Ze Yang – Curriculum Vitæ

CONTACT INFORMATION

Department of Computer Science
University of Toronto
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Google Scholar Link

RESEARCH INTERESTS

My research interests focus on the intersection of 3D computer vision, robotics, and machine learning. In particular, I am dedicated to build *controllable* and *realistic* digital twins using *real-world* data, with the purpose of creating *immersive* virtual environments that facilitate the development and evaluation of robotic systems, such as self-driving vehicles, in a *safe*, *controlled*, *reactive*, and *cost-effective* manner. Towards this goal, I have delved into various areas over the past few years, such as *3D reconstruction* spanning from individual objects to large-scale scene, *3D modeling* encompassing both rigid and dynamic contents, and *closed-loop sensor simulation* for camera and LiDAR data. Crucially, I investigate these tasks not only in *controlled* environments but also in more challenging *in-the-wild* settings where the resulting models will be deployed. During the earlier stages of my research, I'm interested in learning *flexible* and *structural* representation for visual perception.

EDUCATION

University of Toronto
Department of Computer Science 2020/09 – Present
Ph.D., Supervisor: Raquel Urtasun
Committee: Sanja Fidler, Alec Jacobson, David Lindell

Peking University
School of Electronics Engineering and Computer Science (EECS) 2017/09 – 2020/06
M.Sc., Supervisor: Liwei Wang
Thesis: "Learning Representative Points for Visual Perception"
Thesis Defense Committee: Hongbin Zha, Jufu Feng, Gang Zeng, Chao Zhang

Xi'an Jiaotong University
Special Class for the Gifted Young
B.Eng., *Electrical Engineering and Automation* 2013/09 – 2017/06

PROFESSIONAL EXPERIENCE

Waabi Innovation, Toronto, ON, Canada
Senior Researcher 2023/09 – Present
Researcher II 2022/06 – 2023/09
Researcher 2021/03 – 2022/06
Working on next-generation sensor simulation for self-driving

Uber ATG, Toronto, ON, Canada
Research Scientist 2020/06 – 2021/02
Research Internship 2019/10 – 2020/06
Working on 3D reconstruction, modeling and simulation for self-driving

Microsoft Research Asia, Beijing, China
Research Internship 2018/12 – 2019/09
Working with Dr. Han Hu, Jifeng Dai, and Steve Lin on visual perception

Sinovation Ventures, Beijing, China
Research Internship 2017/06 – 2017/08
Working on unmanned convenience store project

National University of Singapore, Singapore
Research Internship 2016/09 – 2016/12
Working with Prof. Jiashi Feng and Shuicheng Yan on generative model

Peer-Reviewed Conference Publications

(*=equal contribution)

2023

C1 LightSim: Neural Lighting Simulation for Urban Scenes
Ava Pun*, Gary Sun*, Jingkang Wang*, Yun Chen, **Ze Yang**, Siva Manivasagam, Wei-Chiu Ma, Raquel Urtasun
In *Neural Information Processing Systems (NeurIPS)*, 2023

C2 Real-Time Neural Rasterization for Large Scenes
Jeffrey Yunfan Liu, Yun Chen*, **Ze Yang***, Jingkang Wang, Sivabalan Manivasagam, Raquel Urtasun
In *International Conference on Computer Vision (ICCV)*, 2023

C3 Towards Zero Domain Gap: A Comprehensive Study of Realistic LiDAR Simulation for Autonomy Testing
Sivabalan Manivasagam*, Ioan Andrei Bârsan*, Jingkang Wang, **Ze Yang**, Raquel Urtasun
In *International Conference on Computer Vision (ICCV)*, 2023

C4 UniSim: A Neural Closed-Loop Sensor Simulator
Ze Yang*, Yun Chen*, Jingkang Wang*, Siva Manivasagam*, Wei-Chiu Ma, Anqi Joyce Yang, Raquel Urtasun
In *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023 (Highlight)

C5 Reconstructing Objects in-the-wild for Realistic Sensor Simulation
Ze Yang, Siva Manivasagam, Yun Chen, Jingkang Wang, Rui Hu, Raquel Urtasun
In *International Conference on Robotics and Automation (ICRA)*, 2023

