

Davis Rempe

Research Interests

3D computer vision and machine learning with a focus on modeling motion to enable improved perception and synthesis of dynamic 3D humans, objects, and scenes.

Education

- 2017–Present **Ph.D. Computer Science**, *Stanford University*, Stanford, CA
Advisor: Prof. Leonidas Guibas
Thesis: Modeling Motion for Improved Understanding of Dynamic 3D Humans, Objects, and Scenes
- 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
 - Worked on several projects related to 3D vision and machine learning. Problems including motion prediction for humans, traffic, and 3D objects, human pose estimation, learning dynamic point cloud representations, and object tracking.
- June 2021 – Present **Research Scientist Intern**, *NVIDIA*, Toronto, Canada (Remote)
 - Working on realistic and controllable simulation of traffic and pedestrians.
- June – Nov. 2019 **Computer Vision Research Intern**, *Adobe*, San Jose, CA
 - Explored 3D human motion estimation from video through learned foot contact detection and physics-based trajectory optimization.
- June – Sep. 2018 **Research Intern**, *Snap Inc.*, Venice, CA
 - Implemented deformable simulation methods and improved cloth simulation using machine learning-based approaches.
- 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– **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] C. Stearns, **D. Rempe**, J. Li, R. Ambrus, S. Zakharov, V. Guizilini, Y. Yang, and L. Guibas. SpOT: Spatiotemporal Modeling for 3D Object Tracking. *European Conference on Computer Vision (ECCV)*, [Oral], 2022.
- [2] **D. Rempe**, J. Phillion, L. Guibas, S. Fidler, and O. Litany. Generating Useful Accident-Prone Driving Scenarios via a Learned Traffic Prior. *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022.
- [3] A. Kashafi, **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.
- [4] **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.
- [5] **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.
- [6] **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.
- [7] **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.
- [8] 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.
- [9] **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.
- [10] **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.
- [11] 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.

Preprints

- [12] B. Pan, **D. Rempe**, B. Shen, D. Paschalidou, K. Mo, Y. Yang, and L. Guibas. COPILOT: Human Collision Prediction and Localization from Multi-view Egocentric Videos. *In Submission*, 2022.

Invited Talks and Lectures

- [13] Visual Datasets. *CS233 Guest Lecture, Stanford University*, April 2022.
- [14] Modeling 3D Human Motion for Improved Pose Estimation. *Invited Talk, Perceiving Systems Group, Max Planck Institute for Intelligent Systems*, July 2021.
- [15] Learned Models of Motion for Understanding Dynamic 3D Objects and Humans. *Invited Talk, Toronto AI Lab, NVIDIA*, June 2021.
- [16] Deep Nets, Multi-View and Volumetric Approaches to 3D. *CS233 Guest Lecture, Stanford University*, May 2021.
- [17] CaSPR: Learning Canonical Spatiotemporal Point Cloud Representations. *Invited Talk, Computer Graphics and Visualization Colloquium, TU Delft*, June 2020.
- [18] Learning an Object-Centric Spatio-Temporal Representation for Dynamic Point Clouds. *Invited Talk, Graphics Cafe, Stanford University*, April 2020.

Patents and Patent Applications

- [19] J. Yang, **D. Rempe**, B. Russell, and A. Hertzmann. Motion model refinement based on contact analysis and optimization. *US11238634B2*.

Teaching Experience

- Spring 2021, **Teaching Assistant**, *Stanford University*, Stanford, CA
- Spring 2022
 - CS233: Geometric and Topological Data Analysis
 - Held two office hours sessions per week and graded all homeworks and midterm exam.
 - Presented lectures on datasets for vision and 3D deep learning.
- Spring 2016 **Teaching Assistant**, *University of Nebraska*, Lincoln, NE
 - CSCE 310H: Honors Data Structures and Algorithms
- Fall 2014–**Coding Seminar Organizer and Instructor**, *Society of Physics Students*, Lincoln, NE
- Spring 2016
 - Led a weekly class for undergraduate physics majors to learn programming concepts with C++.

Achievements and Awards

- 2022-2023 **NVIDIA Graduate Fellowship Recipient**
- 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*

Professional Experience

- Aug. 2014–**Software Development Intern**, *GC Image*, Lincoln, NE
- Aug. 2015
 - Developed scientific software for visualizing and analyzing 2D chromatography data.

Service

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