

Davis Rempe

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Research Interests

3D Computer Vision; Machine Learning; Dynamic Objects & Humans; Physical Scene Understanding; Computer Graphics.

Education

2017–Present **Ph.D. Computer Science**, *Stanford University*, Stanford, CA.
Advisor: Prof. Leonidas Guibas

2012–2016 **B.S. Computer Science, Mathematics**, *University of Nebraska*, Lincoln, NE.
with Highest Distinction
Minor: Physics
Thesis: Effectiveness of Global, Low-Degree Polynomial Transformations for GCxGC Data Alignment

Research Experience

Sep. 2017– **Graduate Research Assistant**, *Stanford University*, Stanford, CA.

Present Advisor: Prof. Leonidas Guibas

- Working on 3D vision and machine learning problems dealing with dynamic objects, humans, and scenes from point clouds, videos, and images. Past and current projects include learning dynamic point cloud representations, predicting future dynamics of 3D objects from point clouds, 3D human motion reconstruction, and multiview shape reconstruction.

June 2021 – **Research Scientist Intern**, *NVIDIA*, Toronto, Canada (Remote).

Present Working with the Toronto AI lab on learning motion models of traffic.

June – Nov. **Computer Vision Research Intern**, *Adobe*, San Jose, CA.

2019 Working on physically-plausible 3D human motion estimation from video through learned foot contact detection and physics-based trajectory optimization. Resulted in *spotlight* paper at ECCV 2020.

June – Sep. **Research Intern**, *Snap Inc.*, Venice, CA.

2018 Implemented deformable simulation methods and investigated improving cloth simulation using machine learning.

Aug. 2016– **Research and Development Intern**, *GC Image*, Lincoln, NE.

July 2017 Developed algorithms for peak detection and deconvolution in gas chromatography data.

May – July **Smart Spaces Research Experience for Undergraduates (REU)**, *Lehigh University*, Bethlehem, PA.

Advisor: Prof. Brian Chen

- Explored inexpensive augmented reality systems for 3D bone model visualization during surgery.

June 2015– **Undergraduate Researcher**, *University of Nebraska*, Lincoln, NE.

May 2016 Advisor: Prof. Stephen Reichenbach

- Developed data alignment algorithms for comprehensive two-dimensional gas chromatography.

- Jan. 2013– **Undergraduate Researcher**, *University of Nebraska*, Lincoln, NE.
May 2014 Advisor: Prof. Aaron Dominguez
◦ Characterized and programmed the construction of particle detector chips for CERN.

Publications

Peer-reviewed Conference and Journal Papers

- [1] A. Kashefi, **D. Rempe**, and L. Guibas. A point-cloud deep learning framework for prediction of fluid flow fields on irregular geometries. *Physics of Fluids*, 33(2):027104, 2021.
 - [2] **D. Rempe**, T. Birdal, A. Hertzmann, J. Yang, S. Sridhar, and L. Guibas. HuMoR: 3D Human Motion Model for Robust Pose Estimation. *International Conference on Computer Vision (ICCV)*, [Oral], 2021.
 - [3] **D. Rempe**, T. Birdal, Y. Zhao, Z. Gojcic, S. Sridhar, and L. Guibas. CaSPR: Learning Canonical Spatiotemporal Point Cloud Representations. *Advances in Neural Information Processing Systems (NeurIPS)*, [Spotlight], 2020.
 - [4] **D. Rempe**, L. Guibas, A. Hertzmann, B. Russell, R. Villegas, and J. Yang. Contact and Human Dynamics from Monocular Video. *European Conference on Computer Vision (ECCV)*, [Spotlight], 2020.
 - [5] **D. Rempe**, S. Sridhar, H. Wang, and L. Guibas. Predicting the Physical Dynamics of Unseen 3D Objects. *Winter Conference on Applications of Computer Vision (WACV)*, 2020.
 - [6] S. Sridhar, **D. Rempe**, J. Valentin, S. Bouaziz, and L. Guibas. Multiview Aggregation for Learning Category-Specific Shape Reconstruction. *Advances in Neural Information Processing Systems (NeurIPS)*, 2019.
 - [7] **D. Rempe**, S. Sridhar, H. Wang, and L. Guibas. Learning Generalizable Final-State Dynamics of 3D Rigid Objects. *CVPR Workshop on 3D Scene Understanding for Vision, Graphics, and Robotics*, 2019.
 - [8] **D. Rempe**, S.E. Reichenbach, Q. Tao, C. Cordero W.E. Rathbun, and C.A. Zini. Effectiveness of Global, Low-Degree Polynomial Transformations for GCxGC Data Alignment. *Analytical Chemistry*, 2016.
 - [9] S.E. Reichenbach, **D. Rempe**, Q. Tao, D. Bressanello, E. Liberto, C. Bicchi, S. Balducci, and C. Cordero. Alignment for Comprehensive Two-Dimensional Gas Chromatography with Dual Secondary Columns and Detectors. *Analytical Chemistry*, 2015.
- ### Invited Talks and Lectures
- [10] Modeling 3D Human Motion for Improved Pose Estimation. *Invited Talk, Perceiving Systems Group, Max Planck Institute for Intelligent Systems*, July 2021.
 - [11] Learned Models of Motion for Understanding Dynamic 3D Objects and Humans. *Invited Talk, Toronto AI Lab, NVIDIA*, June 2021.
 - [12] Deep Nets, Multi-View and Volumetric Approaches to 3D. *CS233 Guest Lecture, Stanford University*, May 2021.
 - [13] CaSPR: Learning Canonical Spatiotemporal Point Cloud Representations. *Invited Talk, Computer Graphics and Visualization Colloquium, TU Delft*, June 2020.

