

## Education

---

### School of Information and Technology, Tsinghua University

Beijing, China

B.E. IN AUTOMATION

2014 - 2018

- GPA: 89.4/100. Rank: 13/135. Major GPA: 90.3/100

## Experience

---

### Deep Learning Research

Apr. 2017 - Present

Intel Labs. Advised by Dr. Anbang Yao

Beijing, China

- **[July 2017 - May 2018]** Proposed new training methods [1, 3] which enables the sharing of learned knowledge within a deep CNN model. Extensive experiments on CIFAR and ImageNet show the proposed method behaves as a strong regularizer and can boost the performance of CNN models without any extra computational cost at the inference phase. This method outperforms the baseline with a large margin (~ 2% on CIFAR, ~ 1% on ImageNet). One patent [3] was filed. This research is targeting to Intel large-scale DL Training.
- **[May 2018 - Present]** Extended [1, 3] to a new method [2] which can train a group of CNNs simultaneously and enable knowledge sharing among them. Preliminary experiments show this method works better than plain knowledge transfer among these CNN models.
- **[July 2018 - Present]** Focused on the application of Graph Neural Networks (GNNs) on 3D data. Specifically, we followed a previous work "Learning to Find Good Correspondences" and utilized GNN to recognize the outliers in the putative correspondences generated by a point cloud registration framework. We have achieved great results and are planning to submit a paper to ICCV.

### Extrinsic Calibration of a 3D Lidar and a Camera

July 2017 - Aug. 2017

School of Computing, National University of Singapore. Advised by Prof. Gim Hee Lee

Singapore

- Developed a software framework which implemented the mutual information method in a previous work.
- Improved the method by replacing MI (mutual information) of intensity with MI of depth. For every pixel, two depth values were generated by lidar and LSD-SLAM algorithm respectively.
- Calculated the analytical form of the derivatives based on a previous work about the differential of the mutual information to speed-up the process of optimization.

### A Lightweight Autonomous Vehicle Implementation

Mar. 2016 - June 2017

Tsinghua University

Beijing, China

- Developed a lightweight autonomous vehicle with GPS, cameras and Lidars. This car can repeat manually taught trajectories with GPS or SLAM.
- Developed a software stack (including controller, path planner and perceptual modules) based on Robot Operating System (ROS).
- Evaluated some traditional control theories and some learning-based control theories on this platform.
- A paper [4] was accepted by CVPR Scene Understanding Workshop 2017.

### Enabling Deep Learning on IoT Devices

Apr. 2017

PerceptIn Inc. Advised by Dr. Shaoshan Liu

Beijing, China

- Focused on the deployment of CNN models on mobile platforms with ARM CPUs.
- Implemented SqueezeNet with the ARM Compute Library which is highly optimized for ARM CPUs and takes the advantages of the SIMD feature.
- The performance of this implementation outperforms some off-the-shelf deep learning platforms like Tensorflow.
- A paper [5] was accepted by IEEE Computer.

### PerceptIn Cloud for Robots

Nov. 2016 - Jan. 2017

PerceptIn Inc. Advised by Dr. Shaoshan Liu

Beijing, China

- This system allows users to upload their videos and generate some tags for every video according to the objects appeared in it, and then users can retrieve their videos using object keywords. More details in this paper [8].
- Developed a storage subsystem using *Alluxio* to ensure high I/O performance.
- Developed an object detection subsystem using *faster-rcnn*.
- Developed an Android app to upload videos.
- Developed some web pages for searching and playing videos.

### Multilayer-Multiframe Compressive Light Field Displays Using LCDs

Jan. 2016 - Jan. 2017

Tsinghua University

Beijing, China

- This is a 3D display system. One paper [7] accepted by TVCG.
- Developed a hardware framework with LCDs.
- Developed a software framework to synchronize every LCD.

### Translation of "Programming Robots with ROS"

Jan. 2017 - Feb. 2017

Tsinghua University

Beijing, China

- We translated a famous ROS book, "Programming Robots with ROS: A Practical Introduction to the Robot Operating System", from English to Chinese.
- The Chinese edition was published. ISBN: 9787111585299.
- I translated ~ 30% of the book.

## Publications and Preprints

---

- [1] **D. Sun**, A. Yao et al. Deeply-Supervised Knowledge Synergy. Submitted to CVPR 2019.
- [2] **D. Sun**, A. Yao et al. Deeply Supervised Mutual Learning. Will be submitted to IJCAI 2019.
- [3] **D. Sun** and A. Yao, Dynamic Knowledge Injection and Synergy for Training Highly Accurate Deep Neural Networks. PCT/CN2018/096599, filing date July 25, 2018.
- [4] K. Wang, **D. Sun**, X. Ma, Z. Gu, and H. Zhao. Lessons learned from a lightweight autonomous vehicle implementation. In CVPR Scene Understanding Workshop 2017. [\[PDF\]](#) [\[Video\]](#)
- [5] J. Tang, **D. Sun**, S. Liu and J. Gaudiot, Enabling Deep Learning on IoT Devices. In Computer, vol. 50, no. 10, pp. 92-96, 2017. [\[Link\]](#)
- [6] **D. Sun**, S. Liu, and J. Gaudiot, Enabling embedded inference engine with ARM compute library: A case study. arXiv, abs/1704.03751, 2017. [\[PDF\]](#)
- [7] J. Zhang, Z. Fan, **D. Sun** and H. Liao, Unified Mathematical Model for Multilayer-Multiframe Compressive Light Field Displays Using LCDs. In IEEE Transactions on Visualization and Computer Graphics. [\[Link\]](#)
- [8] S. Liu, B. Ding, J. Tang, **D. Sun**, Z. Zhang, G. Tsai and J. Gaudiot, Learn-memorize-recall-reduce: A robotic cloud computing paradigm. arXiv, abs/1704.04712, 2017. [\[PDF\]](#)

## Awards

---

- 2015 1st Prize in Chinese College Student Physics Competition, China
- 2016 Academic Excellence Scholarship, Tsinghua University
- 2018 Intel Patent Recognition Award
- 2018 Excellent Undergraduate Thesis, Tsinghua University

## TECHNICAL STRENGTHS

---

- Programming Languages: C/C++, Python, Matlab, Java
- Deep Learning Software Stacks: PyTorch, Tensorflow, Caffe, MXNet
- Additional Skills: Linux, ROS, STM32 MCU, Altium Designer, SolidWorks,  $\text{\LaTeX}$