

LAHAV LIPSON

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EDUCATION

Princeton University: *Sept. 2019 – Present*
Ph.D. Candidate in Computer Science
Advisor: Jia Deng

Columbia University: *Sept. 2015 – May 2019*
B.S. in Computer Science.
GPA: 4.06 / 4.33 (top 5%)

AWARDS AND HONORS

Princeton SEAS Award for Excellence *Sept. 2023*
Qualcomm Innovation Fellowship finalist *May 2023*
Best Student Paper Award – *International Conference on 3D Vision (3DV)* *Oct. 2021*
- State-of-the-art stereo matching
Summa Cum Laude from Columbia University *May 2019*
Academic Excellence Award from Columbia, Department of Computer Science *May 2019*

PUBLICATIONS

Lahav Lipson, Jia Deng “Multi-SLAM with Differentiable Wide-Baseline Pose Optimization” *In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024.*

Alexander Raistrick, Lingjie Mei, Karhan Kaan Kayan, David Yan, Yiming Zuo, Beining Han, Hongyu Wen, Meenal Parakh, Stamatis Alexandropoulos, Lahav Lipson, Zeyu Ma, Jia Deng “Infinigen Indoors: Photorealistic Indoor Scenes using Procedural Generation” *In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024.*

Zeyu Ma, Alexander Raistrick, Lahav Lipson, Jia Deng. “View-Dependent Octree-based Mesh Extraction in Unbounded Scenes for Procedural Synthetic Data” *arXiv preprint arXiv:2312.08364, 2024.*

Lahav Lipson*, Alexander Raistrick*, Zeyu Ma*, Lingjie Mei, Mingzhe Wang, Yiming Zuo, Karhan Kayan, Hongyu Wen, Beining Han, Yihan Wang, Alejandro Newell, Hei Law, Ankit Goyal, Kaiyu Yang and Jia Deng. "Infinite Photorealistic Worlds using Procedural Generation." *In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023.*
(* Equal contribution)

Zachary Teed*, Lahav Lipson*, and Jia Deng. "Deep Patch Visual Odometry" *In Proceedings of the 2023 Conference on Neural Information Processing Systems (NeurIPS).*
(* Equal contribution)

Lahav Lipson, Zachary Teed, Ankit Goyal, and Jia Deng. "Coupled Iterative Refinement for 6D Multi-Object Pose Estimation." *In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2022.*

Lahav Lipson, Zachary Teed, and Jia Deng. "RAFT-Stereo: Multilevel recurrent field transforms for stereo matching." In *2021 International Conference on 3D Vision (3DV), 2021. (Best Student Paper Award)*

RESEARCH AREAS

Visual Odometry and SLAM

- Co-first authored "Deep Patch Visual Odometry (DPVO)" at NeurIPS 2023.
- First authored "Multi-Session SLAM using Wide-Baseline Optical Flow" as CVPR 2024
- Developed a new deep learning system for monocular Visual Odometry, and for monocular SLAM on multiple video streams.
- Matched the SOTA performance of the best alternative approach but using half the VRAM while running twice as fast.
- We outperform all prior work (classical or learned) in both accuracy and/or speed on standard benchmarks.
- Our DPVO method is accurate and robust while running at up to 5x real-time speeds on a single RTX-3090 GPU using only 4GB of VRAM.

Large Scale Synthetic Data Generation

- Co-First authored Infinigen at CVPR 2023, and authored Infinigen: Indoors.
- Developed an automatic dense-annotation system for Infinigen and its indoors follow-up. It uses the generated geometry and semantic tags to produce perfectly accurate dense ground-truth for each frame.
- The system provides automatic annotations for metric depth, surface-normals, occlusion boundaries, panoptic segmentation, optical flow, scene flow, camera pose, and material properties.
- Developed an automatic pipeline for large-scale deployment of Infinigen on a GPU cluster.

6D Object Pose

- Published "Coupled Iterative Refinement for 6D Multi-Object Pose Estimation" at CVPR 2022.
- Achieved state-of-the-art results among published methods on standard benchmarks.
- Co-Winner of the BOP Object Pose Challenge at ECCV 2022 and ICCV 2023
- We proposed an end-to-end pipeline for estimating 6-DOF object pose from a single image.
- We introduced a differentiable solver layer which jointly optimizes both pose and correspondence, enabling us to dynamically remove outliers to improve accuracy.
- Our method works with-or-without depth input, using one of two variants of our introduced solver layer.

Stereo Matching

- Published "RAFT-Stereo: Multilevel Recurrent Field Transforms for Stereo Matching" at 3DV 2021.
- State-of-the-art stereo depth accuracy across multiple real-world datasets with a novel network architecture.
- Our method is extremely memory efficient (inference on 6MP images on a 2080ti). A version of RAFT-Stereo can run in real-time.
- Our method uses multi-level recurrent updates to refine a high-resolution disparity-field between images.

WORK EXPERIENCE

Amazon Intern

June 2018 – Aug. 2018

Software Developer Engineer

- Designed and developed an AI-based product recommendation system as part of the Amazon Stores Team.

Teaching Assistant

2018, 2020 – 2021

Computer Vision (Princeton), Algorithms and Data Structures (Princeton), Computer Science Theory (Columbia)

- Wrote and/or graded assignments, held office hours and led precepts and discussions.