Chenghao Li

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EDUCATION

University of Southern California (Los Angeles, United States) 08/2022-05/2024(expected)
22 Fall Master Student
Major: **Electrical and Computer Engineering (Machine Learning and Data Science)** (GPA: **4.0/4.0**)
Core Courses: *Linear Algebra for Engineering, Probability for Electrical and Computer Engineers, Machine Learning I: Supervised Methods, A Computational Introduction to Deep Learning, Computing Principles for Electrical Engineers.*

Southern University of Science and Technology (Shenzhen, China) 09/2018-06/2022
Bachelor of Engineering (School of Microelectronics)
Major: **Microelectronics Science and Engineering** (GPA: **3.71/4.0**)
Core Courses: *Analog Circuits, Advanced Microelectronics Experiment, Signals and Systems, Introduction to VLSI Technology, Analog Integrated Circuit Design, Digital Image Processing, Data Structures and Algorithm Analysis etc.*

RESEARCH EXPERIENCES

Research on Memorization and Replication in Diffusion Models 06/2023-Present

- Investigating the underlying mechanisms and precipitating factors of **data replication** within **diffusion models**.
- Developing novel techniques to prevent data memorization and replication in diffusion models to mitigate risks associated with **training data leakage**.
- Constructing robust metrics to evaluate the trade-off between prompt generality and model memorization.

Research on Private Inference(PI)-friendly Visual Transformer Structure 01/2023-05/2023
Student Researcher, Professor Peter A. Beerel (University of Southern California)

- Built SAL-ViT to boost PI efficiency (maintain accuracy & reduce latency) on **ViT**s with **Pytorch**.
- Developed **learnable 2Quad (L2Q)** as the approximation of Softmax, which introduces learnable scaling and shifting parameters to the prior 2Quad, and trained on Cifar and ImageNet with **knowledge distillation.**
- SAL-ViT can averagely achieve **1.60×**, 1.56×, 1.12× lower PI latency with 1.79%, 1.41%, and **2.90%** higher accuracy compared to the existing alternatives, on CIFAR-10, CIFAR-100, and Tiny-ImageNet, respectively.
- Authored and published a paper in *2023 International Conference on Computer Vision*(EI).

Research on VSlam Loop Closure Detection Based on Transformer 05/2021-04/2022
Student Researcher, Professor Hao Yu (Southern University of Science and Technology)

- Designed and implemented **transformer**-based feature extraction with Pytorch.
- Designed sequence matching at the back-end of LCD.
- Trained on Places365 with **knowledge distillation,** achieving top-1 of **53.28%** and top-5 of **84.04%**.
- Improved the average precision by **3.18%** compared to the state-of-the-art CNN-based methods on the NewCollege and CityCentre datasets.
- Authored and published a paper in *2022 IEEE International Conference on Advanced Robotics and Mechatronics(EI)*.

An Edge-Device Based Fast Fall Detection Using Spatio-temporal Optical Flow Model 12/2020-04/2021
Student Researcher, Professor Hao Yu (Southern University of Science and Technology)

- Designed **CNN** that integrated **RGB** and **optical flow** to extract spatio-temporal features from detected objects.
- Developed **tensor-compressed LSTM** to process the fused feature and detect falls in real-time on **edge devices**.
- Achieved accuracy of **96.23%** and **99.37%** on Multicam and URFD, with speed of **83.3 FPS** and a storage reduction of **210.9x**.
- Authored and published a paper in *43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*(EI).

Light Monocular Visual Odometry through Attentive Tensor-compressed LSTM Model for Robot Navigation
Student Researcher, Professor Hao Yu (Southern University of Science and Technology) 09/2020-12/2020

- Designed a **CNN+T-LSTM** model with **attention** mechanism to estimate the 6-DoF absolute-scale pose from

the **optimal flow** feature for the monocular visual Odometry, making it friendly to be applied on edge devices.
- Achieved **1/7** the size of DeepVO and **23x** faster than Flowdometry on KITTI dataset, while deployed it to a **Raspberry Pi**-based robot.
- Authored and published a paper in *2021 WRC Symposium on Advanced Robotics and Automation*(EI), awarded the **Best Student Paper**.

3D Facial Recognition System 04/2020-09/2020

Student Researcher, Professor Hao Yu (Southern University of Science and Technology)

- Implemented 2D facial recongition using **FaceNet** and used **PRNet** to convert 2D ID photos to 3D point cloud.
- Extracted and compared point cloud features from input and PRNet output using **Tensorflow** to prevent intrusion and reshoots.
- Won **Global First Prize** in the "Huawei ICT" Competition and **Third Prize** in the "Intel Cup" Competition.

PUBLICATIONS

1.**Chenghao Li**, Hongwei Ren, Minjie Bi, Chenchen Ding, Wenjie Li, Rumin Zhang, Xiaoguang Liu, Hao Yu. TLCD: A Transformer based Loop Closure Detection for Robotic Visual SLAM, 2022 IEEE International Conference on Advanced Robotics and Mechatronics(ARM). (Published EI)

2. Hongwei Ren, **Chenghao Li**, Xinyi Zhang, ChenChen Ding, Changhai Man, Hao Yu. ATFVO: Light Monocular Visual Odometry through Attentive Tensor-compressed LSTM Model for Robot Navigation, 2021 WRC Symposium on Advanced Robotics and Automation (WRC SARA). (Published EI)

3. Yuchao Yang, Hongwei Ren, **Chenghao Li**, Chenchen Ding, Hao Yu. An Edge-device Based Fast Fall Detection Using Spatio-temporal Optical Flow Model, EMBC the 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society. (Published EI)

4. Yuke Zhang, Dake Chen, Souvik Kundu, **Chenghao Li**, Peter A. Beerel. SAL-ViT: Towards Latency Efficient Private Inference on ViT using Selective Attention Search with a Learnable Softmax Approximation, International Conference on Computer Vision (ICCV) 2023. (Accepted)

HONORS AND AWARDS

3rd Prize, The Freshmen Scholarship (University)	09/2018
1st Prize, The Outstanding Student Scholarship (University)	10/2019
Outstanding Individual, Winter Vacation Trip in Alma Mater (University)	03/2020
Shenzhen Excellent Student Union (Provincial)	03/2020
S Award, The Mathematical Contest in Modeling (International)	04/2020
Outstanding Student Leaders (University)	05/2020
3rd Prize, The National College Students Mathematical Contest in Modeling (National)	09/2020
2nd Prize, The Outstanding Student Scholarship (University)	10/2020
3rd Prize, The Embedded Special Invitational of 2020 Intel Cup Electronic Design Competition (National)	10/2020
1st Prize, The Huawei ICT 2019-2020 Global Competition (International)	11/2020
"Longsys" Scholarship (University)	12/2020
Outstanding Student Leaders (University)	05/2021
2nd Prize, The 2021 International Competition of Autonomous Running Robots (Running Robot)(International)	10/2021

EXTRACURRICULAR ACTIVITES

Member of Volunteer Association in Southern University of Science and Technology	09/2018-06/2022
Vice President of the Student Union in Zhicheng College	03/2020-03/2021
President of Student Union in School of Microelectronics	12/2020-03/2022
Member of the IEEE in Southern University of Science and Technology Branch	06/2021-06/2022
Member of Marathon Invitational Tournament	10/2018

RELATED SKILLS

- Languages: Java, Python, C++, Matlab, Chisel, Verilog;
- Other Skills: Pytorch, Tensorflow, Keras, Hugging Face, Git, AutoCAD, Solidworks, Cadence, Pr, COMSOL, Silvaco;