Luke Liu

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Education

University of Rochester	**Rochester, NY**
Master of Science - Computer Science	*Aug. 2025 – Present*
University of Washington	**Seattle, WA**
Bachelor of Science - Electrical and Computer Engineering	*Sept. 2021 – Mar. 2025*

Publications

- **Luke Liu**, Yinglun Zhang, Hande Küçük McGinty, Muhammad Amith, "A GUI for OBO Foundry's ROBOT Library to Encourage Usability and Adoption", IEEE International Conference on Healthcare Informatics, 2024

Research Experience

BEAR Lab - University of Rochester

Simulation-Based Effort Estimation for Wheelchair VR Interaction — Aug. 2025 – Present
Advisor: Dr. Yukang Yang — *Rochester, NY*

- Developing a simulation-based pipeline to estimate cumulative upper-body effort for wheelchair-constrained VR interaction
- Designed arm-driven VR turning and reach tasks in Unity inspired by manual wheelchair propulsion mechanics
- Integrated OpenSim musculoskeletal models with MuJoCo forward simulation to quantify joint motion and mechanical work

Information Processing Lab - University of Washington

Synthetic Data Generation for Vision Model Training — Jan. 2025 – June 2025
Advisor: Dr. Jenq-Neng Hwang — *Seattle, WA*

- Designed a simulation pipeline using Vega Prime to synthesize RGB and infrared video data for training computer vision models
- Automated bounding box label generation using the stencil buffer to isolate and extract object silhouettes frame-by-frame
- Trained a YOLOv8 model on the generated dataset for multi-class object detection from aerial and oblique perspectives

Electronic Monitoring of Alaskan Fish Species — May 2024 – Dec. 2024
Advisor: Dr. Jenq-Neng Hwang — *Seattle, WA*

- Developed a computer vision pipeline for automating fish measurements from video footage
- Created a midline estimation algorithm for length measurement using principal component analysis (PCA), contour detection, and image erosion
- Developed a custom PCA function to partition fish into head and tail regions, recalculating orientation along localized principal axes to address irregular contours and midline estimations
- Implemented a loss function with proximal gradient descent and L2 regularization to penalize midline deviations

University of Texas Medical Branch

GUI Development for Ontology Tool Usability — June 2023 – Oct. 2023
Advisor: Dr. Muhammad Amith — *Galveston, TX*

- Developed GOBOT, a cross-platform graphical user interface designed to improve the accessibility of ROBOT, a command-line tool for ontology file manipulation
- Created 22 functions by interfacing with ROBOT commands through API abstraction layers and system calls
- Conducted usability testing with research professors by implementing iterative design changes for widget placement and user-input optimization based on feedback

miRcore

Predictive Modeling of tRF-mRNA Interactions   Oct. 2024 – July 2025
Advisor: Dr. Inhan Lee   *Seattle, WA*

- Analyzed tRNA-derived fragments (tRFs) in Alzheimer's microglia to identify regulatory relationships between tRF and mRNA expression
- Integrated RNA-seq and proteomic data to examine tRF5 upregulation and its negative correlation with immune-related genes such as *HLA-DRA* and *WDR1*
- Developed computational pipelines using Bowtie2, DESeq2, and RNAhybrid to map reads, quantify differential expression, and predict tRF–mRNA binding interactions

Gene Expression Profiling for Opioid Addiction Biomarkers   Aug. 2019 – Apr. 2020
Advisor: Dr. Inhan Lee   *Ann Arbor, MI*

- Analyzed NCBI microarray datasets to identify down-regulated genes in the nucleus accumbens of opioid-addicted patients to uncover biological markers of addiction
- Applied t-tests, analysis of variance (ANOVA), linear models, and empirical Bayes methods to compare gene expression between control and opioid-addicted subjects
- Classified gene expression profiles using support vector machines and random forests
- Identified FBL and NHP2L1 as key down-regulated genes with implications for schizophrenia in opioid-addicted individuals

