Kangrui Cen

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Education

- **Zhiyuan College, Shanghai Jiao Tong University** Shanghai, China
  Bachelor of Computer Science *Sept 2021 - Present*
  - Member of John Hopcroft Honors Class, which is an elite CS program for top 5% talented students.
  - **Overall GPA**: 86.39/100, **Major GPA**: 89.47/100.
  - **Selected Courses**:
    - **Computer Science**: Programming and data structure II (A+), Programming and data structure III (A+), Efficient Tools and Effective Operations in Computer Systems (A+), Data Mining (A+), Computer System Design and Implementation (A+), Cryptography in Blockchain (A+), Operating System (A)
    - **Mathematics**: Optimization Methods (A+), Computational Complexity (A+), Information Theory (A), Topics in Modern Algorithms (A)

Paper

- **LayerT2V: Customize Object Trajectory via Transparent Video Layering** (In Preparation)
  ***Kangrui Cen**, Kelvin C.K. Chan, Xiaohong Liu, Ming-Hsuan Yang* *Paper* *VL-Lab, UC Merced*

Research Experience

- **Basic-Lab, SJTU** Shanghai, China
  Optimization for Parallel Graph Algorithm based on Hierarchical Architecture *June 2023 - Jan 2024*
  - Research Intern, supervised by Prof. Qiang Yin.
  - Performing hierarchical decomposition of a large-scale image followed by precomputation to enhance the overall performance of dynamic graph analysis.
  - Optimizing the graph partitioning algorithm to minimize the frequency of loading subgraphs onto the GPU, thereby achieving GPU acceleration.
  - Theoretical proof of the correctness of the hierarchical graph algorithm for the Single-Source Shortest Path problem.

- **MultiMedia-Lab, SJTU** Shanghai, China
  Advanced Deep Learning Approaches for Image Quality Analysis and Enhancement *Feb 2024 - Present*
  - Research Intern, supervised by Prof. Xiaohong Liu.
  - Local quality reduction of high-quality images from AIGI using a diffusion model with masks to construct the corresponding dataset.
  - Regression prediction of the argument of the diffusion model and the degree of localized quality reduction using neural network.
  - Design a CNN-based network that can predict the localized quality scores of AIGI.

- **Vision and Learning Lab, University of California Merced** Merced, America
  LayerT2V: Customize Object Trajectory via Transparent Video Layering *June 2024 - Present*
  - Exchange Scholar, supervised by Prof. Ming-Hsuan Yang, advised by Dr. Kelvin C.K. Chan in Google DeepMind.
  - Put forward a novel pipeline that generates videos step-by-step by layering backgrounds and foreground objects separately.
  - These transparent video layers allow for the flexible compositing of multiple independent elements within a video, with each element positioned on a distinct *layer*, enabling complex visual effects and greater control over the generation process.
  - *LayerT2V* is capable of handling complex scenarios with multiple moving objects, and demonstrates the best results compared to state-of-the-art methods.

Course Project

- **Bootstrapping Diffusion Model** Shanghai, China
  CS3964 Image Processing and Computer Vision Course Project *Dec 2023*
  - Leverage synthetic data generated by the model training and train Diffusion/GAN model in a bootstrap manner.
  - Give an affirmative conclusion that generative model can boot-strap itself to deepen its understanding.
  - By recycling samples over successive generations, we continually expand the breadth and variety of our training data. GitHub Project Paper

- **Using information theoretic metrics to study the importance of individual neurons** Shanghai, China
  ICE2601 Information Theory Course Project *May 2023*
  - Use information theoretic metrics for node pruning to learn the importance of individual neurons at different levels in the whole deep neural network.
  - Entropy, Mutual information and KL-Selectivity are used to determine the order of ablation.
  - Figure it out that it is reasonable to use mutual information and KL-Selectivity as indicators of node pruning, indicating that they are strongly correlated with the classification results. GitHub Project Paper Slides
- **Stop Running Your Mouth: Machine Unlearning 4 Pre-Trained LLMs** Shanghai, China
  CS3966: Natural Language Processing and Large Language Model *Spring 2024*
  - Employ the Machine Unlearning approach to mitigate the retention of unethical data within LLMs and prevent the generation of harmful responses. We carefully design a method to ensure: (1) For a negative Q&A training pair, the LLM forgets its original response to the input; (2) The LLM randomly maps negative prompts to any output distribution within its output space; (3) The LLM maintains a level of general language ability close to its original state post-unlearning. GitHub Project Paper Simulative Rebuttal Slides

Honors and Awards

- Undergraduate Class B Scholarship *2022,2023*
- Zhiyuan Honors Scholarship *2021,2022,2023*
- Meritorious Winner of Mathematical Contest In Modeling *2022*

Other Experience

- Teaching Assistant *2023 Summer Semester*
  Programming and data structure III
- Proficient with: C/C++/C#, Python (PyTorch, NumPy, etc.), Rust, Linux, LaTeX