Xinheng Ding

Tel: 86-15212444883 **Homepage:** https://xinhengding.github.io/
Email: Dingxinheng2024@163.com & dxh3382@mail.ustc.edu.cn

EDUCATION

University of Science and Technology of China (USTC), Hefei, China   *Sept.2020-Jul.2024*
Bachelor of Engineering in Automation, School of Information Science and Technology
Elite Class of Wang Daheng Opto-Electro-Mechanical Science and Technology
Overall GPA: 3.6/4.0 (86.48/100)
Awards, Scholarships & Leadership:
- National Encouragement Scholarship (**Top 5%**), **Twice** in *2021&2022*
- Cyrus Tang Foundation Moral Education Scholarship (**Top 2%**), **Twice** in *2021&2022*
- Lanfeng Scholarship for Outstanding Students (Top 10%), *2022*
- Star of Learning Incentive (**Top 1%**), *2021*
- Excellent Student Scholarship – Silver (Top 10%), **Twice** in *2020&2021*
- Outstanding Freshman Representative at the USTC Opening Ceremony, *2020*
- Vice President of the USTC Cycling Association, *Aug. 2022-Aug.2023*
- Monitor of Class 2 of 2020, *Sept.2022-Present*
- Class Commissary in Charge of Studies, *Sept.2020-Jul.2022*

RESEARCH EXPERIENCE

Unified Knowledge Distillation for Resilient Federated Learning
Visual Informatics Group   **University of Texas at Austin（VITA）**
Online research assistant   *Aug. 2023 -Present*
Mentor: Associate Prof. Atlas Wang in the Department of Electrical and Computer Engineering at UT-Austin
Background: In the scenario of using the standard federated learning approach, incorporating more diverse data from heterogeneous clients can sometimes lead to a decline in performance. We expect to establish a Hierarchy Model Soup to enhance performance with more data consistently.
- Fine-tuned the T5 pre-trained model on 6 downstream tasks and obtained the corresponding target vectors
- Employed cosine similarity for hierarchical clustering to establish the model soup with a tree structure
- Utilized Pareto to decompose model weights and select relevant knowledge for composing updates to client weights for specific tasks

AI Transformers for Diagnosis of Cardiac Diseases
Wang's Group in Artificial Intelligence Research Institute   **USTC & Stanford University**
Research assistant   *Feb.-Mar. 2023*
Mentor: Ph.D. Yanran Wang, a research fellow from Stanford University
Background: By harnessing the advancement in computer vision and machine learning, we seek to create an automated system capable of analyzing videos, accurately detecting the presence of heart diseases, and identifying the specific type of cardiovascular conditions.
- Assisted in building the dataset by utilizing ITK-SNAP to segment the magnetic resonance data, extracting ROIs, and ultimately converting them into image format
- Utilized the Neural Network Intelligence (NNI) library to select optimal hyperparameter settings for the CNN-LSTM model
- Increased the F1-score of the CNN-LSTM model from 0.89 to 0.91 by incorporating weighted sampling

AI-Based Preprocessing Technologies for JPEG Image Coding
Intelligent Visual Data Coding Laboratory   **USTC**
Undergraduate researcher   *May. 2022- Present*
Mentor: Prof. Dong Liu in the Department of Electronic Engineering and Information Science at USTC
Background: JPEG image coding is a lossy compression technique, and when the coding rate is low, the reproduced image may exhibit noticeable artifacts. This project aims to propose an end-to-end training approach

which can pre-process images before JPEG compression to minimize artifacts at a given bitrate.

- Participated in a Research Skills Promotion（RSP）Seminar where we probed into Information Theory and paper writing, and collaboratively developed a neural network-based image codec (outperforming JPEG)
- Devised two distinct neural network models, one for estimating the bits per pixel (bpp) of an image post JPEG compression, and the other for emulating the image reconstruction effect of JPEG
- Selected an appropriate preprocessing network that possesses input image identity mapping capability as the starting point of the preprocessing procedure
- Performed joint optimization of rate and distortion by integrating the Rate Prediction and JPEG Simulation Network, and improved the algorithm performance accordingly

Achievement: Our approach has already outperformed JPEG in the low bit-rate range, which means reducing distortion at a given bit budget. We are further exploring the feasibility of simultaneously reducing bpp while enhancing image quality.

A Detection Tool of Tampering with Human Faces in the Videos Based on Xception
Intelligent Multimedia Content Computing Lab **USTC**
Undergraduate researcher *Feb.-Jun. 2022*
Mentor: Prof. Hongtao Xie in the Department of Electronic Engineering and Information Science at USTC
Background: Based on Faceforensics++, we learned to detect manipulated facial images and designed a video tampering detection.

- Trained the model by combining data from four different tampering methods to enhance its generalization capability.
- Incorporated attention mechanisms and texture enhancement modules to enhance classification accuracy.

Achievement: The source code is freely available. For more details, please refer to the following link:
https://github.com/XinhengDing/FaceGuard

RELEVANT COURSEWORK

Parallel JPEG: Accelerated Compression and Decompression using OpenMP and CUDA **USTC**
Independent project advised by Associate Researcher Lixiang Tan *Apr.-May. 2023*

- Implemented a simplified version of JPEG compression and decompression in C++
- Explored and validated the impact of different task scheduling methods and varying thread settings on the acceleration performance
- Further accelerated the serial program by using OpenMP and CUDA and achieved the maximum average speedup of 3.74 and 168.9, respectively

Advanced Cardiac Function Assessment Using Deep Learning and Video Analysis **USTC**
Undergraduate researcher advised by Associate Researcher Yueyi Zhang and Xinwei Zheng *Aug-2022-Jan.2023*

- Focused on semantically segmenting the left ventricle by the use of DeepLabv3
- Developed a classification model to predict the ejection fraction (EF) and train our model based on the weakly supervised learning approach
- Tested and compared the performance of three different model architectures which combine 3D convolutions with residual blocks, namely R3D, MC3, and R2+1D
- Compared discrepancies between the reproduced results and those demonstrated in the original paper, and made a presentation based on the research content and the improvements

TECHNICAL PROFICIENCIES

Computer Skills:
Programming languages: C/C++, Python, MATLAB, VHDL, CUDA, OpenMP, etc.
Deep learning frameworks: Pytorch, transformers
Professional Software:

- Skilled in Origin &Simulink
- Capable of 3D slicer, ITK-SNAP, EasyEDA, Photoshop, etc.