

Xiangjian “Shawn” Liu

Research Engineer · neurosymbolic AI, secure ML inference, and LLM systems that ship

(510) 565-2523 · xl3704@columbia.edu · linkedin.com/in/xiangjian-shawn-liu · github.com/ShawnnnLiu · shawnnnliu.github.io

EDUCATION

Columbia University — M.S. in Computer Science

Incoming Fall 2026 · Expected Jan 2028

University of California, Irvine — B.S. in Computer Science, GPA 3.84 / 4.0

Jun 2026

Dean's Honor List — all quarters (2022–2026).

PUBLICATIONS & MANUSCRIPTS

★ = first author

★ Brain-Inspired Reasoning under Homomorphic Encryption

IEEE TAI · under review

Liu, X. (first author). Controlled homomorphic encryption for secure neurosymbolic reasoning.

★ HyperEncrypt: Homomorphic Hyperdimensional Computing for Efficient & Secure Learning

IEEE TAI · under review

Liu, X. (first author). Encrypted HDC learning with bootstrapping-aware operator design.

Cross-Modal Event Encoder: Bridging Image–Text Knowledge to Event Streams

WACV 2026 · accepted

Liu, X. (co-author). Contributed CLIP–event contrastive integration and attention-rollout visualization.

Integrating Symbolic & Neural Mechanisms for Adversarially Robust HDC

ISLPED 2026 · accepted

Liu, X. (co-author). Contributed robustness evaluation and symbolic–neural encoding experiments.

Geometric Priors for Generalizable World Models via Vector Symbolic Architecture

NeurIPS 2025 · NeurReps Workshop

Liu, X. (co-author). Contributed VSA representation experiments and ablations.

Optimal Hyperdimensional Representation for Learning & Cognitive Computation

Frontiers in AI · accepted

Liu, X. (co-author). Contributed encoding-dimension analysis and evaluation.

RESEARCH EXPERIENCE

BiasLab, UC Irvine — Undergraduate ML Researcher (Advisor: Prof. Mohsen Imani)

Jun 2024 – Present

- Extended CLIP to event-based vision via contrastive learning for zero-shot video anomaly detection — **57.7 / 64.1 / 54.4 AUC** on XD-Violence / UCF-Crime / ShanghaiTech (**+5.5 and +5.2 pts** over frame-based zero-shot CLIP on the latter two); built the attention-rollout visualization pipeline for qualitative analysis. (WACV 2026)
- Engineered CKKS-FHE secure inference for graph neural networks in Microsoft SEAL with a distributed, noise-adaptive bootstrapping scheme — **~4× lower bootstrapping overhead** at **>90% encrypted-inference accuracy**, enabling inference over sensitive graph data without decryption. (IEEE TAI, under review)
- Implemented hyperdimensional computing (HDC) encoders in PyTorch with the surrounding training / validation pipelines, plus Generalized Holographic Reduced Representations (GHRR) for encrypted-domain reasoning.
- Built a pose-estimation + symbolic-reasoning model (PyTorch) for autonomous UAV carrier landing with the **U.S. Navy**, cutting simulated **landing-failure rate (incl. onboard-crew collision events)** **65%** vs. legacy fixed-pattern optical markers in adverse-weather tests.

BioIntelligence Lab, UC Irvine — Undergraduate ML Researcher (Advisor: Dr. Haleh Alimohamadi)

Dec 2025 – Present

- Built a graph convolutional network (GCN) modeling peptide 3D structure — each amino-acid residue a node — for spatial learning and graph-level property prediction.
- Developed a structure-aware minimum-inhibitory-concentration (MIC) prediction workflow fusing ESMFold-predicted structures with SVM geometric descriptors.
- Ran ablations isolating 3D conformation's contribution — curvature-only vs. curvature + structure fusion — to quantify how peptide geometry drives antimicrobial potency.

Softcom Labs, Cal Poly Pomona — Student Researcher

Dec 2020 – Apr 2021

- Built a real-time audio recognition and alarm system (lightweight CNN over Mel-spectrogram input, **95% classification accuracy**) deployed near-sensor on Raspberry Pi, with a Firebase + Flutter app published to the Google Play Store.

