Tianshu Kuai

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Education

- **B.A.Sc in Engineering Science, University of Toronto**
- **Robotics Major, Artificial Intelligence Minor**
- September 2017 – April 2022
- Cumulative GPA: 3.77
- Dean's Honours List for all academic semesters, 2017 - 2021

Research Experiences

University of Toronto | Undergraduate Researcher **May 2021 – Present**

Supervised by Prof. Steven Waslander, Toronto Robotics + AI Lab (TRAILab)

- Thesis on improving feature learning processes for more robust feature extraction and more accurate bounding box refinement for 3D Object Detectors
- Research on LiDAR 3D Object Detection Methods [1]

University of Toronto & CAMH | Undergraduate Researcher **May 2019 – Sept 2019**

Supervised by Prof. Deepa Kundur, University of Toronto

- Developed Machine Learning Models for Early Relapse Detection in Youth Depression
- Worked on patients' data processing and imputations for missing data
- Developed preliminary pipeline to track patients' facial expressions for facial behaviour analysis

Professional Experiences

aUToronto | Computer Vision Engineer **July 2021 - Present**

University of Toronto Autonomous Driving Group, SAE/GM AutoDrive Challenge

- Research on fast and lightweight 3D perception algorithms and models
- Worked collaboratively on deploying real-time perception models on autonomous vehicles

Qualcomm | Machine Learning Research Intern **May 2020 – May 2021**

Machine Learning Research Team

- Research on efficient deep learning algorithms for Audio Processing
- Research on State-of-the-Art methods for Neural Network Compression
- Worked on NPU Software Compiler Pipeline Development

Publications

[1] Jordan S.K. Hu, **Tianshu Kuai**, Steven L. Waslander, "Point Density-Aware Voxels for LiDAR 3D Object Detection". CVPR 2022 [link to paper]

Projects

Deep Learning Based COVID-19 Diagnosis Tool

- A finetuned ResNet18 for COVID-19 diagnosis using Lung CT scan
- Finetuned U-net for labelling the infection area on raw CT scans for COVID-19 Positive patients
- Great potential to be a commercial software product for hospitals where COVID-19 Test Kits are unavailable

Real Time Audio Denoiser

- A model with a symmetric encoder-decoder architecture built using convolutional layers and skip connections
- Model takes in Short-Time Fourier Transform (STFT) of the noisy signal as input, and produces the clean signal's STFT, which can be converted back to waveform as the final output
- Achieved good performance on various types of noise while maintaining the number of parameters small (~33K)

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

New Timing System for Knife Throwing Club in Toronto

- Worked on designing the timing and displaying system for "STRYKE Target Range", a Sport Knife Throwing and Axe Throwing competition club
- With the implementation of the new system, the results are much more accurate and can be sent directly to the referee's phone through Bluetooth

Automated Chess Player

- This automated chess player can evaluate a given chess board and produce the best move
- Implemented using basic game theories

Honours / Awards

University of Toronto Engineering [K]Competition (UTEK) 2020
Awarded second prize in senior design competition of UTEK2020

University of Toronto Excellence Award 2019
Awarded to University of Toronto students based on research aptitude

NSERC Undergraduate Student Research Awards 2019
Awarded to undergraduate science and engineering students based on research aptitude

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Skills

Programming - Python, C/C++, MATLAB, Latex, PostgreSQL, Verilog, Assembly
Software Tools - Git, Linux/Unix, Anaconda, Docker, AutoCAD, OpenFace, OrCAD Pspice
Libraries - Pytorch, TensorFlow, TensorFlow Lite, ONNX, ROS, Numpy, Pandas