Tianshu Kuai

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Education

Sep 2022 – 2024 | **Master of Science in Applied Computing, University of Toronto**
AI Concentration

Sep 2017 – Apr 2022 | **Bachelor of Applied Science in Engineering Science, University of Toronto**
Robotics Major, Artificial Intelligence Minor
Major GPA: *3.80 / 4.00*, cGPA: *3.73 / 4.00*
University of Toronto Excellence Award, NSERC Undergraduate Student Research Awards, Dean's Honour List

Experience

May 2022 - Ongoing | **University of Toronto** | 3D Computer Vision Researcher
Supervised by Prof. Igor Gilitschenski, Toronto Intelligent Systems Lab (TISL)
- Working on building neural representations for editable 3D objects and scenes
- Recently proposed a template-free method [3] for building animatable 3D models for arbitrary types of articulated and deformable objects from a collection of monocular videos, which allows users to animate reconstructed objects in 3D for content creation

May 2021 - Ongoing | **University of Toronto** | Computer Vision Researcher
Supervised by Prof. Steven L. Waslander, Toronto Robotics and Artificial Intelligence Lab (TRAILab)
- Working on self-supervised LiDAR semantic segmentation for autonomous driving, and contributed to the development of a novel method [2] that outperforms state-of-the-art 2D-to-3D representation learning frameworks
- Designed and supported the development of high-performance LiDAR 3D object detection models for autonomous vehicles. PDV [1] achieved state-of-the-art multi-class 3D object detection results on Waymo Open Dataset upon publication
- Undergraduate thesis on improving feature learning processes to get more robust features and more accurate bounding box refinement for 3D object detectors

July 2021 - June 2022 | **aUToronto** | Computer Vision Engineer
University of Toronto Autonomous Driving Group, SAE/GM AutoDrive Challenge
- Research on fast and lightweight 3D perception models on collected data
- Worked on deploying real-time perception models on autonomous vehicles

May 2020 - May 2021 | **Qualcomm** | Machine Learning Research Intern
Supervised by Dr. Shaojie Zhuo, Machine Learning Research Team
- Proposed several efficient deep learning models for audio processing
- Applied state-of-the-art methods for neural network compression
- Contributed to NPU software compiler pipeline development

May 2019 - Aug 2019 | **University of Toronto** | Undergraduate Researcher
Supervised by Prof. Deepa Kundur, Department of Electrical and Computer Engineering
- Implemented machine learning models for early relapse detection in Youth Depression
- Worked on patients' data processing and imputations for missing data
- Developed pipeline to track patients' facial expressions for behaviour analysis

Publications

2022

[3] **T. Kuai**, A. Karthikeyan, Y. Kant, A. Mirzaei, and I. Gilitschenski, "CAMM: Building Category-agnostic and Animatable 3D Models from Monocular Videos," ***Under Review,*** 2022.

[2] A. Mahmoud, J. S. K. Hu, **T. Kuai**, A. Harakeh, L. Paull, and S. L. Waslander, "Self-Supervised Image-to-Point Distillation via Semantically Tolerant Contrastive Loss," ***Under Review,*** 2022.

[1] J. S. K. Hu, **T. Kuai**, and S. L. Waslander, "Point Density-Aware Voxels for LiDAR 3D Object Detection," ***CVPR*** 2022.

Honors

Jan 2020 | **University of Toronto Engineering Competition**
- Awarded the second prize in the senior design competition

Mar 2019 | **NSERC Undergraduate Student Research Awards**
- Undergraduate student research awards by Natural Sciences and Engineering Research Council of Canada (NSERC)

Feb 2019 | **University of Toronto Excellence Award**
- Awarded to University of Toronto undergraduate students based on research aptitude

Sep 2017 | **University of Toronto Engineering Entrance Scholarship**
- Scholarship for top engineering candidates pursuing studies at the University of Toronto

Selected Projects

2021 | **Real Time Audio Denoiser**
- A model built using convolutional neural networks with an encoder-decoder structure
- The model takes the noisy speech as input and produces a de-noised speech as the output
- Achieved good performance on various types of signals with only around 33k parameters

2020 | **Deep Learning Based COVID-19 Diagnosis Tool**
- A finetuned ResNet-18 for COVID-19 diagnosis using Lung CT scan
- Finetuned U-Net for labelling the infection area on raw CT scans for COVID-19 patients
- Great potential to be a commercial software product for hospitals where COVID-19 testing kits are unavailable

2019 | **Autonomous Ball Dispensing Mobile Machine**
- Started from literature and market survey, through professional engineering decision-making tools to successfully converge to a fully autonomous ball dispensing machine prototype
- Used PIC18F4620 with MPLAB X and Arduino Nano to enable movement of its components, real-time clock, user Interface, and IR Remote Control
- Can potentially be used for automatic delivery and dispensing in warehouses

Skills

Languages | (*Proficient*) Python, C/C++, MATLAB, LaTeX - (*Working*) PostgreSQL, Bash, Java, Verilog

Tools | Git, Linux, Unix, Docker, Anaconda, AutoCAD, OpenFace, OrCAD Pspice

Libraries | Pytorch, TensorFlow, TensorFlow Lite, ONNX, ROS, OpenCV, SciPy, Scikit-learn, Pandas