Teaching & Leadership Experience

Paul G. Allen School of Computer Science & Engineering   Aug. 2023 – Mar. 2025
Lead Teaching Assistant   *Seattle, WA*

- Developed a pipeline to convert Markdown cheat sheets to HTML, making them compatible with screen readers
- Led weekly meetings with a group of over 20 Teaching Assistants to discuss grading logistics
- Developed programming assignments, technical specifications, and practice problems for a class of 400 students
- Debugged individual student code in office hours to resolve structural, semantic, and conceptual coding issues

miRcore   June 2019 – Aug. 2019
Lead Teaching Assistant   *Ann Arbor, MI*

- Taught high school students introductory R programming and microbiology, guiding them in using NCBI and STRING databases to analyze large mRNA datasets for bioinformatics research
- Served on the online relations committee, responsible for organizing and coordinating online meetings

Work Experience

Cloud Clusters Inc.   June 2024 – Aug. 2024
Software Engineer Intern   *Kansas City, MO*

- Engineered features to improve deep-learning fraud detection for purchases and suspicious customer behavior
- Tested models, progressing from probabilistic models (Naive-Bayes) to language models (BERT)
- Improved fraud detection precision and recall by $\sim$17% through iterative model evaluation on internal validation datasets

Extracurriculars & Projects

RoomSense: AR-Enhanced Classroom Engagement System   Aug. 2025 – Dec. 2025
Frontend & Backend Engineer   *Rochester, NY*

- Built an AR classroom assistant on Snap Spectacles that overlays real-time, color-coded engagement bars above students' heads and supports anonymous in-class questions via a companion web app
- Implemented on-device engagement estimation in Lens Studio (TypeScript) using Head Binding facial landmarks and smoothed 3D bar rendering (scale + color interpolation) for up to three simultaneous faces

Confusion Detection for Low Vision Presenters   Aug. 2025 – Dec. 2025
Machine Learning Engineer   *Rochester, NY*

- Developed a deep learning system for automatic learner confusion detection from webcam video using the DAiSEE dataset
- Implemented a ResNet-18 + LSTM (LRCN) model with geometric facial features extracted via MediaPipe Face Mesh
- Achieved 73.49% test accuracy and 74.78% weighted F1, outperforming the RGB-only baseline by +12.0% accuracy

Cornbear Jan. 2024 – June 2024

Backend Developer *Seattle, WA*

- Worked with a team of Teaching Assistants to develop an auto-grading tool for the introductory programming classes to reduce grading time by 50%
- Developed style and concept checkers using static analysis tools to manage and lint through student submissions

UW Human Powered Submarine June 2022 – Sept. 2023

Electrical Engineer *Seattle, WA*

- Developed a codebase using the I2C protocol to interpret sensor data for diver feedback on submarine alignment
- Provided depth data to the diver using liquid crystal displays (LCDs) and light-emitting diodes (LEDs) through an integrated depth sensor
- Developed a driveshaft clamp that stores and utilizes magnets to provide real-time RPM data through the integration of hall-effect sensors

HuskyADAPT Oct. 2021 – June 2022

Electrical Engineer *Seattle, WA*

- Prototyped a drumset with sound-activated LED lights catered to those with hearing impairments and those who prefer multisensory experiences
- Showcased our prototype, receiving positive reception and interest from an audience representing diverse backgrounds and disabilities

Technical Skills

Languages: C++, C, Java, JavaScript, TypeScript, Python, HTML/CSS, SQL
Frameworks/Libraries: PyTorch, TensorFlow, Scikit-learn, OpenCV, NumPy, SciPy, Pandas, Matplotlib, Django, React, Next.js, MediaPipe, JavaParser, CheckStyle
Developer Tools: Unity, Arduino, Git/GitHub, QT, Linux, SolidWorks, KiCAD, Hugo, Vega Prime