Wenxiao (Russell) CAI

Tel: (+86)180 5196 4139 | Email: wxcai_seu@163.com | Website: https://russrobin.github.io
Add: No.1 Wolong hu Blvd, Zhetang Town, Lishui District, Nanjing 211214 China

Education

Southeast University (SEU) Sep. 2020 – Present
B.S. in Engineering, Automation; GPA: 3.93/4.0; Rank: 1/111 (Top1%) Nanjing

- ✓ Relevant Courses: Artificial Intelligence, Optimization, Data Structure, Algebra and Geometry Numerical Computing Methods, Linear Control System Theory, Signal Processing, Microcomputer, MATLAB and Control System Simulation, etc.
- ✓ International Conference on Learning Representations (ICLR) 2024 Reviewer

University of California, San Diego (UCSD), San Diego Mar. 2023 – Aug. 2023
Exchange Program; GPA: 4.0/4.0 San Diego

- ✓ Relevant Courses: Application of Data Science, Linear Control System Theory, Machine Learning with R, etc.
- ✓ Neural Information Processing Systems (NeurIPS) 2023 Emergency reviewer

Research Experience

Research on Semantic Information-based Image Stitching Jul. 2023 – Sep. 2023
Student Researcher, Advised by Prof. Wankou Yang, SEU and Jiayi Ma, Wuhan Univ. Nanjing

- ✓ Proposed to use Segment-Anything model to extract object-level global structures
- ✓ Proposed to use triangle mesh samping to preserve object structures during stitching
- ✓ Reached new state-of-the-art in image stitching on major benchmarks and the proposed dataset

Research on Uncertainty Estimation of Binocular Depth Estimation Jul. 2023 – Nov. 2023
Student Researcher, Advised by Prof. Mingming Gong, UniMelb Melbone (Remote)

- ✓ Proposed an ordinal regression stereo matching methodology based on GwcNet architecture
- ✓ Proposed to estimate aleatoric uncertainty based on probability mass function and epistemic uncertainty with two bootstrapping
- ✓ Conducted experiments on KITTI, Driving Stereo, Scene Flow datasets and reached state-of-the-art in uncertainty estimation

Unsupervised and semi-supervised Semantic Segmentation Mar. 2023 – Aug. 2023
Student Researcher, Advised by Prof. Pengtao Xie, UCSD San Diego

- ✓ Proposed the use of bi-level optimization in unsupervised semantic segmentation
- ✓ Innovatively used Gaussian blur and conditional random field to address the issue of local consistency
- ✓ Employed large-scale pre-trained backbone with various unroll& iterative strategies to tackle loss convergence
- ✓ Proposed to adopt Meta Pseudo Labels in semi-supervised semantic segmentation
- ✓ Conducted research on Large Language and Vision Assistants for object detection and semantic segmentation

Research on Varied Drone Dataset (VDD) for Semantic Segmentation Sep. 2022 – Mar. 2023
Student Researcher, Advised by Prof. Wankou Yang, SEU Nanjing

- ✓ Proposed a new Varied Drone Dataset for semantic segmentation with variations like camera angles, scenes, weather and light conditions, which is the largest drone dataset now
- ✓ Comprehensively overviewed challenges and trends in drone datasets for visual scene understanding
- ✓ Trained cutting-edge models on drone datasets and analyzed experiment results to provide baseline performance for future research

Research on Drone Image Stitching at Ultra-low height Aug. 2021 – Aug. 2022
Student Researcher, Advised by Prof. Wankou Yang, SEU Nanjing

- ✓ Proposed a parallax tolerant and semantic information-aided image stitching method to deal with aerial images taken at an ultra-low altitude
- ✓ Innovatively derived transformation matrices for UAV image stitching, based on mathematical principles
- ✓ Collected a high-resolution drone image dataset; Employed and trained automatic segmentation models on drone datasets and used semantic information in image stitching
- ✓ Achieved natural stitching results and short processing time compared with state-of-the-art models

