

Xueyang Kang

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MAIN RESEARCH INTERESTS

Robotic Perception, 3D Reconstruction, Deep Learning, Geometry Representation, Signal Processing, Equi-Vision, Graph Neural Network, SLAM, VR/AR, Sensor Fusion, Spatial Sensing for Embodied AI.

SKILLS

Software: TensorFlow, PyTorch, PyTorch Geometry; SOTA models: implicit SDF, Gaussian Splatting, Mesh Processing, CNN, Transformer, GNN, Diffusion, Equi-model; Blender, Isaac-Sim, PyBullet, Three.js.

Hardware: FPGA, ARM Microcontroller M4, Jetson Nano/X, Raspberry Pi (ARM); ROS integration with GPS, ultrasound, ToF, UWB, stereo/RGB-D cameras, Lidar, mmWave Radar, IMU, Wheel encoder.

Coding: C++, Python, C, MATLAB, JavaScript (Three.js), HTML

Languages: English (proficient), Mandarin (mother tongue), German (good), Dutch (beginner)

EDUCATION

University of Melbourne, Melbourne, Australia 05/2021 – 10/2025
Ph.D. in Engineering & Information Technology

KU Leuven, Belgium 05/2021 – 06/2025
Joint Ph.D. in Electrical & Information Engineering

Technical University of Munich (TUM), Munich, Germany 10/2016 – 01/2018
Master of Science in Electrical & Information Engineering
GPA: 1.7/1.0

Tongji University, Shanghai, China 09/2014 – 06/2016
Master of Science in Electrical & Information Engineering
GPA: 86.5/100

Hangzhou Dianzi University, Hangzhou, China 09/2009 – 06/2013
Bachelor of Engineering in Control Engineering
GPA: 90/100

WORK EXPERIENCE

Nanyang Technological University, Singapore 02/2026 – Present
Research Fellow, Electrical & Electronics Engineering

Summary: Conducting advanced research in robotic perception and 3D scene understanding for embodied AI applications by using a graph neural network and geometry representation learning.

Telstra – IoT Smart Sensor Research Lab, Melbourne, Australia 04/2025 – 09/2025
Research Intern

Summary: Designed next-generation IoT sensor solutions for infrastructure monitoring and theft detection.

- Designed a sensor node suite using the A121 radar for underground cable-well monitoring and theft detection through an event-based multi-stage trigger detection algorithm.
- Developed ultra-low-power algorithms enabling multi-year operation through Pulsed Coherent Radar (PCR) and optimized signal processing.
- Contributed to the hyperbolic lens and IPv4 shield design for presence and motion detection.

The Hong Kong Polytechnic University (PolyU) – AAE Faculty, Hong Kong 09/2023 – 01/2024
Research Visiting Scholar

Summary: Proposed and implemented Equi-GSPR, an SE(3)-equivariant GNN for point cloud registration.

Momenta AI – R&D Center, Parking Division, Suzhou, China 12/2020 – 05/2021
Senior Algorithm Engineer

Summary: Developed perception and tracking algorithms for autonomous parking systems.

- Sensor Fusion for Obstacle Avoidance: Developed a fusion pipeline combining ultrasonic sensors with image-based edge detection to improve obstacle detection robustness in urban driving scenarios.

- Vehicle Tracking under Kinematic Constraints: Implemented an Interacting Multiple Model (IMM) filter incorporating Ackermann kinematics for accurate multi-vehicle tracking.
- 3D Ground-Line Fusion for Static Obstacle Detection: Designed a method to fuse 3D ground lines from multi-sensor inputs to detect static structures such as pillars, walls, and stairs.

Qualcomm – R&D Center, Robotic Visual Group, Beijing, China

09/2018 – 11/2020

Robot System Engineer

Summary: *Developed visual odometry and SLAM systems enhanced by multi-modal sensor fusion.*

- VIO improved by Electronic Image Stabilization (EIS): combined tracking with IMU pre-integration to improve image-based tracking robustness.
- IR+RGB-based feature fusion to support long-term SLAM over day and night conditions.
- Programmed an EKF-based framework coupling Visual Odometry with IMU and wheel encoder data.

Chair of Navigation & Communication, TUM, Munich, Germany

04/2018 – 09/2018

Research Assistant (HIWI)

Summary: *Integrated UWB and stereo vision sensors in a ROS framework for drift-corrected SLAM.*

- Integrated stereo camera (Bumblebee) and Decawave UWB sensor modules wrapped in ROS.
- Built hardware-triggered synchronization for image pairs and UWB ranging.
- Developed adaptive fusion of UWB for scale recovery and drift correction in visual SLAM.

