Peifeng Jiang

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Research Interests: SLAM, Embodied AI, 3D Gaussian Splatting, Robot Perception

Education

- **Peking University (PKU)** *Sep. 2023 – Jun. 2026 (Expected)*
  M.Sc. in Computer Application Technology Beijing, China
  - **GPA: 3.95/4.0 | Rank: 1/83**
  - **Honors:** Peking University Academic Excellence Scholarship (2023–2024).
- **Dalian University of Technology (DUT)** *Sep. 2019 – Jun. 2023*
  B.Eng. in Software Engineering Dalian, China
  - **GPA: 3.72/4.0 | Rank: 8/382 (Top 2%)**
  - **Honors: National Scholarship** (Highest honor for undergrads in China, awarded to Top 0.2%); Outstanding Graduate of DUT; First Class Academic Scholarship (2x).
  - **English Proficiency:** CET-6: 541 (Working Proficiency).

Publications & Manuscripts

- **A Unified End-To-End Network for Category-Level & Instance-Level Object Pose Estimation**
  • **Led the algorithm deployment on physical robots** to validate real-world performance and generated comprehensive visualizations for qualitative analysis.
  Jiale Ren, Hong Liu, Jinfu Liu,* ***Peifeng Jiang****, Accepted by* ***ICRA-25*** *Accepted*
- **Debiased Multiplex Tokenizer for Efficient Map-Free Visual Relocalization**
  • **Designed the learnable rotation representation module** to optimize orientation regression stability.
  Wenshuai Wang, Hong Liu , Shengquan Li,* ***Peifeng Jiang****, Runwei Ding, Accepted by* ***AAAI-26*** *Accepted*
- **Object-oriented Novel Visual Odometry Architecture: An Exploratory Study**
  Peifeng Jiang, Junyin Qiu, Guowei Wu, Hong Liu (ACAIT-2023)* **Oral Presentation**
- **TAMBRIDGE: Bridging Frame-Centered Tracking and 3D Gaussian Splatting for Enhanced SLAM**
  Peifeng Jiang, Hong Liu, Xia Li, Ti Wang, Fabian Zhang, Joachim M. Buhmann, ArXiV 5 citations*
- **Uncertainty-Driven 3D Gaussian Splatting for Robust Real-Time RGB-D SLAM**
  Peifeng Jiang, Hong Liu, Xia Li, Joachim Buhmann, Submitted to* ***TASE*** *Under Review*
- **One Field to Rule Them All: A Unified 3DGS Representation for Perception, Memory, and Planning**
  Peifeng Jiang, Hong Liu, Xia Li, Jin Jin, Joachim Buhmann, In preparation for* ***RSS-26*** *Drafting*

Research Experience

- **Gaussian Memory Field for Multimodal Embodied Perception** *Research Assistant*
  National Key R&D Program of China
  - **Proposed** a novel 3D scene representation, the "Gaussian Memory Field," addressing limitations in interpretability and fidelity of existing maps.
  - **Engineered** a lightweight, high-fidelity, semantic-aligned scene model by embedding semantic, spatial, and temporal constraints from textual queries into 3D Gaussian Splatting (3DGS).
  - **Demonstrated** significant improvements in robot execution, memory recall, and scene understanding, enabling precise navigation and high-level intent comprehension.
- **μSLAM: Uncertainty-Driven Dense 3DGS-SLAM** *Lead Algorithm Developer*
  National Key R&D Program of China
  - **Constructed** a robust, real-time SLAM system (>30 FPS) based on 3DGS, achieving SOTA performance in tracking accuracy and reconstruction quality.

- **Devised** an uncertainty-driven framework explicitly modeling the confidence of Gaussian primitives. This guides information-theoretic keyframe selection and a confidence-modulated adaptive optimizer to suppress local noise.
- **Designed** a novel coarse-to-fine loop closure detection mechanism, enabling high-precision relocalization without external models.

- **TAMBRIDGE: Robust Humanoid SLAM via Neural Rendering** *Lead Researcher*
  NSFC: Autonomous Learning Mechanism for Multi-Robot Perception
  - **Addressed** localization failures in humanoid robots caused by motion jitter and motion blur by proposing a robust neural rendering SLAM system.
  - **Implemented** a "Cumulative Opacity Voting" mechanism to precisely remove outlier Gaussians and mitigate catastrophic forgetting.
  - **Optimized** camera pose and scene representation via a geometric-photometric alternating strategy. Achieved a **20% increase** in reconstruction accuracy on the TUM-RGBD dataset while maintaining real-time performance (10 FPS).

- **High-Performance Parallel SLAM Framework** *Undergraduate Researcher*
  NSFC: Shenzhen Stability Support Project
  - **Architected** a general-purpose parallel computing framework for SLAM inspired by the Von Neumann architecture to resolve real-time bottlenecks in complex algorithms.
  - **Decomposed** SLAM algorithms into independent "atomic operations" reorganized into a parallel "instruction pipeline," maximizing multi-core CPU efficiency.
  - **Achieved** a **250% performance boost** for mainstream algorithms (e.g., ORB-SLAM) on standard i5 processors without compromising localization accuracy.

Engineering & Funded Projects

- **Text-Driven Simulation Scene Generation** | *Guangdong Flagship Project* *Technical Lead*
  - **Defined** the technical architecture for end-to-end scene generation driven by natural language.
  - **Integrated** Unreal Engine (UE) with 2D Gaussian Splatting to automate the construction of high-fidelity 3D scenes from textual descriptions.

- **Intelligent Dual-Arm Nursing Robot System** | *National Key R&D Program* *Core Developer*
  - **Developed** embodied AI algorithms for the "Gaussian Memory Field," enabling environment understanding and natural language interaction.
  - **Deployed** the system on the DashGo platform, closing the loop between perception, decision-making, and interaction in nursing scenarios.

- **Multi-Robot Distributed Perception** | *NSFC Project* *System Architect*
  - **Built** a cluster experimental platform using DashGo robots and designed a distributed communication interface within ROS.
  - **Formulated** a collaborative visual localization algorithm based on co-visibility, significantly enhancing cluster robustness in complex environments.

- **Unmanned Supermarket Navigation** | *Shenzhen Stability Support Project* *Algorithm Engineer*
  - **Implemented** a Visual-Inertial Odometry (VIO) algorithm optimized for dynamic, complex supermarket environments.
  - **Fused** 2D LiDAR and occupancy grids into a multi-sensor framework, overcoming challenges posed by dynamic obstacles and lighting changes.