Publications

- ✓ **Cai, Wenxiao.** Du, Songlin. Yang, Wankou. *UAV image stitching by estimating orthograph with RGB cameras*. *Journal of Visual Communication and Image Representation*. Vol. 94, 2023.
- ✓ **Cai, Wenxiao.** Jin, Ke. Hou, Jinyan. Guo, Cong. Wu, Letian. Yang, Wankou. *VDD: Varied Drone Dataset for Semantic Segmentation*. *Pattern Recognition.* (Under Review)
- ✓ **Cai, Wenxiao.** Yang, Wankou. *IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR)*. 2024. (Under Review)

Course Projects

Control System Course Project, SEU, Supervised by Prof. Zheng Wang Sep. 2021 - Jan. 2022

- ✓ Researched the simulated analysis and optimization on scheduling issues of automatic guided vehicle (AGV) in automated storage and retrieval system (ASRS)
- ✓ Built simulated models based on queuing theory and visualized AGV operations in logistics factories with Matlab Simulink
- ✓ Optimized system performance through simulated analysis of indexes such as throughput rate, number of AGV, cargo quantity, etc.

Algorithms Course Project, SEU, Supervised by Prof. Junyang Li Jul. 2021 - Sep. 2021

- ✓ Designed software with a construction heuristic algorithm featuring spatial-based segmentation to solve NP-hard packing problems
- ✓ Designed packaging rules, software interface and software functions, including information input, real-time packaging procedures display, packaging advising, etc.
- ✓ Drew 3D graphics frame by frame in PyQt and converted to video using Matplotlib
- ✓ Tested and adjusted the algorithm to raise the filling rate to 80%; applied it to a local logistics factory

***Artificial Intelligence* Course Project, SEU, Supervised by Prof. Haikun Wei** Jan. 2021 - Jun. 2021

- ✓ Developed PyQt-based software using multi-algorithms to extract key sentences from articles
- ✓ Designed the software interface to receive instructions, display information and interact with built-in algorithms
- ✓ Implemented functions like full-file reading, language processing, and parameter settings, etc.
- ✓ Preprocessed Chinese and English texts to split them into words and sentences
- ✓ Applied 3 algorithms, namely AP, K-means, and mean-shift; achieved a 40% overall accuracy rate
- ✓ Ran tests, focusing on the efficiency, extensibility, user-friendliness, and simplicity of the software

***Neural Radiance Field* Course Project, SEU, Supervised by Prof. Yangang Wang** Sep. 2023 - Nov. 2023

- ✓ Propose using NeRF to reconstruct dynamic 3D scenes
- ✓ Suggest calculating NeRF using a sufficient number of images from past time steps and a small number of images from the current state
- ✓ Mathematically derive the spatial particle dynamics correspondence and integrate the solving module into the structure of NeRF
- ✓ Lead the team in constructing a dataset for dynamic NeRF, validating the model, and achieving promising results.

Leadership Activities

President, LabVIEW Club, SEU Aug. 2022 – Aug.2023

- ✓ Hosted club lectures, training sessions, and events; organized the university team's participation in Robocon
- ✓ Led the club to achieve second place in the university's technology-oriented club competition

Honors & Awards

- ✓ Perfection Student Scholarship Award, SEU Oct.2021; Oct.2022
- ✓ Presidential Scholarship Award, SEU (Top 1%) Oct.2021
- ✓ First Prize of CUPT in East China Jun.2021
- ✓ Merit Student Award, SEU Apr.2021

Skills & Interests

- ✓ Languages: Native in Mandarin; Proficient in English (TOEFL: 108; GRE: 330)
- ✓ Programming Languages: Python; R; C/C++; Matlab; SQL; HTML; Assembly
- ✓ Libraries: NumPy; Pandas; Scikit-Learn; Matplotlib; OpenCV; PyTorch
- ✓ Software: Microsoft Office; Visual Studio; PyCharm; Git; Qt Designer; Jupyter Notebook