Additional Training:

03/2020 – 09/2020: Shenlan Academy – "[VIO Code Programming](#)" Certificate (5 projects)

02/2018 – 08/2018: Udacity Nanodegrees: (a) [Robot Software Engineer](#) (9 projects); (b) [Flying Car](#) (4 projects).

MAIN RESEARCH PROJECTS

Generative AI for Mesh and Novel View Generation

2023 – Present

PhD & Postdoc Research, University of Melbourne / KU Leuven / NTU Singapore

Summary: *Exploring how 2D diffusion foundation models can be lifted into 3D space to synthesize geometrically consistent novel views and high-quality meshes. Key challenges addressed include multi-view consistency, wavelet-based geometry priors, and being aware of geometry and physics consistency.*

Research Goal: To develop generative pipelines that produce photorealistic, geometry-faithful 3D content from sparse or single-view inputs, enabling scalable scene synthesis for embodied AI and VR/AR applications.

- Look Beyond: Two-Stage Scene View Generation via Panorama and Video Diffusion. *ACM MM 2025 (CORE A*, Oral Presentation)*. [\[Paper\]](#)
- Multi-view Geometry-Aware Diffusion Transformer for Indoor Novel View Synthesis. *ICLR 2025 Workshop; IJCNN 2025 (Oral)*. [\[Paper\]](#)

3D Reconstruction and Registration

2021 – Present

PhD Research, University of Melbourne & KU Leuven; Visiting Scholar, PolyU Hong Kong

Summary: *Investigating robust point cloud registration and depth-based reconstruction through equivariant neural networks and multi-modal fusion. Work spans sparse outdoor LiDAR, indoor RGB-D scenes, and focal-stack-based depth estimation, tackling the challenge of generalizing across sensor modalities and environments.*

Research Goal: To build registration and reconstruction systems that are provably robust to rotation and scale changes, generalize across sensor types, and produce metrically accurate 3D models suitable for downstream robotic manipulation and navigation.

- Equi-GSPR: Equivariant SE(3) Graph Network Model for Sparse Point Cloud Registration. *ECCV 2024 (CORE A*, Oral, Top <2% of 8300 submissions)*. [\[Springer\]](#) [\[Poster\]](#)
- Surfel-based 3D Registration with Equivariant Features. *CVPR 1st Equi-Vision Workshop & IEEE IGARSS 2025*. [\[Poster\]](#)

Geometry Representation and 3D Completion

2023 – Present

PhD & Postdoc Research, University of Melbourne / NTU Singapore; Supervised by Prof. Liangliang Nan (TU Delft)

Summary: *Exploring compact and expressive 3D geometry representations — including implicit SDFs, Gaussian splatting, and manifold graph representation— for shape completion, anomaly detection, and various applications. The focus is on learning geometry priors that transfer across object categories with minimal supervision.*

Research Goal: To design geometry representation frameworks that unify reconstruction, completion, and understanding in a single learned model, enabling robots to perceive and interact with partially observed or occluded 3D environments.

- Hierarchical Point-Patch Fusion with Adaptive Patch Codebook for Shape Anomaly Detection. *CVPR 2026*.

- Very Few Click-based Interactive 3D Segmentation with Semantic Prototype Embedding. (Accepted, IEEE Robotics and Automation Letters).

Robotic Fusion Sensing

2018 – Present

Industry: Qualcomm (Beijing), Momenta AI (Suzhou), Telstra IoT Lab (Melbourne), TUM Navigation Lab (Munich)

Summary: Developing multi-modal sensor fusion systems that combine cameras, IMU, LiDAR, UWB, radar, and wheel encoders for robust localization, SLAM, and perception. Work spans both algorithm design — VIO, EKF-based state estimation, particle filtering — and hardware integration and deployment on embedded platforms.

Research Goal: To create lightweight, real-time sensor fusion architectures that maintain accurate spatial awareness under challenging conditions (low-light, occlusion, GPS-denied environments), bridging the gap between high-fidelity 3D perception and deployable robotic systems.

- Adaptive Sampling-based Particle Filter for Visual-inertial Gimbal in the Wild. *ICRA 2023* [[Full Paper](#)] [[Demo](#)]
- Integrated Visual-Inertial Odometry and Image Stabilization for Image Processing; EKF-based VIO coupled with EIS for robust visual tracking. PCT Patent: (PCT/CN2021/070099, US20230421902A1).

