# Kairui Shi

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Kairui Shi's Homepage (kairui-shi.github.io)

## Education

**Wuhan University (WHU), Wuhan, China** 09/2021 - Present
**Bachelor of Engineering in Remote Sensing and Information Engineering** (expected in 07/2025)
GPA (major): **3.86/4.0,** GPA (overall): **3.76/4.0**, ranking: **2/34**
Core Courses: Advanced Mathematics (100/100), Object-Oriented Programming (96/100), Probability and Mathematical Statistics (95/100), Error Processing of Spatial Data (96/100), Computer Vision and Pattern Recognition (92/100)

## Publication

***Fusion Sense: Bridging Common Sense, Vision, and Touch for Robust Sparse-View Reconstruction***
Irving Fang, **Kairui Shi**, Xujin He, Siqi Tan, Yifan Wang, Hanwen Zhao, Hung-Jui Huang, Wenzhen Yuan, Chen Feng, Jing Zhang
ICRA 2025 (Under Review) Project Page / arXiv / Code

## Research Experiences

**AI4CE, New York University |** Research Assistant 02/2024 – Present
***Fusion Sense: Bridging Common Sense, Vision, and Touch for Robust Sparse-View Reconstruction***
*Advisor: Feng Chen (Associate Professor)*
- Integrated Grounded-SAM model to extract object masks, generating initial points for 3DGS using visual hull reconstruction, and used Realsense depth images to establish initial points for distant scene areas.
- Developed a method for hull pruning via visual hull to trim floating points around target object, and supervised the training of 3DGS scenes using RGB, Realsense depth, and normal maps generated by DSINE.
- Guided by LLM's common sense and Gaussian gradient clustering, selected touch-worthy areas and directed the robot to touch specific cluster centers identified as important.
- Integrated touch point cloud into 3DGS training to achieve fusion, enabling the reconstruction of challenging objects (black, transparent, reflective) with sparse views (4–9) and minimal key touches.

***DeepGS: Self-Supervised RGB-D Map Optimization Based Gaussian Splatting***
*Advisor: Feng Chen (Associate Professor)*
- Developed a method to extract and learn features from RGB-D data by utilizing DINOv2 for RGB color information extraction and converting depth data into point clouds for spatial recognition.
- Integrated SLAM-predicted poses with extracted features as inputs to the Lnet network. Achieved precise localization optimization under low FOV conditions.
- Performed occupancy classification predictions on point clouds derived from depth data, and combined 3DGS-rendered images of each keyframe to train the self-supervised network for more accurate pose estimation.
- Implemented simultaneous training of camera pose and Gaussian scene updates using Lnet and 3DGS. Achieved exceptional mapping visualization and high tracking accuracy.

**SkyEarth, Wuhan University |** Team Leader 04/2023 – 02/2024
***NeRF-Based Method for Virtual-Reality Fusion Scene Reconstruction***
*Advisor: Yongjun Zhang (Professor, Dean of the School of Remote Sensing and Information Engineering)*
- Achieved high-resolution texture reconstruction of large-scale buildings using NeRF, leveraging oblique aerial imagery captured by drones for detailed and accurate 3D reconstruction.

- Developed a synchronized visualization feature for LoD1~2 models and NeRF rendering perspectives using the LidarPro professional software released by the lab.

**Artificial Intelligence and Machine Perception, Wuhan University |** Research Assistant 12/2023 – 05/2024

***High-Speed NeRF in Large-Scale Scenes with Compression***

*Advisor: Professor Zhenzhong Chen, Associate Research Fellow Wanjie Sun*

- Achieved high-speed reconstruction of large urban scenes using NeRF by partitioning the spatial voxel grid into different resolutions for hierarchical training.
- Implemented adaptive reconstruction and rendering of buildings and scenes with varying precision requirements by utilizing voxel grids of different resolutions (512, 1024, 2048) for streets, high-rises, and small structures.
- Developed a 3D pyramid-level rapid reconstruction and visualization system for large scenes, effectively reducing memory overhead.

## Project Experiences

**Remote Sensing Image Clustering Parallel Analysis Project** 09/2023 - 11/2023

- Designed a program and implemented data parallelism with PySpark.
- Conducted a rapid analysis of remote sensing image clustering and assessed a parallel strategy to address the challenges associated with clustering large-scale RS images.

**Aerial Triangulation Algorithm Design** 10/2023 - 12/2023

- Developed a program for the automatic computation of camera intrinsic and extrinsic parameters, along with the measurement of ground point coordinates.

**Air Quality Prediction and Warning Model** 11/2022 - 08/ 2023

- Proposed mixed methods for air quality data analysis and improved prediction accuracy.
- Led the team to participate in the College Student Mathematical Modeling Challenge and got 2nd (top 10%) prize.

## Awards

- Second Class Scholarship in Wuhan University (top 10%) 2023
- 2nd prize in the 15th "Huazhong Cup" College Student Mathematical Modeling Challenge (top 10%) 2023
- 3rd prize in the 14th Chinese Mathematics Competitions 2023
- 3rd prize in 2023 Contemporary Undergraduate Mathematical Contest in Modeling 2023
- 3rd prize in National College Students' Language and Writing Skills Competition 2021
- 2nd prize in the 2nd "BETT Cup" National College Students' English Vocabulary Competition 2023

## Leadership & Activities

**Wuhan University Student Union, WHU |** Member 08/2021 - 09/2022

- Designed and organized various activities and professional seminars for WHU students.
- Established "Future Academy" courses to cultivate professional skills for WHU students.

**The 9th China Youth Innovation and Entrepreneurship Competition |** Outstanding Volunteer 08/2022

**College Students' innovation and Entrepreneurship Competition |** Team Leader 06/2023

## Skills

**Programming Languages**: Python, C/C++, Matlab, R, Javascript

**Tools:** Latex, pytorch, tensorflow, vim, git

**Achievements & Hobbies:** the highest amateur rank in Go, the highest level of calligraphy, violin