En Xu (Thomas) Li

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https://thomas-enxuli.github.io | Toronto, Canada

Research Interests

Autonomous Vehicle, Object Detection and Recognition, LiDAR Semantic and Instance Segmentaion, LiDAR Panoptic Tracking, Motion Prediction, Point Cloud Semi-supervised and Unsupervised Learning, 2D and 3D Scene Understanding, Video Understanding

Education

Sep 2022 – Present
Doctor of Philosophy in Computer Science, University of Toronto
Supervisor: Prof. Raquel Urtasun

Sep 2017 – Apr 2022
Bachelor of Applied Science in Engineering Science with High Honours, University of Toronto
Robotics Major, Artificial Intelligence Minor, Engineering Business Certificate
Major GPA: 3.99/4.00, cGPA: 3.87/4.00
Thesis: "4D Panoptic LiDAR Segmentation for Autonomous Driving"
Supervisor: Prof. Steven Waslander
University of Toronto Scholar, NSERC Undergrad Student Research Award, Daisy Intelligence Scholarship, W. S. Wilson Medal, Dean's Honour List

Experience

Aug 2022 - Present
Waabi Innovation Inc. | Full-time Research Scientist
Supervised by Prof. Raquel Urtasun, Perception Team

May 2020 - Aug 2021
Noah's Ark Lab, Huawei Canada | Research Intern
Supervised by Dr. Bingbing Liu, Cognitive IoV Perception Team

- Built a custom PyTorch training pipeline for panoptic segmentation with LiDAR inputs
- Led a research project on real-time deployable panoptic segmentation networks using LiDAR point cloud as inputs. First author of *CPSeg* and *SMAC-Seg*, state-of-the-art methods on SemanticKITTI panoptic segmentation benchmarks. Three Patents pending (as the main inventor), two paper (as the leading author) under review
- Designed and supported the development of high-performance perception models. Co-author of *AF2-S3net* (accepted at *CVPR 2021*) and *GP-S3net* (accepted at *ICCV 2021*). The two models are top ranked on SemanticKITTI and nuScenes semantic segmentation and panoptic segmentation challenges upon publication

May 2019 - Aug 2019
Department of ECE, University of Toronto | Summer Student Researcher
Supervised by Prof. Roman Genov, Intelligent Sensory Microsystems Laboratory

- Designed FSMs and Programmed the FPGA board (Opal Kelly XEM7310) to control 3D imaging cameras with CMOS sensors using Verilog and Python
- Refined the PC-FPGA communication and memory interfacing to allow faster data process by replacing sequential read/write to all-freedom DDR3 memory address mapping

Honors

2022
W.S. Wilson Medal

- Awarded for being the top-ranked engineering science student in the 4th year

2020 **Daisy Intelligence Scholarship**
- Awarded for being the top-ranked robotics engineering student in the 3rd year

2019 **NSERC USRA**
- Undergraduate Student Research Award by Natural Sciences and Engineering Research Council of Canada (NSERC)

ESROP-U of T Fellowship [*declined*]
- Awarded by Engineering Science Research Opportunities Program to pursue a paid summer research internship at University of Toronto

ESROP-Global Fellowship [*declined*]
- Awarded by Engineering Science Research Opportunities Program to pursue a paid summer research internship at National University of Singapore

2017 **University of Toronto Scholar**
The Murray Calder Hendry Scholarship

Publications

2022 [1] **E. Li**, R. Razani, Y. Xu, B. Liu, "SMAC-Seg: LiDAR Panoptic Segmentation via Sparse Multi-directional Clustering," **ICRA** 2022.

2021 [1] R. Razani*, R. Cheng*, **E. Li**, E. Tagahvi, Y. Ren, B. Liu, "GP-S3Net: Graph-based Panoptic Sparse Semantic Segmentation Network," **ICCV** 2021
[2] R. Cheng, R. Razani, E. Tagahvi, **E. Li**, B. Liu, "$(AF)^2$-S3Net: Attentive Feature Fusion with Adaptive Feature Selection for Sparse Semantic Segmentation Network," **CVPR** 2021

Preprints Under Review

2021 [1] **E. Li**, R. Razani, Y. Xu, B. Liu, "CPSeg: Cluster-free Panoptic Segmentation Network of LiDAR Point Clouds," *arXiv preprint arXiv:2111.01723*, 2021.

Patents

2021 [1] **E. Li**, R. Razani, Y. Ren, B. Liu, "Methods and Systems for Deterministic Calculation of Surface Normal Vectors for Sparse Point Clouds," *US Patent Application No. 63/242,000*
[2] **E. Li**, R. Razani, B. Liu, "System and Method for Panoptic Segmentation System of Point Clouds," *US Patent Application No. 63/238,759*
[3] **E. Li**, R. Razani, B. Liu, "System and Method for Proposal-free and Cluster-free Panoptic Segmentation System of Point Clouds," *US Patent Application No. 63/241,986*