Ce ZHANG

Southern University of Science and Technology (SUSTech), Shenzhen
Department of Electronic and Electrical Engineering Communication Engineering
+86 150-7127-4102 zhangc2019@mail.sustech.edu.cn 2001-12-03

I am currently an undergraduate student in the Department of Electrical and Electronic Engineering at Southern University of Science and Technology. I have a solid foundation in mathematics and statistics, skilled in modeling and analyzing data, and have acquired the use of deep learning frameworks.

Academic Performance and Major Courses

- **GPA:** 3.91/4.00 **Percentage Grade:** 94.27/100 **Ranking (Major):** 1/31
- **English Assessments:** **CET-4:** 610 **CET-6:** 552 **IELTS:** 7 (L7.5 R8 W6 S7) **GRE:** 324 (V154 Q170)
- **Major Courses and Grades:**
  Artificial Intelligence B: 96 Linear Algebra A: 100 Probability and Statistics: 96
  Data Structure and Algorithm Analysis B: 100 Introduction to Computer Programming A: 98

Research Experiences

Since my sophomore year, I joined the Artificial Intelligence (AI) Lab for research training under the guidance of Zhihai He (IEEE Fellow, Chair Professor, link). During the past two years, I have been actively involved in research projects related to artificial intelligence, computer vision and machine learning.

#1. (CV - Semantic Segmentation) Participated in the Imperial College of Science and Technology's Data Science Summer School, complete a brain tumor segmentation task using U-Net.

- Use Keras to load datasets and do data preprocessing and augmentation on images, build U-Net, Res-UNet and U^2-Net networks, optimize using the dice loss.
- The network built (GitHub link) performed well in the final evaluation and received the highest grade of A.

#2. (ML - Time Series) Develop Multi-Scale Self-Referential Correction Networks (MSRCN) for time series forecasting and gain state-of-the-art performances in multiple public datasets.

- The proposed MSRCN algorithm is able to characterize the prediction error based on a forward-backward prediction loop by a self-referential error and adaptively adjust the prediction result for each test sample.
- We notice single-scale correction has difficulties dealing with long time series, therefore we extend the self-referential correction into multiple time scales to capture the correlation and change patterns of the time series data at different time scales.
- We fuse the error vectors obtained from the multi-scale error correction networks and the differential vector information together for joint error correction.
- **Research Output: A third-author paper is submitted to AAAI 2023.**

#3. (CV - Pose Estimation) Develop Self-Correctable and Adaptable Inference (SCAI) network with prediction error characterization and correction to improve generalization performance in pose estimation.

- A well-trained prediction network model often experiences severe performance degradation on new test samples. We focus to address the performance degradation or generalization problem in this research.
- We partition the body keypoints into 6 structural groups. Each structural group corresponds to a body part, inside which the group of keypoints are connected during motion.
- We design and learn a fitness feedback network which maps the prediction result of the prediction network back to the input sample. A self-matching error is formed by the loop prediction of prediction prediction and fitness feedback networks. A third network called prediction error correction network is added to adjust the prediction results using the self-matching error as input during the inference stage.
- The SCAI approach makes the model learnable at the inference stage. On MS COCO-testdev dataset, our method improves upon the current best method by up to 1.4%.
- **Research Output: A third-author paper is submitted to AAAI 2023.**

#4. (AI - Differential Equations) Research on data-driven AI automated scientific exploration topics, using a small amount of observational data to learn evolution operators with neural networks.

- Task Description: Using experimental observational data to learn the physical equations (ODE & PDE) behind them using a neural network approach.
- We introduce a joint spatial-temporal evolution network which incorporates spatial dynamics modeling into the temporal evolution prediction for robust learning the evolution operator with very few samples.

- During training, we adaptively discover new locations to collect more critical samples based on multi-step reciprocal prediction error generated by a prediction loop of forward and backward networks.
- The proposed method is able to dramatically reduce the numbers of samples needed for effective learning and accurate prediction of evolution behaviors of unknown dynamic systems by up to 100 times.
- **Research Output: A first-author paper is under peer review in NeurIPS 2022.**

Honors and Awards

- The first prize of Outstanding Student Scholarship for the academic year 2019-2020, 2020-2021 (top 5%).
- Academic Star of Shuli College of SUSTech for the academic year of 2020-2021, 2021-2022 (top 2%).
- Members of the Innovative Experimental Class of the Department of Electronic and Electrical Engineering.
- Outstanding Guide Student of SUSTech 8th & 9th Peer-Supporting Class Project (Linear Algebra Course).
- Meritorious Winner in Mathematical Contest in Modeling 2022 (Top 9.5%).
- National Second Prize in Contemporary Undergraduate Mathematical Contest in Modeling 2021 (Top 2%).
- Successful Participants in Mathematical Contest in Modeling 2021.

Computer Skills

Languages	Python, Java, C/C++, MATLAB, LaTeX
Data Analysis	PyTorch, Keras, Numpy, Scikit-learn, Pandas, Matplotlib, SPSS
Other Skills	Application design: Android Studio, STM32 development: Keil/STM32CubeIDE