ENGINEERING PROJECTS

Loop — LLM-Powered Scheduling Agent Python · FastAPI · React/TS · Anthropic API · [Fly.io](#)

Live

- Architected a “LLMs propose, deterministic code disposes” system: five LLM nodes (Opus 4.8 / Sonnet 5 / Haiku 4.5) draft plans and structured extractions, while every calendar write clears a deterministic **validation** → **human-approval** → **rollback** pipeline (LLM SDK import-fenced so it can't run outside its package).
- Built a five-stage validator (schema, graph, coverage, user-fit, scheduling) returning typed repairs to the model (≤ 2 retries), and a single write-manager that rechecks approval + payload hash, dry-runs, dedupes, and verifies post-write with rollback.

- Grounded the planner with a **BM25 retrieval layer** over a curated career-prep corpus: 75-query labeled evalset across 6 career tracks graded against a pinned snapshot (**recall@5 0.90 / MRR 0.85** regression floors); ablated a hybrid dense-embedding variant (+0.08 MRR) and kept BM25 to avoid a second provider in the serving path.
- Shipped a **recordings-based eval harness**: CI re-grades committed LLM outputs deterministically and version-pins prompt bytes so unmeasured prompt changes fail the build; **3,900+ tests green** (3,773 backend in CI + 169 frontend), per-user LLM spend hard-capped in code (\$8/mo ceiling, ~\$1.70 expected).

Neurosymbolic Crash Anticipation VideoMAE · YOLO11n · ByteTrack · PyTorch (code)

- Distilled a **2.95M-param** dashcam student model from a VideoMAE teacher, streaming at **408 fps (RTX 5070 Ti)** for real-time deployment.
- Added a symbolic layer (multi-object tracking + monocular collision geometry) that grounds every alarm in a specific tracked vehicle, issuing an auditable advisory ~3 s before impact rather than an opaque risk score.

Generalizable Arrhythmia Detection 1D-CNN · LSTM-AE · MIT-BIH (code)

- Demonstrated that conventional beat-wise splits leak patient identity and inflate reported ECG accuracy, then built an optimal **patient-wise split search** for deployment-realistic evaluation — prioritizing honest generalization over headline numbers.

PROFESSIONAL EXPERIENCE

AdamsFoods — Full-Stack Contractor (adamsfoodswholesale.com)

Summers 2024 & 2025

- Built and shipped a **live** wholesale e-commerce platform (React, Node / Express) with S3 signed-URL media and JWT role-guarded admin routes, serving real customers today.
- Developed an internal livestock-distribution management system (CRUD, search / filter, low-stock alerts, CSV export, 3D warehouse map) tracking **300+ SKUs** and synced to the storefront — replacing handwritten logs and saving staff **5–7 hrs/week**.

Commit the Change, UC Irvine — Full-Stack Developer

Nov 2023 – Jun 2024

- Delivered pro-bono donation-tracking and authentication software for the non-profit Feeding Pets of the Homeless, coordinating with chapter leads across an agile, cross-functional team (React, Firebase, SQL, Git).

TEACHING & LEADERSHIP

Certified Learning Assistant — ICS 33: Intermediate Python (Prof. Alex Thornton)

Apr 2025 – Jun 2025

- Supported students in lecture and lab as a certified peer educator (UNI STU 176: LA Pedagogy), facilitating metacognitive, active-learning practice and weekly planning with faculty and TAs.

SKILLS

Languages: Python, C / C++, Java, TypeScript / JavaScript, SQL, R

ML / AI: PyTorch, TensorFlow, scikit-learn, CLIP · ViT · VideoMAE, GNNs / GCNs, Hyperdimensional Computing, Contrastive Learning, Knowledge Distillation, ESMFold

Secure ML: CKKS Fully Homomorphic Encryption (Microsoft SEAL), bootstrapping-aware operator design, encrypted inference

LLM & Eval: Anthropic API, BM25 / retrieval evaluation (recall@k, MRR), eval harnesses & CI regression gates, structured outputs, bounded repair loops, prompt versioning

Systems & Infra: React, Node / Express, FastAPI, Pydantic v2, PostgreSQL, MongoDB, Firebase, AWS S3, Fly.io, Git / CI, JWT / OAuth, Linux, CUDA

Spoken: English (fluent), Mandarin (fluent)