2022

C6 CADSim: Robust and Scalable in-the-wild 3D Reconstruction for Controllable Simulation
Jingkang Wang, Siva Manivasagam, Yun Chen, **Ze Yang**, Ioan Andrei Bârsan, Anqi Joyce Yang, Wei-Chiu Ma, Raquel Urtasun
In *Conference on Robot Learning (CoRL)*, 2022

C7 RBGNet: Ray-based Grouping for 3D Object Detection
Haiyang Wang, Shaoshuai Shi, **Ze Yang**, Rongyao Fang, Qi Qian, Hongsheng Li, Bernt Schiele, Liwei Wang
In *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022

2021

C8 S3: Neural Shape, Skeleton, and Skinning Fields for 3D Human Modeling
Ze Yang, Shenlong Wang, Siva Manivasagam, Zeng Huang, Wei-Chiu Ma, Xinchen Yan, Ersin Yumer, Raquel Urtasun
In *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021

2020

C9 Recovering and Simulating Pedestrians in the Wild
Ze Yang, Siva Manivasagam, Ming Liang, Bin Yang, Wei-Chiu Ma, Raquel Urtasun
In *Conference on Robotic Learning (CoRL)*, 2020 (Spotlight)

C10 Dense RepPoints: Representing Visual Objects with Dense Point Sets
Ze Yang*, Yinghao Xu*, Han Xue*, Zheng Zhang, Raquel Urtasun, Liwei Wang, Steve Lin, Han Hu
In *European Conference on Computer Vision (ECCV)*, 2020

2019

C11 RepPoints: Point Set Representation for Object Detection
Ze Yang*, Shaohui Liu*, Han Hu, Liwei Wang, Steve Lin
In *International Conference on Computer Vision (ICCV)*, 2019

C12 Learning Relationships for Multi-view 3D Object Recognition
Ze Yang, Liwei Wang
In *International Conference on Computer Vision (ICCV)*, 2019

2018 and before

C13 Learning to Navigate for Fine-grained Classification
Ze Yang, Tiange Luo, Dong Wang, Zhiqiang Hu, Jun Gao, Liwei Wang
In *European Conference on Computer Vision (ECCV)*, 2018

C14 Single Image Super-Resolution with a Parameter Economic Residual-Like Convolutional Neural Network
Ze Yang, Kai Zhang, Yudong Liang, Jinjun Wang
In *International Conference on Multimedia Modeling*, 2017 (Oral)

Preprints & Tech Reports

R1 On the Anomalous Generalization of GANs
Jinchen Xuan, Yunchang Yang, **Ze Yang**, Di He, Liwei Wang
arXiv preprint arXiv:1909.12638, 2019.

R2 Single Image Super-resolution via a Lightweight Residual Convolutional Neural Network
Yudong Liang, **Ze Yang**, Kai Zhang, Yihui He, Jinjun Wang, Nanning Zheng
arXiv preprint arXiv:1703.08173, 2017.

Patents

P1 Ava Pun, Gary Sun, Jingkang Wang, Yun Chen, **Ze Yang**, Sivabalan Manivasagam, Wei-Chiu Ma, Raquel Urtasun. Neural Lighting Simulation for Urban Scenes, *US Patent*, 2023.

P2 **Ze Yang**, Sivabalan Manivasagam, Yun Chen, Jingkang Wang, Raquel Urtasun. Real World Object Reconstruction and Representation, *US Patent*, 2023.

P3 Jeffrey Liu, Yun Chen, **Ze Yang**, Jingkang Wang, Sivabalan Manivasagam, Raquel Urtasun. Realistic Rendering in Real-time for Large Scenes, *US Patent*, 2023.

P4 **Ze Yang**, Yun Chen, Jingkang Wang, Sivabalan Manivasagam, Wei-Chiu Ma, Raquel Urtasun. UniSim: a Neural Closed-loop Sensor Simulator, *US Patent*, 2023.

P5 Ioan Andrei Bârsan, Yun Chen, Wei-Chiu Ma, Sivabalan Manivasagam, Raquel Urtasun, Jingkang Wang, **Ze Yang**. Three Dimensional Object Reconstruction for Sensor Simulation, *US Patent*, 2023.

