



—PRINCETON—  
VISION & LEARNING LAB

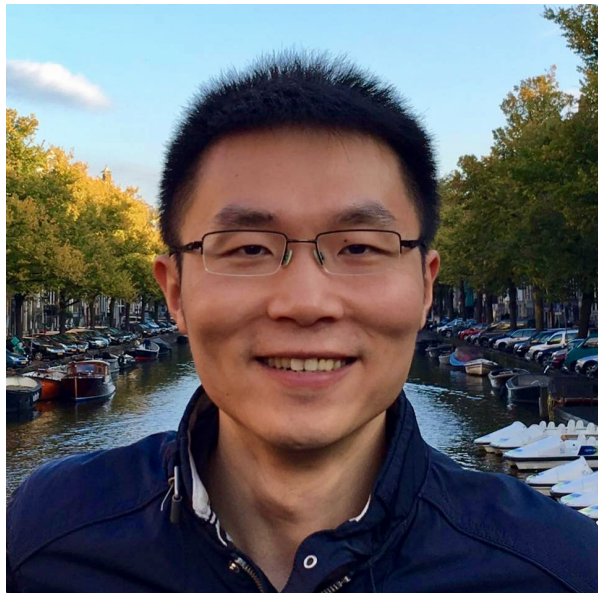
IARPA Video LINC S Proposers' Day Lightning Talk

Jia Deng

Princeton University

Feb 7, 2024

# PI: Jia Deng

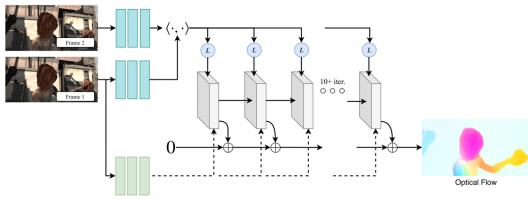


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- Princeton University
- [jiadeng@princeton.edu](mailto:jiadeng@princeton.edu)
- Lab: <https://pvl.cs.princeton.edu>

# Capability 1: 3D Reconstruction

- Optimization-inspired neural networks (neural + classical)
  - Recurrent neural networks + differentiable optimization layers
  - Large improvements over prior SOTA on many 3D vision tasks

