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Shaohui Liu

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RESEARCH INTEREST

My research interests span the area of 3D computer vision, with strong connections to robotics, graphics, and computational photography. I focus on visual perception and spatial intelligence for real-world vision and robotic systems, from geometric localization and mapping to semantic and spatial understanding.

EDUCATION

ETH Zurich, Department of Computer Science Oct 2022 – Present
PhD student in Computer Science, Advised by Prof. Marc Pollefeys
Thesis title: "Geometric Mapping and Localization in Man-made Structured Environments"

ETH Zurich, Department of Computer Science Sep 2020 – Sep 2022
Master's in Computer Science, part of the direct doctorate program at ETH Zurich

Tsinghua University, Department of Electronic Engineering Aug 2015 – Jun 2020
Bachelor of Engineering in Electronic Engineering Top 5% (GPA: 3.75/4.0)

EXPERIENCE

Microsoft – Zurich, Switzerland Apr 2026 – Jun 2026
[Researcher Intern] Microsoft Spatial AI Lab
· Topic: Spatial cognitive maps for visual-language models.

Google – Zurich, Switzerland Jul 2024 – Dec 2024
[Student Researcher] Visual Mapping Group at Google Geo.
· Topic: Tokenizing 3D neural maps for memory-efficient visual localization.

ByteDance Inc. – Beijing, China Jan 2020 – Sep 2021
[Research Intern] Group "SLAM & 3D Vision".
· Topic: 3D tracking and estimation for daily smartphone videos. [7] [8]

ETH Zurich - Zurich, Switzerland Jul 2019 – Nov 2019
[Academic Guest] Computer Vision and Geometry Group (CVG). Led by Prof. Marc Pollefeys.
· Topic: 3D reconstruction (structure-from-motion, differentiable rendering) [5]

Microsoft Research Asia - Beijing, China Dec 2018 – May 2019
[Research Intern] Visual Computing Group.
· Topic: Improving deep learning architecture design for object recognition, detection and segmentation. [3]

University of Pennsylvania [Remote] – Philadelphia, PA, United States / Beijing, China Jul 2018 – Feb 2019
GRASP Lab. Advised by Prof. Jianbo Shi.
· Topic: Deep learning for 3D vision & generative modeling [2]

Tsinghua University – Beijing, China Sep 2017 – Sep 2018
Intelligent Vision Group (IVG). Advised by Prof. Jiwen Lu.
· Topic: Deep learning for 3D vision & generative modeling [1]

SenseTime – Beijing, China Jun 2017 – Mar 2018
[Research Intern] Group "Video Intelligence" (camera department).
· Major developer of an online real-time system for face tracking and identification (shipped).

July 17, 2026

PUBLICATIONS

[Publications]: (* indicates equal contribution) [GitHub] [Google Scholar]

[20] **Shaohui Liu**, Rémi Pautrat, Daniel Barath, Richard Hartley, Viktor Larsson, Marc Pollefeys, "Stable and Scalable Bundle Adjustment of Holistic 3D Structures". In ECCV, 2026.

[19] Ahmetcan Yavuz*, Alpay Ozkan*, Rémi Pautrat, **Shaohui Liu**, Marc Pollefeys, "Pixel-wise Planarity for High-Precision Monocular Plane Segmentation". In ECCV, 2026

[18] François Costa*, Raphael Kreft*, Felix Möller, Hardik Shah, Ramanathan Rajaraman, Eckhard Goedeke, **Shaohui Liu**, Rémi Pautrat, Marc Pollefeys, "Unified and Efficient Point-Line Local Features". In ECCV, 2026

[17] Gustav Hanning, **Shaohui Liu**, Rémi Pautrat, Marc Pollefeys, Kalle Åström, Viktor Larsson, "PolyLayout: Multi-room Manhattan Layout Estimation". In ECCV, 2026.

[16] Anusha Krishnan*, **Shaohui Liu***, Paul-Edouard Sarlin*, Oscar Gentilhomme, David Caruso, Maurizio Monge, Richard Newcombe, Jakob Engel, Marc Pollefeys, "Benchmarking Egocentric Visual-Inertial SLAM at City Scale". In ICCV, 2025 (Highlight).

