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 05/2023-09/2023
Student Researcher, Professor Peter A. Beerel (University of Southern California)

- Developed **dual fusion enhancement** technique to mitigate **data replication** in **diffusion models**.
- Constructed robust metrics to evaluate the trade-off between **caption generality** and data replication.
- Reduced replication by **43.5%** compared to the original model while maintaining the diversity and quality.
- Submitted a paper to *2024 IEEE International Conference on Acoustics, Speech and Signal Processing*(EI).

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.
- Trained on Places365 with **knowledge distillation,** achieving top-1 of **53.28%** and top-5 of **84.04%**.
- Improved average precision by **3.18%** over state-of-the-art CNN methods on NewCollege and CityCentre.
- Authored and published a paper in *2022 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 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** size of DeepVO and **23x** faster than Flowdometry on KITTI dataset in **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.
- Compared point cloud features of 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 (EMBC). (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)

5. Dake Chen, Yuke Zhang, Souvik Kundu, **Chenghao Li**, Peter A. Beerel. RNA-ViT: Reduced-Dimension Approximate Normalized Attention Vision Transformers for Latency Efficient Private Inference, 2023 International Conference on Computer-Aided Design (ICCAD). (Accepted)

6. **Chenghao Li**, Dake Chen, Yuke Zhang, Peter A. Beerel. Mitigate Replication and Copying in Diffusion Models with Generalized Caption and Dual Fusion Enhancement, 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). (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 (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;