Tianyi Song

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EDUCATION

9/2024–7/2028 University College London (UCL) London, UK
PhD, majoring in Computer Science
Research Direction: Navigation and 3D reconstruction of surgical robots in endoscopic scenes

9/2021–7/2024 Southeast University (SEU) Nanjing, China
Master of Engineering, majoring in Electronic Information
GPA: 3.8/4.0, Average Score: 89.64/100, Top 5%
Relevant Courses: Numerical Analysis, Analysis of Complex Networks and Social Networks, Artificial Intelligence and Machine Learning, Pattern Recognition, Algorithm Design and Analysis

9/2017–7/2021 Nanjing University of Posts and Telecommunications (NJUPT) Nanjing, China
Bachelor of Engineering, majoring in Communication Engineering
GPA: 4.04/5.0, Average Score: 90.04/100, Top 10%
Relevant Courses: Mathematical Analysis, Numerical Analysis, Communication Principles, Signals and Systems, Analog/Digital Circuits, Computer Communication Network, Wireless Communications Principles, Digital Signal Processing, Optical Fiber Communication System

ACADEMIC PROJECTS

12/2025–5/2026 Project Title: Online Deformable SLAM and 3D Reconstruction in Robotic Surgery
Paper Name: Track2Map: Online Deformable SLAM with Motion-Aware Pose Optimization in Robotic Surgery
First Author

- Proposed Track2Map, an online 3D Gaussian Splatting-based deformable SLAM pipeline for robot-assisted minimally invasive surgery, jointly optimising camera trajectory and deformable 3D scene representation from surgical stereo video.
- Designed a motion-aware pose optimisation strategy using dense 2D point tracks to detect camera-static periods, reduce trajectory drift, and disentangle camera motion from tissue deformation.
- Introduced tracker-guided deformation initialisation by lifting dense 2D correspondences to 3D anchors and using them to initialise sparse anchor-based deformation for online mapping.
- Demonstrated robust reconstruction and pose recovery on StereoMIS under clean, noisy, and absent pose priors, outperforming competing SLAM and deformable 3DGS baselines.

Outcome: Accepted by MICCAI 2026 (International Conference on Medical Image Computing and Computer Assisted Intervention, CCF-B), May 2026.
Project website/code: https://track2map.github.io/

10/2025–7/2026 Project Title: 3D Reconstruction in Endoscopic Scenes
Paper Name: Diff2DGS: Reliable Reconstruction of Occluded Surgical Scenes via 2D Gaussian Splatting
First Author

- Designed a two-stage 3D reconstruction framework for endoscopic scenes, utilising a diffusion model to recover occluded surgical areas before reconstructing dynamic endoscopic scenes with 2D Gaussian Splatting and flexible deformation modelling.
- Addressed artifacts in occluded-region restoration and improved reconstruction quality in challenging endoscopic surgical scenes with tool occlusions and limited viewpoints.

Outcomes: Achieved SOTA PSNR, LPIPS, RMSE, and SSIM scores on the EndoNeRF, Stereo, and SCARED datasets.
Publication Status: Accepted by IEEE Robotics and Automation Letters (IEEE RA-L, 中科院二区 TOP)

5/2025–7/2026 Project Title: Image Shadow Removal
Paper Name: Shadeoff: A SAM-Integrated Diffusion Framework for High-Fidelity Shadow Removal
Second Author

- Devised an adaptive input perturbation strategy tailored to accelerate iterative diffusion-model training for image shadow removal.
- Integrated SAM-based segmentation priors with a diffusion framework to improve high-fidelity shadow removal performance.

Outcomes: The optimised diffusion model performed well on the ISTD/SRD datasets.

Publication Status: Accepted by IEEE Transactions on Consumer Electronics (IEEE TCE, 中科院一区).

3/2023–2/2024 Project Title: Continuous Story Visualisation

Paper Name: Causal-Story: Local Causal Attention Utilising Parameter-Efficient Tuning for Visual Story Synthesis
First Author

- Designed a local causal attention mask combined with latent diffusion to improve contextual causal relationship modelling; proposed a lightweight adapter for efficient parameter tuning.

Outcomes: The model obtained SOTA FID scores on the PororoSV and FlintstonesSV datasets.
Publication Status: Accepted by IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2024).

ACADEMIC SERVICE

2026 IMed Challenge, MICCAI 2026

Challenge Organizer

- Participated in organising the IMed Challenge at MICCAI 2026, supporting challenge planning and community engagement in medical image computing.

