

# NICHOLAS SHARP

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

## Education

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**Carnegie Mellon University · MS & PhD in Computer Science**

Pittsburgh, PA

ADVISOR: KEENAN CRANE

Aug 2021

Topics: geometry processing, computer graphics & vision, geometric learning

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

Blacksburg, VA

TRIPLE MAJOR, IN HONORS

May 2015

Minors in Physics and Statistics

## Work Experience

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**NVIDIA**

Seattle, WA

SENIOR RESEARCH SCIENTIST

July 2022 - ongoing

Research at the intersection of 3D geometry and machine learning. Applications to computer graphics, computer vision, and robotics. Member of Sanja Fidler's AI 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.

**Carnegie Mellon University**

Pittsburgh, PA

GRADUATE RESEARCHER

Aug 2015 - Aug 2021

**Oculus Research / Facebook Reality Labs**

Pittsburgh, PA & Redmond, WA

RESEARCH INTERN

Summer 2015 & 2016, Fall 2018

Mentors: Yaser Sheikh, Takaaki Shiratori, Alexander Fix. Developed new methods for learned appearance modeling and temporal correspondence in 3D reconstructions. Prototyped a multicamera scanning system, including hardware and calibration.

**Microsoft Silicon Valley**

Mountain View, CA

SOFTWARE DEVELOPMENT INTERN

Summer 2013

**Lawrence Livermore National Lab**

Livermore, CA

HIGH ENERGY DENSITY PHYSICS INTERN

Summer 2012

Integrated new visualizations into a massively parallel multiphysics codebase.

**Johns Hopkins University Applied Physics Lab**

Laurel, MD

NASA RESEARCH INTERN

Summer 2011

Mentor: Mikhail Sitnov. Developed an empirical computer model of the terrestrial magnetosphere synthesizing first-principle techniques and data analytics.

# Publications

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- [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) 39 (6) 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) 38 (4) 2019
- [4] **The Vector Heat Method**  
Nicholas Sharp, Yousuf Soliman, and Keenan Crane  
ACM TRANSACTIONS ON GRAPHICS (SIGGRAPH) 38 (4) 2019
- [3] **Variational Surface Cutting**  
Nicholas Sharp and Keenan Crane  
ACM TRANSACTIONS ON GRAPHICS (SIGGRAPH) 37 (4) 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

# Talks

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<b>Robust and Reliable Geometry Processing</b> SUMMER GEOMETRY INITIATIVE TUTORIALS (2022)	(virtual) July 2021
<b>Geometric Perspectives on 3D Deep Learning</b> GOOGLE BRAIN	Toronto, ON (virtual) Feb 2022
<b>Robust and Reliable Geometry Processing</b> STAG GRADUATE SCHOOL (2021)	(virtual) Oct 2021
<b>Geometry Processing with Intrinsic Triangulations</b> ACM SIGGRAPH COURSES (SIGGRAPH 2021)	(virtual) Aug 2021
<b>Geometry Processing with Intrinsic Triangulations</b> INTERNATIONAL MESHING ROUNDTABLE COURSES (IMR 2021)	(virtual) June 2021
<b>Intrinsic Triangulations in Geometry Processing</b> UCSD VISUAL COMPUTING SEMINAR	San Diego, CA (virtual) Apr 2021
<b>Intrinsic Triangulations in Geometry Processing</b> GAMES SEMINAR	China (virtual) Mar 2021
<b>Robustness in Geometry Processing: from Laplacians to Learning</b> NVIDIA AI	Toronto, ON (virtual) Feb 2021
<b>You Can Find Geodesic Paths in Triangle Meshes by Just Flipping Edges</b> ACM SIGGRAPH ASIA 2020	Daegu, South Korea (virtual) Nov 2020
<b>Intrinsic Triangulations in Geometry Processing</b> GEOMETRIC COMPUTATION GROUP, STANFORD	Stanford, CA (virtual) Nov 2020
<b>Intrinsic Triangulations in Geometry Processing</b> ADOBE RESEARCH	San Jose, CA (virtual) Nov 2020
<b>Intrinsic Triangulations in Geometry Processing</b> TORONTO GEOMETRY COLLOQUIUM	Toronto, ON (virtual) Oct 2020
<b>A Laplacian for Nonmanifold Triangle Meshes</b> SGP 2020	Utrecht, NL (virtual) July 2020
<b>Geometric Computing with geometry-central</b> SGP 2020 GRADUATE SCHOOL	Utrecht, NL (virtual) July 2020
<b>Robust Geometry Processing and Nonmanifold Laplacians</b> GRAPHICS SEMINAR, MIT	Cambridge, MA (virtual) July 2020
<b>Intrinsic Triangulations in Geometry Processing</b> STREAM GROUP, LIX, ÉCOLE POLYTECHNIQUE	Paris, France Oct 2019

