

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, Summa Cum Laude

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

Academic Excellence Award from Columbia, Department of Computer Science

May 2019

PUBLICATIONS

(first authorship bolded)

Lahav Lipson, Jia Deng, “Multi-Session SLAM with Differentiable Wide-Baseline Pose Optimization”, *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”, *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", *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", *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", *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", *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 with Differentiable Wide-Baseline Pose Optimization” at CVPR 2024
- Developed methods for monocular Visual Odometry and monocular SLAM on multiple video streams. Both designs are based on optimization guided neural iterations (deep network + differentiable optimization layer).
- Developed a visual odometry system with state-of-the-art accuracy and 2x faster inference than the best alternative approach, while requiring only half the memory. In absolute terms, we match the accuracy of DROID-VO while averaging 60-FPS with just 4GB of GPU memory.

Large Scale Synthetic Data Generation

- Co-First authored Infinigen at CVPR 2023, and co-developed Infinigen: Indoors at CVPR 2024.
- Developed a system for producing per-pixel ground-truth annotations for Infinigen and its indoors follow-up. It uses the generated geometry and semantics to create exact, dense labels for rendered images.
- Wrote GPU compute shaders to annotate per-pixel metric depth, surface-normals, occlusion boundaries, panoptic segmentation, and 3D motion fields for dynamic, non-rigid scenes (e.g., cloth, animals, fluids, etc.).
- 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
- Proposed an end-to-end pipeline for estimating 6-DOF object pose from a single RGB or RGBD image.
- Introduced a differentiable optimization layer for estimating object pose from 2D matches. This layer enables us to *indirectly* train a deep network for outlier rejection by supervising on the optimizer output.

Stereo Matching

- Published “RAFT-Stereo: Multilevel Recurrent Field Transforms for Stereo Matching” at 3DV 2021.
- Developed a method for stereo matching with state-of-the-art accuracy across multiple real-world datasets with a novel network architecture. Accurate stereo matching enables accurate metric depth from image pairs.
- Developed the first memory-efficient approach to accurate stereo matching. We were the first method capable of inference on 6-megapixel images with a 2080ti (among the 10 best prior work). A version of RAFT-Stereo can also run in real-time.

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 graded assignments, held office hours and led precepts and discussions.