## Optical Flow

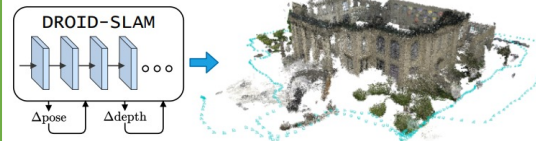


RAFT

- ECCV 2020
- 30-40% less error

**ECCV Best Paper**

## SLAM

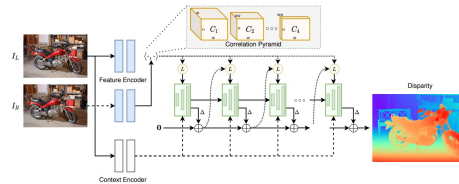


DROID-SLAM

- NeurIPS 2021
- 60-80% less error

**NeurIPS Oral**

## Stereo Depth

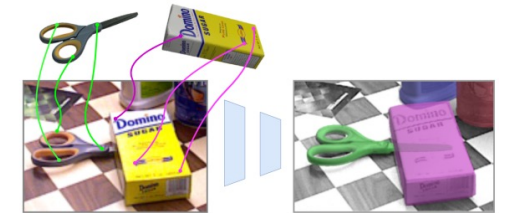


RAFT-Stereo

- 3DV 2021
- 30% less error

**3DV Best Student Paper**

## 6DoF Object Pose



Coupled Iterative Refinement

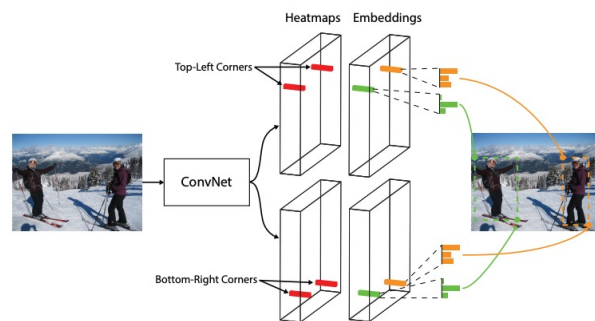
- ECCV 2022

**Co-Winner, BOP Challenge**

# Capability 2: Object Recognition

- Extensive experience in object recognition
- PI was first author of ImageNet

## Object Detection



### CornerNet

- ECCV 2018

Citations: 3978

## Human Pose

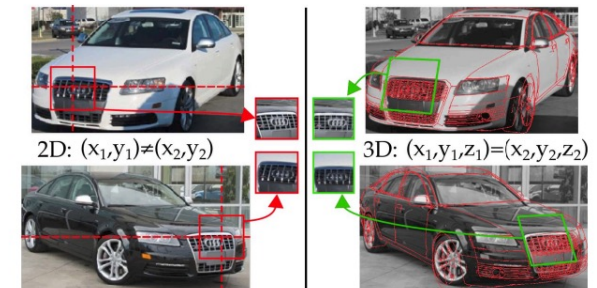


### Hourglass Networks

- ECCV 2016

Citations: 5818

## Vehicle Recognition



### Fine-grained vehicle recognition

- CVPR 2013 Workshop

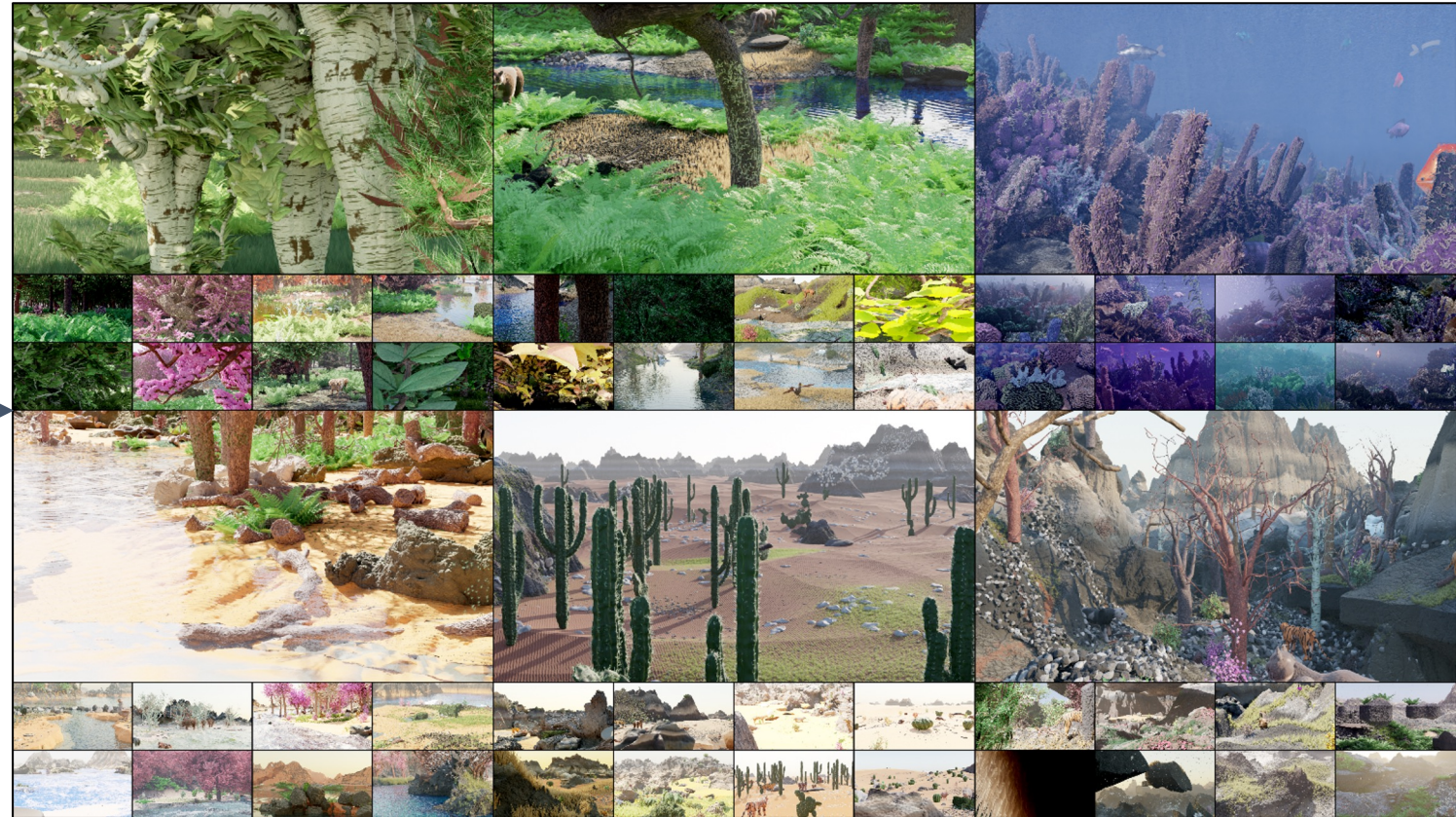
Citations: 3333

# Capability 3: Procedural Synthetic Data

- Infinigen: a procedural *generator* of infinite synthetic data (graphics-based)
  - CVPR 2023
  - [infinigen.org](http://infinigen.org)