**Navigating Intrinsic Triangulations**  
ACM SIGGRAPH 2019

Los Angeles, CA  
Aug 2019

**The Vector Heat Method**  
ACM SIGGRAPH 2019

Los Angeles, CA  
Aug 2019

**Variational Surface Cutting**  
IST AUSTRIA

Klosterneuburg, Austria  
June 2018

**Variational Surface Cutting**  
ACM SIGGRAPH 2018

Vancouver, BC  
Aug 2018

**Machine Learning Models for Terrestrial Space Weather Forecasting**  
SIAM ANNUAL MEETING

Chicago, IL  
July 2014

**Optimal Control in Time-Varying Velocity Fields using Alpha Hulls**  
SIAM ANNUAL MEETING

Chicago, IL  
July 2014

## Awards

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- 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 **Best Project Pitch** CMU Graphics Seminar
- 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

## Service

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	SIGGRAPH (2020-2022), SIGGRAPH Asia (2021-2022), Transactions on Graphics (2021), Symposium on Geometry Processing (IPC, 2021-2022), Pacific Graphics (PC 2022, 2020), SMI (PC, 2022), Eurographics (2018,2019), TVCG (2021), CGTA (2019), Graphics Interface (2020), Eurographics Short Papers (2020), Computers and Graphics (2021-2022), SGP Software and Dataset Awards (2021)
<b>Reviewer</b>	
<b>Teaching</b>	Graduate TA at CMU 15-462 Computer Graphics 15-869 Discrete Differential Geometry
<b>Departmental</b>	Student Member, Doctoral Review Committee Organizer, PhD Admissions Open House Organizer, Random Distance Run
<b>Project Leader</b>	Summer Geometry Institute (2021,2022)
<b>Mentor</b>	CMU Graduate Application Support Program (2020) SIGGRAPH RDRC Graduate Application Mentorship Program (2021 x2)
<b>Problem Author</b>	ACM Inter-Collegiate Programming Contest (ICPC), 2017 & 2018
<b>Organizer</b>	Virginia High School Programming Contest, 2015

## Software

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

### **Polyscope - (SGP Software Award winner, 2022)**

Easy 3D visualization of meshes, point clouds, etc. in C++ & Python. Enables engineers, artists, and researchers to create useful, interactive visualizations with < 5 lines of code.

[polyscope.run](#)

### **geometry-central**

A modern C++ library of data structures and algorithms for geometry processing, with a particular focus on surface meshes.

[geometry-central.net](#)

### **hapPLY**

A header-only C++ reader/writer for .ply file format. Parse .ply happily!

[github.com/nmwsharp/happly](#)

## Skills

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**Programming** C++, **Python**, Java,  $\text{\LaTeX}$ , MATLAB

**Technologies** PyTorch, OpenGL, Eigen, CMake

**Tools** Unix/Linux, VIM, Blender, Adobe Illustrator & Photoshop

## Personal

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**Cooking** [www.nmwsharp.com/recipes](http://www.nmwsharp.com/recipes)

**Baking** ciabatta, focaccia, pretzels, sourdough

**Long Distance Running** 2014 Hokie Half, 2017 Baltimore Marathon, 2019 Pittsburgh Half