Optimal Control in Time-Varying Velocity Fields using Alpha Hulls

July 2014	*SIAM Annual Meeting, Undergraduate Research Session*	Chicago, IL

Software

Additionally, open-source code is available for publications above at `https://github.com/nmwsharp/`.

Polyscope (SGP Software Award winner, 2022) [2000+ github stars]

Easy 3D visualization of meshes, point clouds, etc. in C++ & Python. Create useful, informative visualizations with <5 lines of code. Build interactive interfaces to support research.
polyscope.run

geometry-central [1000+ github stars]

Modern C++ library of data structures and algorithms for geometry processing, with a focus on surface meshes.
geometry-central.net

potpourri3d
Python toolbag of fast and robust geometric algorithms for meshes and point clouds.
github.com/nmwsharp/potpourri3d

hapPLY
Header-only C++ reader/writer for .ply file format. Parse .ply happily!
github.com/nmwsharp/happly

Academic Service

Committee Service

SIGGRAPH Technical Papers Committee [2025,2026]
SIGGRAPH Asia Technical Papers Committee [2023]
Symposium on Geometry Processing IPC [2021-2025]
Eurographics IPC [2024,2025]
Pacific Graphics IPC [2022,2024]
Eurographics STAR IPC [2023]
Shape Modeling International IPC [2022]
Geometric Modeling and Processing IPC [2025,2026]

Reviewing

SIGGRAPH [2020-2025]
SIGGRAPH Asia [2021-2025]
Transactions on Graphics [2021-2025]
Symposium on Geometry Processing (SGP) [2021-2025]
Symposium on Geometry Processing (SGP), Software and Datasets [2021]
Eurographics [2018-2019, 2023-2025]
Eurographics, Short Papers [2020,2023]
Eurographics, STAR [2023]
International Conference on 3D Vision (3DV) [2025]
Transactions on Pattern Analysis and Machine Intelligence (TPAMI) [2024]
Winter Conference on Applications of Computer Vision (WACV) [2026]
Pacific Graphics [2020,2022,2024]
Shape Modeling International (SMI) [2022]
Transactions on Visualization and Computer Graphics (TVCG) [2021-2024]
Computer-Aided Design [2023-2025]
Geometric Modeling and Processing (GMP) [2025]
Computational Geometry: Theory and Applications [2019]
Computers and Graphics [2021-2025]
Graphics Interface [2020]

Miscellaneous Service

Problem Author, ACM Inter-Collegiate Programming Contest (ICPC) [2017-2018]
Organizer, Virginia High School Programming Contest [2015]
Organizer, CMU CS PhD Admissions Open House [2017]
Organizer, CMU Random Distance Run [2018-2020]

Teaching

University Course Instruction

CMU 15-462 Computer Graphics, Lead Teaching Assistant [Fall 2017]
Developed course materials and assignments for a widely-used graphics curriculum
Delivered auxiliary lectures, led a team of TAs

CMU 15-869 Discrete Differential Geometry, Teaching Assistant [Spring 2016]
Developed course materials, sole TA for graduate-level course

Short Courses and Tutorials

Tutorial: ***Robustness and Debugging in Geometry Processing*** [2021-2025]
Day-long tutorial with lectures and exercises
Given at the MIT Summer Geometry Initiative [2022-2025], STAG Graduate School [2021]
Course: ***Geometry Processing with Intrinsic Triangulations*** [2021]
with Mark Gillespie and Keenan Crane
3hr course and course notes
Given at SIGGRAPH 2021 and the International Meshing Roundtable (IMR) 2021

Mentoring

Mentor, WiGRAPH (Women in Computer Graphics Research) [2025]
Intern Mentor, NVIDIA Spatial Intelligence Lab [2023-2025]
7+ PhD research interns
Mentor, MS and PhD students at CMU and UofT [2016-2023]
Project Leader, MIT Summer Geometry Institute [2020-2024]
Tutorial Author, SIGGRAPH Research Career Development Committee [2022]
Mentor, SIGGRAPH RDRC Graduate Application Mentorship Program [2021]
Mentor, CMU Graduate Application Support Program [2020]

Skills

Programming	**C++**, **Python**, LaTeX
Technologies	PyTorch, JAX, OpenGL, Eigen, CMake
Tools	Unix/Linux, VIM, Blender, Adobe Illustrator & Photoshop

Personal

Cooking	www.nmwsharp.com/recipes
Baking	focaccia, english muffins, sourdough
Long Distance Running	2014 Hokie Half Marathon, 2017 Baltimore Marathon, 2019 Pittsburgh Half Marathon, 2022 Buffalo Half Marathon, 2022 Portland Marathon, 2025 Vancouver Half Marathon, 2025 Seattle Marathon
Cat	River, 9 year old domestic medium-hair
Dog	Felix, 5 year old cattle dog mix