[15] Yifan Yu, **Shaohui Liu**, Rémi Pautrat, Marc Pollefeys, Viktor Larsson, "Relative Pose Estimation through Affine Corrections of Monocular Depth Priors". In CVPR, 2025 (Highlight).

[14] Siyan Dong*, Shuzhe Wang*, **Shaohui Liu**, Lulu Cai, Qingnan Fan, Juho Kannala, Yanchao Yang, "Large-Scale Training of Relative Camera Pose Regression for Generalizable, Fast, and Accurate Visual Localization". In CVPR, 2025.

[13] **Shaohui Liu***, Yidan Gao*, Tianyi Zhang*, Rémi Pautrat, Johannes Schönberger, Viktor Larsson, Marc Pollefeys, "Robust Incremental Structure-from-Motion with Hybrid Features". In ECCV, 2024.

[12] Lei Li, Songyou Peng, Zehao Yu, **Shaohui Liu**, Rémi Pautrat, Xiaochuan Yin, Marc Pollefeys, "3D Neural Edge Reconstruction". In CVPR, 2024.

[11] Petr Hruby, **Shaohui Liu**, Rémi Pautrat, Marc Pollefeys, Daniel Barath, "Handbook on Leveraging Lines for Two-View Relative Pose Estimation". In 3DV, 2024 (Spotlight).

[10] Rémi Pautrat, **Shaohui Liu**, Petr Hruby, Marc Pollefeys, Daniel Barath, "Vanishing Point Estimation in Uncalibrated Images with Prior Gravity Direction". In ICCV, 2023.

[9] **Shaohui Liu**, Yifan Yu, Rémi Pautrat, Marc Pollefeys, Viktor Larsson, "3D Line Mapping Revisited". In CVPR, 2023 (Highlight).

[8] Wang Zhao, **Shaohui Liu**, Hengkai Guo, Wenping Wang, Yong-Jin Liu, "PartcileSfM: Exploiting Dense Point Trajectories for Localizing Moving Cameras in the Wild". In ECCV, 2022.

[7] Wang Zhao*, **Shaohui Liu***, Yi Wei, Hengkai Guo, Yong-Jin Liu, "A Confidence-based Iterative Solver of Depths and Surface Normals for Deep Multi-view Stereo". In ICCV, 2021.

[6] Yi Wei, **Shaohui Liu**, Yongming Rao, Wang Zhao, Jiwen Lu, and Jie Zhou, "NerfingMVS: Guided Optimization of Neural Radiance Fields for Indoor Multi-view Stereo". In ICCV, 2021 (Oral).

[5] **Shaohui Liu**, Yinda Zhang, Songyou Peng, Boxin Shi, Marc Pollefeys and Zhaopeng Cui, "DIST: Rendering Deep Implicit Signed Distance Function with Differentiable Sphere Tracing". In CVPR, 2020.

[4] Wang Zhao, **Shaohui Liu**, Yezhi Shu and Yong-Jin Liu, "Towards Better Generalization: Joint Depth-Pose Learning without PoseNet". In CVPR, 2020.

[3] Ze Yang*, **Shaohui Liu***, Han Hu, Liwei Wang and Stephen Lin, "RepPoints: Point Set Representation for Object Detection", In ICCV, 2019.

[2] **Shaohui Liu***, Xiao Zhang*, Jianqiao Wangni and Jianbo Shi, "Normalized Diversification", In CVPR, 2019.

[1] Yi Wei*, **Shaohui Liu***, Wang Zhao*, Jiwen Lu and Jie Zhou, "Conditional Single-view Shape Generation for Multi-view Stereo Reconstruction", In CVPR, 2019.

· **Open-sourcing – Core contributor and active maintainer of the following libraries:**

colmap – the most popular structure-from-motion software.
limap – mapping and localization support for lines and structural image features.
PoseLib – A collection of minimal solvers for camera pose estimation.
particle-sfm – global structure-from-motion support for dense optical flow correspondences.
pyceres – Python binding support for non-linear optimization.

TECHNICAL SKILLS

Programming: C/C++, CUDA, Python, MATLAB, R, HTML/CSS, JavaScript, SQL, Verilog, LaTeX, Linux/Unix
Language: Mandarin (native), English (fluent), German (basic)