

NICHOLAS SHARP

nmwsharp@gmail.com | www.nmwsharp.com | [nmwsharp](https://scholar.google.com/citations?user=nmwsharp) | [google scholar](https://scholar.google.com/citations?hl=en&user=nmwsharp)

Education

Carnegie Mellon University · MS & PhD in Computer Science

ADVISOR: KEENAN CRANE

THESIS: INTRINSIC TRIANGULATIONS IN GEOMETRY PROCESSING

Topics: geometry processing, computer graphics & vision, 3D machine learning

Pittsburgh, PA

Aug 2021

Virginia Tech · BS in Engineering Physics, Computer Science, Mathematics

TRIPLE MAJOR, IN HONORS

Minors in Physics and Statistics

Blacksburg, VA

May 2015

Experience

NVIDIA

SENIOR RESEARCH SCIENTIST

Research in 3D geometry and machine learning, with applications to visual computing, robotics, and industrial AI. Area lead of the geometry processing subgroup within the Spatial Intelligence Lab.

Seattle, WA

July 2022 - ongoing

University of Toronto & Fields Institute for Mathematics

POSTDOCTORAL FELLOW

Supervised by Alec Jacobson. Affiliated with the Vector Institute for AI.

Toronto, ON

Aug 2021 - July 2022

Oculus Research / Facebook Reality Labs

RESEARCH INTERN

Mentors: Yaser Sheikh, Takaaki Shiratori, Alexander Fix. Learned appearance modeling and 3D correspondence. Developed a multicamera scanning system.

Pittsburgh, PA & Redmond, WA

Summer 2015 & 2016, Fall 2018

Carnegie Mellon University

GRADUATE RESEARCHER

Pittsburgh, PA

Aug 2015 - Aug 2021

Microsoft Silicon Valley

SOFTWARE DEVELOPMENT INTERN

Mountain View, CA

Summer 2013

Lawrence Livermore National Lab

HIGH ENERGY DENSITY PHYSICS INTERN

Livermore, CA

Summer 2012

Johns Hopkins University Applied Physics Lab

NASA RESEARCH INTERN

Mentor: Mikhail Sitnov. Implemented an empirical model of the magnetosphere.

Laurel, MD

Summer 2011

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
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

- Sept 2025 UW GRAIL FACULTY RETREAT
Mar 2025 SIGGRAPH PROGRAM COMMITTEE WORKSHOP
Feb 2025 OBERWOLFACH WORKSHOP ON MATHEMATICAL IMAGING AND SURFACE PROCESSING

Long Beach, WA
Vancouver, BC
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
Aug 2023 SIGGRAPH 2023

Boston, MA*
Los Angeles, CA

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

- Apr 2023 BROWN VISUAL COMPUTING SEMINAR
Feb 2023 UW GRAPHICS
Sep 2022 AMHERST MLFL
Oct 2022 IEEE VIS INVITED TALKS
Aug 2022 OBERWOLFACH WORKSHOP ON MATHEMATICAL IMAGING AND SURFACE PROCESSING
Aug 2022 SIGGRAPH 2022

Providence, RI*
Seattle, WA
Amherst, MA*
Oklahoma City, OK*
Oberwolfach, Germany
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
July 2024 SUMMER GEOMETRY INITIATIVE TUTORIALS
July 2023 SUMMER GEOMETRY INITIATIVE TUTORIALS
Oct 2022 EVOCATION SUMMER SCHOOL
July 2022 SUMMER GEOMETRY INITIATIVE TUTORIALS
Oct 2021 STAG GRADUATE SCHOOL

online*
online*
online*
online*
online*
online*

Geometry Processing with Intrinsic Triangulations

Aug 2021 ACM SIGGRAPH COURSES (SIGGRAPH 2021)
June 2021 INTERNATIONAL MESHING ROUNDTABLE COURSES (IMR 2021)

online*
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
Mar 2021 GAMES SEMINAR
Nov 2020 STANFORD GEOMETRIC COMPUTATION GROUP
Nov 2020 ADOBE RESEARCH
Oct 2020 TORONTO GEOMETRY COLLOQUIUM
Oct 2019 STREAM GROUP, LIX, ÉCOLE POLYTECHNIQUE

San Diego, CA*
online*
Stanford, CA*
San Jose, CA*
Toronto, ON*
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/happy

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 and Mentoring

UNIVERSITY COURSE INSTRUCTION

CMU 15-462 Computer Graphics, Lead Teaching Assistant [2016]

Developed course materials, delivered auxiliary lectures, led a team of TAs

CMU 15-869 Discrete Differential Geometry, Teaching Assistant [2015]

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, resulting in several publications at top venues

Advising & mentoring MS and PhD students at CMU and UofT [2016-2023]

Project Leader, MIT Summer Geometry Institute [2020-2024]

Mentor, SIGGRAPH RDRC Graduate Application Mentorship Program [2021]

Mentor, CMU Graduate Application Support Program [2020]

Tutorial Author, SIGGRAPH Research Career Development Committee [2022]

Skills

Programming C++, Python, L^AT_EX

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

Cat River, 9 year old domestic medium-hair

Dog Felix, 5 year old cattle dog mix