

Education

University of Pennsylvania

Sep 2025 - Aug 2026

Visiting PhD Student

GRASP Lab · Advisor: Prof. Kostas Daniilidis

ShanghaiTech University

Sep 2021 - Jun 2027

PhD Student in Computer Science

Research interests: Visual Localization · 3D Reconstruction · Robotic Perception

Advisor: Prof. Laurent Kneip

ShanghaiTech University

Sep 2017 - Jun 2021

B.Eng. in Computer Science

Selected Research

I Multi-View Geometry & Egomotion Estimation

Camera Motion Estimation from Point Feature Tracks

Oct 2025

ICCV 2025 Highlight · First author

- Modelled how point tracks relate to camera motion in space-time and derived its solver: observations carry their own timestamps with no common sampling instant, covering global-shutter, rolling-shutter and event cameras.
- Implemented in C++ and Eigen with Schur-complement elimination, jointly estimating camera velocity and 3D points, RANSAC rejecting track outliers for a full path from minimal solution to robust estimate; code open-sourced.
- The same framework yields five-point, eight-point and line-based solvers under different constraints, covering both point and line primitives; a separate Ceres module estimates IMU angular rates for motion initialization.

Linear N-Point Solver for Line and Motion

Jun 2024

CVPR 2024 Oral · Third author

- A singularity-free three-DoF line parameterization makes the incidence relation linear in the unknowns, solved by SVD null space; this removes polynomial root finding and admits five or more observations per line.
- Accuracy, numerical stability and efficiency all improve and stay robust under pixel, timestamp and gyroscope noise; GC-RANSAC handles outlier rejection and inlier refinement, verified on real VECtor sequences.

Five-Point Solver for Line-Based Motion

Oct 2023

ICCV 2023 Oral · Co-first author

- Modelled the spatio-temporal structure linking line features to camera motion, replacing the earlier planar approximation; without an accurate model, line extraction and motion estimation stayed coupled and accuracy was capped.
- A five-point minimal solver estimates 3D line parameters and per-line velocity components under known rotation, then fuses several lines into full camera translation; 100% success on VECtor against 23-70% for closed-form solvers.

Event Flow-IMU velocity estimation for VIO initialization (ongoing)

Mar 2026 - Present

- Depth priors with event optical flow and IMU for velocity estimation, VIO initialization and observability analysis.

I Learning-Based Matching & 3D Reconstruction

Match-Any-Events: Zero-Shot Cross-Modal Matching

Jun 2026

ECCV 2026 · Second author

- In low light, motion blur and wide viewpoint change, where image matching fails: cross-modal zero-shot matching (event-to-event, event-to-image) on a DINOv3-pretrained ViT with multi-timescale fusion and sparsity-aware attention.
- Over 20% better than VGGT and MatchAnything on event matching, 50 Hz inference; object pose estimation and COLMAP sparse reconstruction built on the matches. Python/PyTorch, three days on H100, implementation and weights open-sourced.

3DGS event-camera synthetic data generation and auto-labelling

Oct 2024 - Jan 2025

- Too little public event data exists to train on, so built a reusable synthetic data system: 3DGS rebuilds real indoor scenes and trajectories generated around the originals render novel RGB views across varied motion.
- A video-to-events network converts the renders to event streams, with FlowFormer and CoTracker auto-generating dense optical-flow and point-track pseudo labels; both dataset scale and scene mix extend on demand.

I Real-Time Visual Localization & Optical Communication

Visual Localization and Communication Under Motion

Nov 2024

IEEE Robotics and Automation Letters, Presented at ICRA 2025 · First author

- A dynamic marker any electronic screen can display, with event-camera detection, tracking, asynchronous pose optimization and decoding, lets a moving camera localize itself and receive data at the same time.
- Built an event-camera capture platform with motion-capture ground truth as a labelled evaluation set; centimetre-level accuracy and about 1% pre-FEC bit error under fast handheld motion, static throughput on the order of 100 Kbps.

Real-time indoor pose estimation and data transmission (ongoing)

2024 - Present

- Redesigned the visual coding and reworked the implementation on top of the previous system, improving both runtime efficiency and effective working range; implemented in C++ and ROS for real-time indoor operation.
- Centimetre-level localization with 300 Kbps real-time communication indoors, demonstrated live.

I Other Research

Denoised internal models: a brain-inspired autoencoder against adversarial attacks

Oct 2022

Machine Intelligence Research

- Two-stage generative model pairing input denoising with class-conditional reconstruction for adversarial robustness.
- Outperformed contemporary methods in overall robustness across 42 attacks while retaining efficient inference.

Reviewer: CVPR, NeurIPS, ECCV, BMVC, ICRA, IROS, IEEE T-RO, IEEE T-MECH, IEEE RA-L

🧰 Experience

Changan Automobile (Chongqing, China)

Aug 2021

Intern at Autonomous Driving Group

- Reviewed internal autonomous-driving solution and test-scenario documentation and sat in on design discussions.

ShanghaiTech University

2020 - 2022

Teaching Assistant

Machine Learning; Introduction to Programming; Computer Architecture

🏆 Honors and Awards

Outstanding Student (Top 10%)

2022, 2024, 2025

Merit Student (Top 5%)

2023

Outstanding Thesis (Top 5%)

Jul 2021

Second Prize, Shanghai, China Undergraduate Mathematical Contest in Modeling

2020

First Prize, National Olympiad in Informatics in Provinces (NOIP)

Nov 2015

🧰 Skills

Languages: C++, Python

Tools & Frameworks: PyTorch, Linux, ROS, OpenCV, NumPy, Eigen, Ceres, CMake, COLMAP, Git, Pixi