Nicholas Sharp

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Education

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

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

[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) 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

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

Awards

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

Invited Talks and Tutorials

* denotes talks delivered virtually

Spelunking the Deep: Guaranteed Queries on General Neural Implicit Surfaces via Range Analysis
Oct 2022 IEEE Vis Invited Talks — Oklahoma City, OK*
Aug 2022 SIGGRAPH 2022 — Vancouver, BC

DiffusionNet: Discretization Agnostic Learning on Surfaces
Aug 2022 SIGGRAPH 2022 — Vancouver, BC

Robust and Reliable Geometry Processing
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 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

Service

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

Skills

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

Personal

Cooking	www.nmwsharp.com/recipes
Baking	ciabatta, focaccia, pretzels, sourdough
Long Distance Running	2014 Hokie Half, 2017 Baltimore Marathon, 2019 Pittsburgh Half