- [14] Learning an Object-Centric Spatio-Temporal Representation for Dynamic Point Clouds. *Invited Talk, Graphics Cafe, Stanford University, April 2020.*

Teaching Experience

- Spring 2021 **CS233 Teaching Assistant**, *Stanford University*, Stanford, CA.
- Geometric and Topological Data Analysis
 - Held two office hours sessions per week and graded all homeworks and midterm exam.
 - Presented lecture introducing deep learning overall and multi-view and volumetric 3D deep learning approaches.
- Spring 2016 **CSCE 310H Teaching Assistant**, *University of Nebraska*, Lincoln, NE.
- Honors Data Structures and Algorithms
- Fall 2014–
Spring 2016 **Coding Seminar Organizer and Instructor**, *Society of Physics Students*, Lincoln, NE.
- Led a weekly class for undergraduate physics majors to learn programming concepts with C++.

Achievements and Awards

- 2019 **NSF Graduate Research Fellowship Honorable Mention.**
- 2016 **Smart Spaces REU Outstanding Project**, *Lehigh University*.
- 2015-2016 **Undergraduate Creative Activities and Research Experience (UCARE) Funding**,
2013-2014 *University of Nebraska*.
- 2016 **Eunice Stout Scholarship**, *University of Nebraska*.
- 2013–2016 **D&F Eastman Scholarship**, *University of Nebraska*.
- 2012–2016 **Regents Scholarship**, *University of Nebraska*.
- 2013–2016 **High Scholar**, *University of Nebraska*.
- Spring 2013 **Arts and Sciences Celebration of Excellence for Academic Achievement**, *University of Nebraska*.

Professional Experience

- Aug. 2014–
Aug. 2015 **Software Development Intern**, *GC Image*, Lincoln, NE.
- Developed and maintained scientific software for visualizing and analyzing comprehensive two-dimensional gas and liquid chromatography data.

Service

- Volunteer Stanford CS Undergraduate Mentor (2020-2021), Stanford CS230 (Deep Learning) Project Mentor (Fall, 2020)
- Reviewer IJCV (2021-), TPAMI(2021-), NeurIPS (2020, 2021), ICCV (2021), ICLR (2021), CVPR (2020), Eurographics (2020)
- Committees Stanford CS PhD Admissions (2019)

Technical Skills

- Languages *Experienced:* Python *Familiar:* C++, MATLAB, Java, C#
- Libraries PyTorch, TensorFlow, Bullet Physics
- Cloud AWS (EC2, EFS, S3)
- Software Git, Blender, Unity, Visual Studio Code, vim, Adobe Premiere Pro and After Effects
- OS Linux (Ubuntu), Microsoft Windows, macOS

Membership

2012–2016 **Honors Program**, *University of Nebraska*.

- Required extra academic achievements to be fulfilled throughout undergraduate education, including 24 hours of honors classes and completion of senior thesis.

2012–2016 **Society of Physics Students**, *University of Nebraska*.

Secretary (2014 – 2016)

- Group of students passionate about physics and exploring the discipline further. Participated in many volunteering and scientific outreach opportunities.

2012–2016 **Math Club**, *University of Nebraska*.

2015– **Upsilon Pi Epsilon**, *International Computer Science Honor Society*.

2014– **Pi Mu Epsilon**, *National Mathematics Honor Society*.

2013– **Phi Eta Sigma**, *National Freshmen Honor Society*.

2013– **Alpha Lambda Delta**, *National Freshmen Honor Society*.

References

Available upon request.