P6 Ming Liang, Wei-Chiu Ma, Sivabalan Manivasagam, Raquel Urtasun, Bin Yang, **Ze Yang**. Systems and Methods for Simulating Dynamic Objects Based on Real World Data, US 17/388,372 A1, *US Patent*, 2022.

Teaching Assistant

University of Toronto
- CSC 490: Making Your Self-driving Car Perceive the World — 2021 Winter

Peking University
- EECS 04831210: Information Theory — 2018 Spring

Selected Awards

- May 4th Scholarship (Highest Honor Scholarship in Peking University) — 2019
- Merit Student, Peking University — 2019
- International 1st Place in TianChi AI Competition for Healthcare (lung nodule detection) — 2017

Professional Service

Journal Reviewer:

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
- IEEE Transactions on Multimedia (TMM)

Conference Reviewer:

- Conference on Computer Vision and Pattern Recognition (CVPR) 2020 – 2023
- International Conference on Computer Vision (ICCV) 2021 – 2023
- European Conference on Computer Vision (ECCV) 2022
- Conference on Neural Information Processing Systems (NeurIPS) 2023
- Asian Conference on Computer Vision (ACCV) 2020
- Winter Conference on Applications of Computer Vision (WACV) 2021 – 2024
- International Conference on Intelligent Robots and Systems (IROS) 2023

Open Source Softwares

- Learning to Navigate for Fine-grained Classification.
  GitHub: `https://github.com/yangze0930/NTS-Net`
- RepPoints: Point Set Representation for Object Detection.
  GitHub: `https://github.com/microsoft/RepPoints`
- Dense RepPoints: Representing Visual Objects with Dense Point Sets.
  GitHub: `https://github.com/justimyhxu/Dense-RepPoints`
- MMDetection (RepPoints).
  GitHub: `https://github.com/open-mmlab/mmdetection/tree/main/configs/reppoints`

Invited Talks

T1 Learning in-the-wild Sensor Simulation for Autonomous Driving
OpenDriveLab @ Shanghai AI Lab, Online 2023/07

T2 Learning in-the-wild Sensor Simulation for Autonomous Driving
Toronto Computational Imaging Group @ UofT, Toronto, ON, Canada 2023/07

T3 Learning 3D Reconstruction in the Wild for Realistic Sensor Simulation
ByteDance Research, Online 2022/10

T4 Learning Realistic Multi-modal Sensor Simulation from Real World for Autonomous Driving
Waabi, Toronto, ON, Canada 2022/08

T5 Deformable Asset Reconstruction and Animation for Sensor Simulation
CVPR21 Tutorial: All about Self-Driving, Online 2021/06

T6 Representing Objects as Point Sets for Visual Perception
Uber ATG, Toronto, ON, Canada 2019/11

T7 Learning Fine-grained Regions for Long-tail Visual Perception
Microsoft Research Asia, Beijing, China 2019/09

T8 Representing Objects as Point Sets for Visual Perception
Noah's Ark Lab, Shenzhen, China 2019/07

T9 Learning Representative Regions for Fine-grained Classification
Noah's Ark Lab, Shenzhen, China 2018/11

Mentorship and Support

Jeffrey Liu (University of Waterloo Undergrad & Waabi Internship)

- Working on *Neural Scene Rasterization* project

George Chen (University of Waterloo Undergrad & Waabi Internship)

- Working on *Neural Scene Calibration* project

Ava Pun (University of Waterloo Undergrad & Waabi Internship)
Gary Sun (University of Waterloo Undergrad & Waabi Internship)

- Working on *Neural Light Simulation* project

Haiyang Wang (Peking University Ph.D.)
- Working on *Ray-based Grouping for 3D Object Detection* project

Shengcao Cao (Peking University Undergrad)
- Working on *Video Object Detection* project

Jinchen Xuan (Peking University Undergrad)
- Working on *Anomalous Behaviour of GANs* project

MEDIA COVERAGE

- Introducing UniSim, one of the core groundbreaking technologies powering Waabi World. Waabi Blog. `[link]`. 2023/06.
- Getting a better visual: RepPoints detect objects with greater accuracy through flexible and adaptive object modeling. Microsoft Research Blog. `[link]`. 2019/10.