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–Present **Graduate Research Assistant**, *Stanford University*, Stanford, CA.
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 – Nov. 2019 **Computer Vision Research Intern**, *Adobe*, San Jose, CA.
- Explored 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. 2018 **Research Intern**, *Snap Inc.*, Venice, CA.
- Implemented deformable simulation methods and investigated improving cloth simulation using machine learning.

Aug. 2016–July 2017 **Research and Development Intern**, *GC Image*, Lincoln, NE.
- Developed algorithms for peak detection and deconvolution in gas chromatography data.

May – July 2016 **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–May 2016 **Undergraduate Researcher**, *University of Nebraska*, Lincoln, NE.
Advisor: Prof. Stephen Reichenbach
- Developed data alignment algorithms for comprehensive two-dimensional gas chromatography.

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

Publications

Peer-reviewed Conference and Journal Papers

[1] **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**)*, 2020 [**Spotlight**].

[2] **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**)*, 2020 [**Spotlight**].

[3] **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.

[4] 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.

[5] **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.

[6] **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.

[7] 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

[8] CaSPR: Learning Canonical Spatiotemporal Point Cloud Representations. *Computer Graphics and Visualization Colloquium, TU Delft*, June 2020.

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

Other Demos and Presentations

[10] **D. Rempe**, M. Snyder, A. Pracht, T. Nguyen, M. Vostrez, Z. Zhao, and M.C. Vuran. A Cognitive Radio TV Prototype for Effective TV Spectrum Sharing. *IEEE International Symposium on Dynamic Spectrum Access Networks (**DySPAN**) Demo Session, Baltimore, MD, USA*, March 2017.

[11] S.E. Reichenbach, **D. Rempe**, Q. Tao, and C. Cordero. Simple models for second-column retention-time variability across peaks from GCxGC. *8th **Multidimensional Chromatography Workshop**, Toronto, ON, Canada*, January 2017.

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

Teaching Experience

Spring 2016 **Teaching Assistant**, *University of Nebraska*, Lincoln, NE.

- CSCE 310H - 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++

Service

Reviewer CVPR (2020), NeurIPS (2020), Eurographics (2020)

Committees Stanford CS PhD Admissions Committee (2019)

Technical Skills

Languages *Experienced:* Python, C++ *Familiar:* Java, C#, MATLAB

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.