Tuxun (Nick) Lu

3301 Saint Paul St., Baltimore, MD • tlu32@jhu.edu • +1 (443) 2240010

GitHub: github.com/nicklutuxun
LinkedIn: http://www.linkedin.com/in/tuxun-lu-3b2406221/
Website: nicklutuxun.com

Education

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

- Overall GPA: 3.92
- Dean's List: 2020, 2021, 2022, 2023
- Member of Upsilon Pi Epsilon

Researches Experience

JOHNS HOPKINS UNIVERSITY WITH PROF. JEREMIAS SULAM September 2023-Present
Research Assistant Baltimore, MD

- Study the adversarial robustness of neural networks and leverage single-image generative models to defend against adversarial attacks.
- Combine image generative models with the classifier in a way such that *N* images are sampled from the adversarially corrupted image and predict the majority class from these generated images.

RESEARCH EXPERIENCE FOR UNDERGRADUATE (REU) WITH DR. JOHN P. DICKERSON 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.
- First-author paper: **Tuxun Lu**, and Aviva J. Prins. "*An Online Optimization-Based Decision Support Tool for Small Farmers in India: Learning in Non-stationary Environments*" accepted by AAAI 2024 Workshop: *AI to Accelerate Science and Engineering.*

JOHNS HOPKINS UNIVERSITY WITH PROF. MATHIAS UNBERATH April 2023-Present
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 at publication on Natural Scientific Data and we will propose a benchmark challenge at MICCAI 2024.

JOHNS HOPKINS UNIVERSITY WITH DR. ANTON DAHBURA September 2021-September 2023
Research Assistant Baltimore, MD

- Applied optimization skills including (non)linear programming to schedule baseball matches for the league.
- Scheduled games for the independent Frontier Baseball League 2023/2024 and was accepted by the League.
- Maintained the MATLAB code base.
- The poster was presented at Design Day 2022 at Johns Hopkins University.

BLOOMBERG DISTINGUISH PROFESSOR SUMMER PROGRAM WITH PROF. SABINE STANLY June 2022-August 2022
Research Assistant Baltimore, MD

- Ran the simulations based on inputs from various datasets, visualized the results of the simulation, wrote code to obtain specific results from the simulation, and constructed and analyzed time series datasets.
- Characterized external magnetic fields in Earth's magnetosphere of unclear origin which have been found to interfere with vital observations of Earth's internal geomagnetic field.

Independent Projects

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

- Developed a training scheme, leveraging transfer learning, that enables unsupervised learning of monocular depth estimation using only RGB video frames.
- Used two separate DNNs to estimate depth map and transformation matrix respectively between consecutive frames. Using this information, we reproject the image from the current frame onto the next frame, and backpropagate photometric reconstruction loss to train the whole network.
- GitHub, Poster

UNSUPERVISED SEGMENTATION AND LABELING BASED ON MULTIPLE CELL IMAGES February 2023-May 2023
Team Leader Baltimore, MD

- Proposed a novel approach to cell classification by leveraging deep learning and color analysis.
- First pre-process images by applying histogram adjustment and Gaussian filtering. Then, the cellpose algorithm is used to create masks and isolate individual cells. Finally utilize a pretrained ResNet to generate image vectors and apply Kmeans to perform unsupervised clustering.
- Achieve automated cell classification by processing stained cell data.
- Report, GitHub, Slides

BRAIN TUMOR SEGMENTATION AND CLASSIFICATION September 2022-November 2022
Team Leader Baltimore, MD

- Developed a pipeline for brain tumor segmentation and type classification using Kmeans with deep autoencoder and Softmax regression.
- After pre-processing, we input each MRI slice into a Kmeans algorithm and combine clusters to generate the tumor region mask. From the segmentation, we extract three sets of robust features from the tumor region for each slice using information-theoretic measures, wavelet packet Tsallis entropy (WPTE), and scattering transform (ST). Finally, we trained a DAE to learn the compact representation of features and used the Adam optimizer to train the network.
- Report, GitHub, Slides

EZNOTE September 2022
Team Leader Baltimore, MD

- EZnote is an automatic note-taking tool empowered by computer vision and machine learning that aims to enhance learning experiences for students with disability.
- link

Teaching

COURSE ASSISTANT September 2023-Present

CS 482/682 Machine Learning: Deep Learning Baltimore, MD

- Helped to develop exam contents, hosted office hours, and mentored groups of student to complete their final projects successfully.

TEACHING ASSISTANT January 2024-Present

EN.553.493/693 Mathematical Image Analysis Baltimore, MD

Activities

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 blackboard background. Built an online platform called EZnote to automatically generate notes from uploaded lecture videos or real-time streaming.

GREENHACKS 10/22/2021-10/24/2021

Team Member Baltimore, US

- Aimed to address sustaining disruption in natural disasters.
- Developed an algorithm that combines SVI (social vulnerability index) with disaster seriousness index to measure the priorities of regions that should receive aids with visualization of the generated maps.

Skills

- C, C++, Java, Python, Gurobi, JavaScript, Shell scripts, HTML, CSS, R, MATLAB, Git, Conda, Slurm, LINUX/UNIX, LaTeX.
- SciPy, NumPy, PyTorch, Pandas, OpenCV, OpenGL, scikit-learn, Matplotlib, etc.