PUBLICATIONS UNDER REVIEW

(as 1st / unique corresponding author*, draft available on demand)

1. Kang, Xueyang, et al. "Zero Shot Style Transfer to Gaussian Splatting." (Submitted to TIP 2026).
2. Kang, Xueyang, et al. "Wavelet-based Geometry Prior from 2D Diffusion Foundation Model for High-Quality 3D Reconstruction." (Under review, TIP 2026, supervised by Prof. [Guo Yulan](#)).
3. Li, Zizhao; Kang, Xueyang*. "Out-of-distribution detection in 3D applications." [arXiv:2507.00570](#) (Under review, Neuro Computing Journal 2026).
4. Wong, Lik Hang Kenny; Kang, Xueyang*, et al. "A Survey of Robotic Navigation and Manipulation with Physics Simulators in the Era of Embodied AI." [arXiv:2505.01458](#) (Accepted, ACM Computing Survey, major revisions).
5. Kang, Xueyang, et al. "Very Few Click-based Interactive 3D Segmentation with Semantic Prototype Embedding." (Accepted, Robotics and Automation Letters, minor revisions).
6. Kang, Xueyang, et al. "Soft Robotic Finger for Texture Unfolding with Visual Feature Fusion." (Under review, ECCV 2026; supervised by [Prof. Dr. Jianwei Zhang](#)).
7. Kang, Xueyang, et al. "MeshGuard: Robust and Imperceptible Watermarking of 3D Mesh Assets via Laplace–Beltrami Spectral Embedding." (Submitted to 2026 ACM Multimedia; supervised by Prof. [Daniel Cremers](#)).
8. Kang, Xueyang, et al. "Robust Convex Decomposition-based Mesh Reconstruction from the Point Cloud." (Submitted to 2026 NeurIPS, supervised by [Prof. Matthias Niessner](#)).

PUBLIC PUBLICATIONS (1st Author)

9. Kang, Xueyang. Geometric Deep Learning (PhD Thesis). KU Leuven and the University of Melbourne. [[Project Link](#)].
10. Kang, Xueyang, et al. "Hierarchical Point-Patch Fusion with Adaptive Patch Codebook for Shape Anomaly Detection." *CVPR 2026* (CORE A*; supervised by [Prof. Liangliang Nan](#)).
11. Kang, Xueyang, et al. "Look Beyond: Two-Stage Scene View Generation via Panorama and Video Diffusion." *ACM MM 2025* (CORE A*, Oral). [[Paper](#)].
12. Kang, Xueyang, et al. "Equi-GSPR: Equivariant SE(3) Graph Network Model for Sparse Point Cloud Registration." *ECCV 2024* (CORE A*, Oral, Top <2% of 8300 submissions). [[Springer](#)] [[Poster](#)].
13. Kang, Xueyang, et al. "Adaptive Sampling-based Particle Filter for Visual-inertial Gimbal in the Wild." *ICRA 2023* (CORE A). [[Full Paper](#)] [[Demo](#)].
14. Kang, Xueyang, Shengjiong Yin, Yinglong Feng. "3D Reconstruction & Assessment Framework based on Affordable 2D LiDAR." IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2018, pp. 292–297 (Oral Presentation). [[IEEE Link](#)].
15. Kang, Xueyang, et al. "Surfel-based 3D Registration with Equivariant Features." *CVPR 1st Equi-Vision Workshop; IEEE IGARSS 2025*. [[Poster](#)].
16. Kang, Xueyang, et al. "Multi-view Geometry-Aware Diffusion Transformer for Indoor Novel View Synthesis." *ICLR 2025 Workshop; IJCNN 2025* (Oral). [[Paper](#)].
17. Kang, Xueyang, et al. "FocDepthFormer: Transformer with Latent LSTM for Depth Estimation from Focal Stack." *AJCAI 2024* (Oral). [[Paper](#)].s

18. Preprint (1st Author and Co-author)

1. Kang, Xueyang, Shunying Yuan. "Robust Data Association for Object-Level Semantic SLAM." arXiv preprint, 2019. [[arXiv:1909.13493](#)]

2. Feng, Yinglong, Shuncheng Wu, Okan Köpüklü, **Kang, Xueyang**, Federico Tombari. "*Unsupervised Monocular Depth Prediction for Indoor Continuous Video Streams.*" arXiv Preprint, 2018. [<https://arxiv.org/pdf/1911.08995>]

PATENTS (1st Inventor)

19. **Xueyang Kang**, Leixu, et al. "Simultaneous Localization and Mapping using Cameras Capturing Multiple Spectra of Light." PCT patent (PCT/CN2020/119769, US20230177712A1).
20. **Xueyang Kang**, Shunying Yuan, et al. "Integrated visual-inertial odometry and image stabilization for image processing." PCT patent (PCT/CN2021/070099, US20230421902A1).
21. **Xueyang Kang**, et al. "Vision-based 3D obstacle groundline fusion framework." CN1155123.

HOBBIES & INTERESTS

Chess, Movies, Football, Table Tennis, Music, Hiking, Reading, Drawing, Piano, Traveling