Tuxun Lu

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GitHub: https://github.com/tuxunlu
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Education

UNIVERSITY OF MARYLAND, COLLEGE PARK September 2024 – Present (Expected 2029)
Doctor of Computer Science, Second-year Ph.D. student College Park, MD

- Advised by Dr. Cornelia Fermüller and Dr. Yiannis Aloimonos.
- Research interests: Event-based vision, Dynamic Vision Sensor (Event Camera), neuromorphic computing, and medical image analysis.

JOHNS HOPKINS UNIVERSITY September 2020 - May 2024
Bachelor of Science Baltimore, MD
Double Major: Computer Science, Applied Mathematics and Statistics

- Overall GPA: 3.92/4.0 (Dean's List: 2020-2023)
- Member, Upsilon Pi Epsilon (CS Honor Society).

Technical Skills

- Languages: Python, C++, CUDA, C, MATLAB, R, Java, Shell.
- Deep Learning: PyTorch, MONAI, PyTorch Geometric, PyTorch Lightning, Graph Neural Networks (GNNs), Transformers, State Space Models (SSM).s
- Libraries: OpenCV, NumPy, SciPy, Pandas, scikit-learn, ROS (Robot Operating System)
- HPC & Optimization: Multi-GPU Training, Distributed Data Parallel (DDP), Real-time Inference Optimization.

Publication

- Ding, H., Zhang, Y., Lu, T., Liang, R., Shu, H., Seenivasan, L., ... & Unberath, M. (2024). **SegSTRONG-C: Segmenting Surgical Tools Robustly On Non-adversarial Generated Corruptions--An EndoVis' 24 Challenge**. arXiv preprint arXiv:2407.11906.
- Lu, Tuxun, and Aviva Prins. "**An Online Optimization-Based Decision Support Tool for Small Farmers in India: Learning in Non-stationary Environments.**" arXiv preprint arXiv:2311.17277 (2023).

Research Experience

EVENT CAMERA DE-RAINING IN THE FOURIER DOMAIN October 2025-Present
Graduate Researcher College Park, MD

- Developed an event-based framework to remove visual obstructions (raindrops, snow) from DVS streams for robust perception in adverse weather. Performed 2D FFT on asynchronous event streams and model frequency-domain dynamics using state-space models for robust de-raining with PyTorch.
- Target applications include autonomous driving and outdoor surveillance under severe weather conditions.

EFFICIENT ACTION RECOGNITION WITH EVENT CAMERA September 2025-Present
Graduate Researcher College Park, MD

- Designed parsimonious, online human-gesture recognition methods based on Dynamic Vision Sensor (DVS) data.
- Implemented state space model based architectures over spatio-temporal event clouds for low-latency recognition.

7T MRI PARAMAGNETIC RIM LESION SEGMENTATION IN MULTIPLE SCLEROSIS September 2025-Present
Graduate Researcher College Park, MD

- Built a 3D nnUNet–based pipeline for automatic segmentation of paramagnetic rim lesions (PRLs) on 7T MRI datasets using the NVIDIA MONAI framework, leveraging its specialized data augmentations and inference engines.
- Investigated the effectiveness of two modalities of susceptibility imaging (Phase and GRE) in identifying PRLs.
- Achieved strong lesion-wise Dice/IoU; performed error analysis on small-lesion and class-imbalance regimes.

MAMMOGRAPHY-BASED TERMINAL DUCT LOBULAR UNIT CLASSIFICATION February 2025-Present
Graduate Researcher College Park, MD

- Studied mammograms and histologic annotations to investigate whether imaging-derived features can predict terminal duct lobular unit (TDLU) density—the primary site where most breast cancers originate.
- Built a classification pipeline using multi-view mammography and clinical metadata to model TDLU density as a breast cancer risk marker.

SEGMENT SURGICAL TOOLS ROBUSTLY ON NON-ADVERSARIAL GENERATED CORRUPTIONS April 2023-May 2024
Research Assistant Baltimore, MD

- Collected a multimodal dataset in a simulated surgical environment using da Vinci endoscopes.
- Performed hand-eye calibration of the mounted LiDAR camera. Refined the imprecise point cloud generation and ensured seamless synchronization of LiDAR and endoscope ROS node subscriptions.
- Benchmarked visual transformer models with the combination of various data augmentation methods.
- The dataset aims for publication on Natural Scientific Data, and our benchmark challenge is accepted by MICCAI 2024.

REU RESEARCH INTERN – REINFORCEMENT LEARNING FOR AGRICULTURAL DECISION SUPPORT June 2023-August 2023
Research Intern – Combinatorics, Algorithms, and AI for Real Problems College Park, MD

- Independently studied reinforcement learning theories and online learning in environments with sparse rewards.
- Developed an online RL optimization-based decision support tool to provide crop planning advice to farmers in India.

Teaching

- ***Teaching Assistant**, CMSC 422 Introduction to Machine Learning (UMD, Fall 2024)*
- ***Teaching Assistant**, EN.553.493/693 Mathematical Image Analysis (JHU, Spring 2024)*
- ***Course Assistant**, CS 482/682 Deep Learning (JHU, Fall 2023)*

Projects & Activities

MONOCULAR DEPTH ESTIMATION February 2023-May 2023
Project Leader Baltimore, MD

- Built an unsupervised monocular depth-estimation pipeline from RGB video using two networks for depth and pose, and a photometric reconstruction loss. Implemented in PyTorch with differentiable view synthesis for self-supervision.

HOPHACKS September 2022
Team Member - Hackathon Baltimore, MD

- Won the 2nd prize and Most Innovative Platform to Help with Learning.
- Developed a pipeline utilizing computer vision and machine learning algorithms to remove humans from the blackboard background. Built an online platform called EZnote to automatically generate notes from uploaded lecture videos or real-time streaming.
- Project link