Website: https://imed-challenge.github.io/

RESEARCH PROJECTS

6/2023–6/2024 Interactive Chinese-style Face Image Generation for Open-Ended Text (Master's Graduation Design) Nanjing, China

Independent Researcher

- Constructed a Chinese text–Chinese face image dataset specifically for text-to-image tasks.
- Designed a multi-layer diffusion model to achieve high-definition and high-quality face image generation by fusing text and image features.
- Developed a dynamic memory network to enable interactive modifications of generated face images.

12/2022–5/2023 Twin Modeling Techniques for Typical Abnormal Scenarios Nanjing, China

Student Member

- Investigated abnormal issues in power grid control systems and summarised their characteristics.
- Classified data anomalies into data submission anomalies, parameter configuration anomalies, and data fluctuations.
- Completed the project proposal and technical report for a data anomaly analysis and warning system in the power grid control system.

12/2020–6/2021 Sports Image Scene Recognition based on Convolutional Neural Networks (Undergraduate Graduation Design) Nanjing, China

Independent Researcher

- Constructed a sports-related scene dataset and trained a ResNet50-based classifier, achieving an optimised Top-5 accuracy of 85.08% on the test set.
- Developed a Django-based prototype system for image uploading, backend recognition, and frontend display of recognition results.

5/2019–6/2020 Mechanical Instrument Information Acquisition System Nanjing, China

Leader

- Utilised YOLOv5 for object detection in instrument images and OpenCV for image processing to enhance recognition accuracy.
- Designed instrument pose estimation and correction algorithms based on Hough detection to address tilting and rotation during image capture.
- Completed writing and application for the granted utility model patent "An Instrument Information Collector Based on Image Recognition".

1/2018–2/2018 Short-term Visiting Program San Francisco, U.S.

- Completed a short-term visiting program at Stanford University and the University of California, Berkeley, with courses and activities related to computer science, image recognition, semantic segmentation, and NVIDIA frontier sharing.

PATENTS

Utility Model Patents:

- 05/2020 An instrument information collector based on image recognition
- 05/2020 A highly sensitive, large-sized screen touch gesture capturing device

- 05/2020 A three-dimensional scene remote controller designed for Android smartphones

WORKING EXPERIENCE

1/2025–6/2026 University College London London, UK

Teaching Assistant

- Responsible for classroom teaching, course experiment design, and courseware development for UCL computer course COMP0248: Object Detection and Classification .

7/2023–9/2023 & 7/2022–9/2022 Nanjing Research Institute, Huawei Technologies Co., Ltd. Nanjing, China

Algorithm Engineer (Intern)

- Participated in the IPCA project's white-box testing initiative, building the project with CMake and conducting white-box tests using the gtest/mockcpp framework.

AWARDS

10/2024 UCL CDI Innovation Scholarship London, UK
10/2023 Kaggle LLM Science Exam, Bronze Medal, 241/2664 TOP 10% Nanjing, China
10/2022 First-class Scholarship, SEU Nanjing, China
10/2022 Three Good Graduate Student Title, SEU Nanjing, China
8/2022 Second Prize from Jiangsu Post-Graduate Mathematical Contest in Modelling Nanjing, China
10/2021 Second-class Scholarship, SEU Nanjing, China
11/2019 First Prize, China Undergraduate Mathematical Contest in Modelling Nanjing, China
9/2019 Award for Excellence in Social Work, NJUPT Nanjing, China
9/2018 Spiritual Civilisation Award, NJUPT Nanjing, China
9/2018 Third-class Scholarship, NJUPT Nanjing, China

EXTRACURRICULAR ACTIVITY

9/2018–9/2019 News and Publicity Department, Student Union, School of Communication and Information Engineering Nanjing, China

Student Leader

- Organised and coordinated major events at the School of Communication and Information Engineering.
- Recorded event proceedings, prepared news articles, captured photographs for promotional and archival purposes, and managed the College's official website.

ADDITIONAL SKILLS

IT Skills

- Programming: Python, C++, C, MATLAB, and SPSS.
- Deep learning frameworks: PyTorch and TensorFlow.
- Research expertise: diffusion models, 3D/2D Gaussian Splatting, SLAM, 3D reconstruction, generative adversarial networks (GANs), convolutional neural networks (CNNs), image restoration, and multimodal generation.

Languages

- Chinese: Native
- English: Fluent (CET-6, IELTS 7.0)

Certifications

- National Computer Rank Examination, Certificate of Level 2