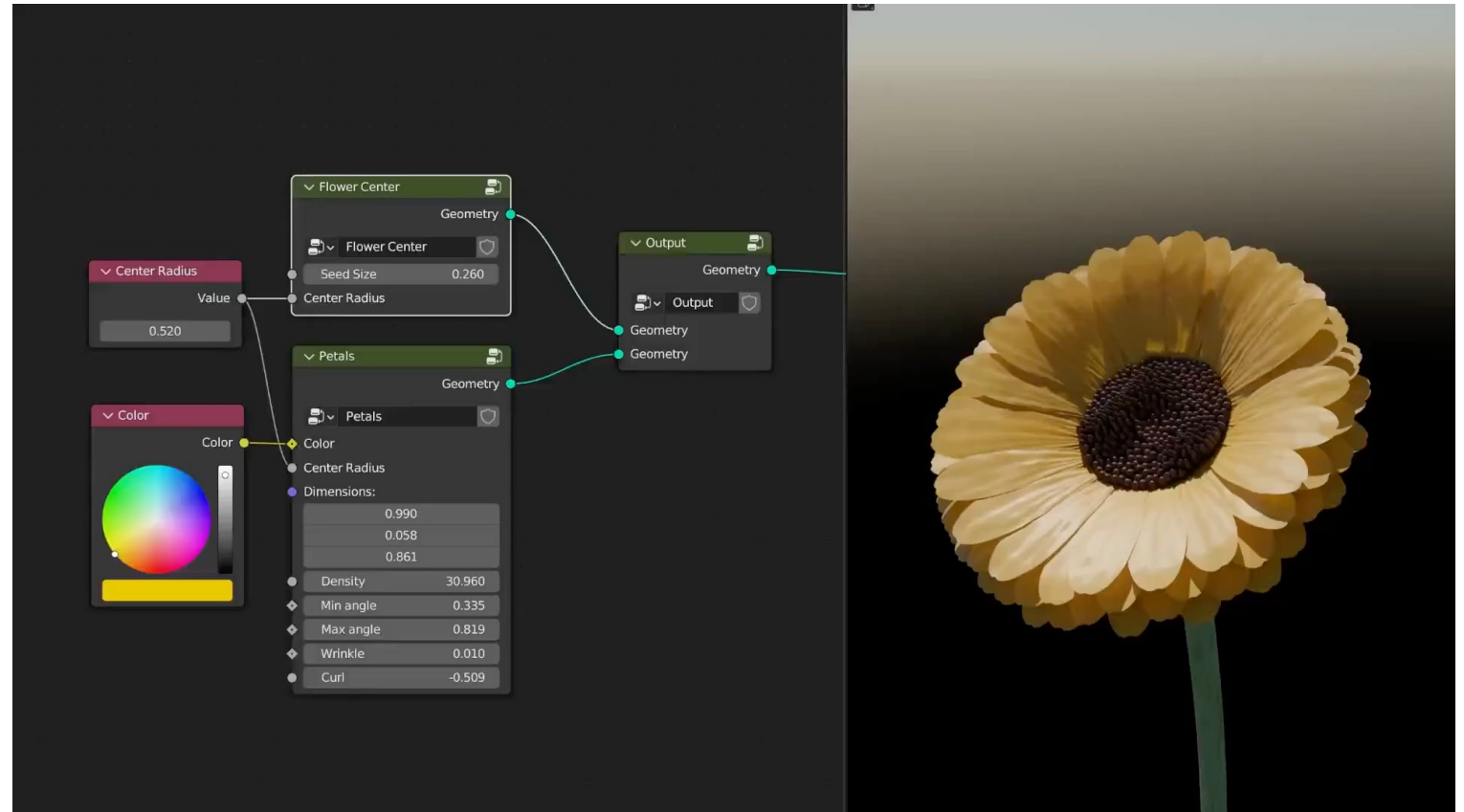
Random seeds +  
Optional user controls



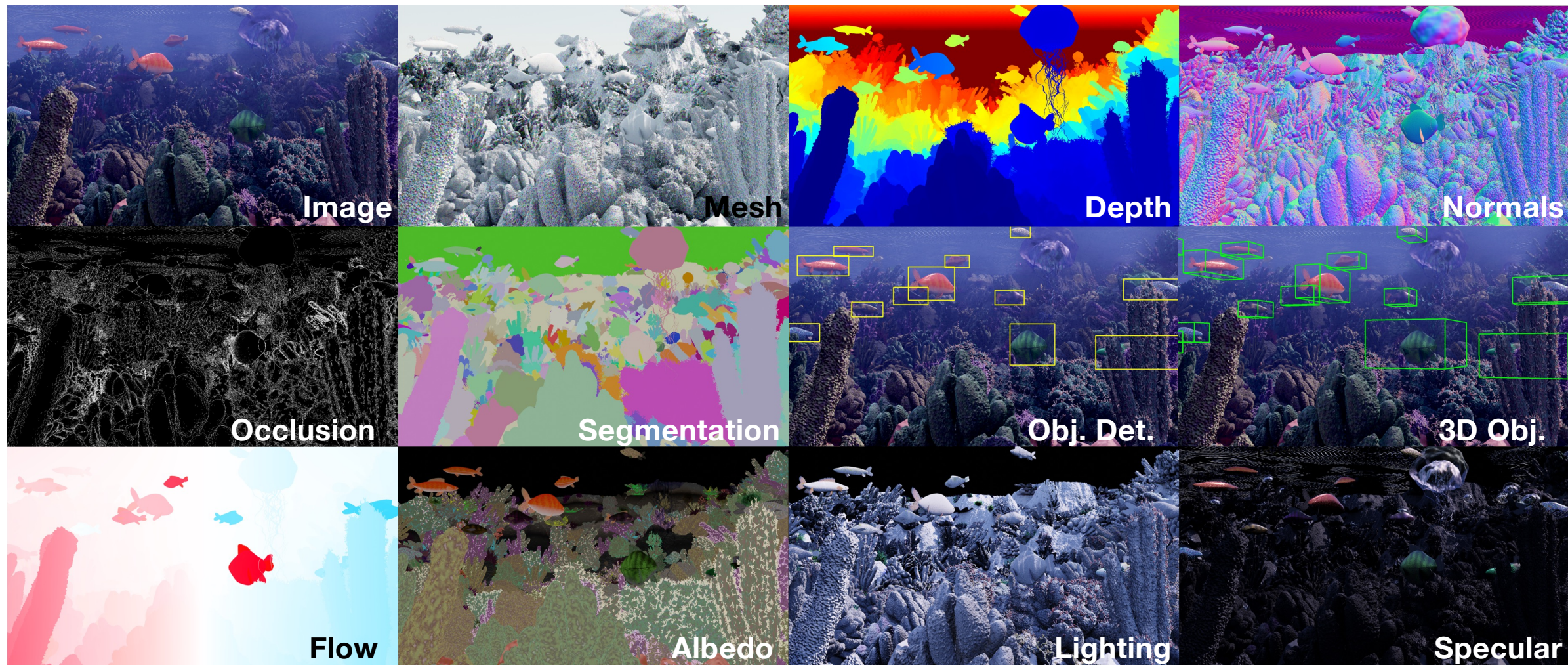
(Random sample of generated scenes)

# Infinigen is 100% Procedural

- Generated from scratch using randomized mathematical rules
- Everything (shape, texture, material, lighting, arrangement, animation) is procedural
- No external assets
- No AI



# Infinigen creates automatic labels



# Infinigen is free and open-source (BSD)



The screenshot shows the GitHub repository page for 'princeton-vl / infinigen'. The repository is public and titled 'Infinite Photorealistic Worlds using Procedural Generation'. It is licensed under BSD-3-Clause. The repository has 4.9k stars, 516 forks, and includes links to branches, tags, and activity.

 [princeton-vl / infinigen](#) Public

Infinite Photorealistic Worlds using Procedural Generation

 [infinigen.org](#)

 BSD-3-Clause license

 4.9k stars    516 forks    Branches    Tags    Activity

<https://github.com/princeton-vl/infinigen>



# Customizing Infinigen for Video LINC

- Data is often the bottleneck
- Infinite tailored synthetic data:
  - Custom procedural objects (e.g. vehicles) placed in diverse procedural scenes

