Keith Kwan

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EDUCATION

University of California, San Diego Sep 2024 - Jun 2026
M.S. Computer Science CGPA: 3.88 / 4.00

Purdue University Jan 2020 - May 2022
B.S. Cybersecurity CGPA: 3.90 / 4.00

RESEARCH EXPERIENCE

Graduate Researcher, UCSD (Advised by Prof. Marc Niethammer) July 2025 - Present
Spatiotemporal MRI Liver Tumor Segmentation
- Designed an end-to-end pipeline for liver and tumor segmentation on multi-phase and longitudinal MRI scans using **PyTorch** and **SimpleITK**.
- Trained a temporal fusion model inspired by nnU-Net to address large deformations across registered and unregistered scans, improving segmentation robustness under treatment response.
- Implemented domain-agnostic preprocessing (bias field correction, normalization) and domain-shift augmentation to enhance model generalization.

Undergraduate Student Researcher, Purdue University Jan 2022 - May 2022
- Enhanced **UAV-based** small-object detection by integrating Feature Pyramid Network and channel attention into **YOLOX**, improving AP from 42.6 to 52.3 (+10) and AP_small from 17.6 to 30.5 on SARD (1,981 UAV images).
- Co-authored *"EHDNet: Enhanced Human Detection Network for Search and Rescue"*, published at IEEE COMPSAC 2022.

Data Science Researcher, The Data Mine, Purdue University Aug 2021 - May 2022
- Collaborated with MakeMyMove to analyze relocation factors for remote workers using survey and web-scraped data (>10,000 data points).
- Built regression-based ranking models weighted by survey responses; identified Las Vegas, Scottsdale, and Tucson as top relocation destinations.
- Presented findings at the Data Mine Corporate Partners Symposium 2022.

PUBLICATIONS

Han, S., Nho, A.-Y., Kwan, W. T., Paglia, B., Visniski, J., Lee, M., Matson, E. T., & Lee, M. (2022). "EHDNet: Enhanced Human Detection Network for Search and Rescue." 2022 IEEE 46th Annual Computers, Software, and Applications Conference (COMPSAC). https://doi.org/10.1109/compsac54236.2022.00084

Rath, I., Ilan B., Kruse, M., Pati, P., Lee, S., Jeong, I. S., & Kwan, W. T. (2022). "Why you should move here." Poster presented at Data Mine Corporate Partners Symposium 2022

PROJECTS

Simulation and Evaluation of Vision-Based Robotic Navigation Models May 2025
- Evaluated robustness of robotic navigation models (GNM, ViNT, NoMaD) in zero-shot simulated environments.
- Developed **ROS Noetic** + Gazebo stack for closed-loop experiments with TurtleBot agents. Identified <30% success rates on long-horizon navigation tasks and 70%+ failure from obstacle pushing, highlighting critical robustness gaps.

Multi-Scattering Neural Radiance Field (NeRF) Mar 2025
- Implemented decomposition-based NeRF for disentangling material properties from lighting in volumetric rendering.
- Reduced rendering cost by 40% via hierarchical sampling and spherical harmonics approximation compared to Monte Carlo path tracing.

2D Wave Simulation Nov 2024
- Implemented a parallel solver for the 2D wave equation in C++ with **MPI** and OpenMP.
- Achieved **14.6× speedup** over single-core baseline for large-scale physics simulations.

GPU Matrix Multiplication Optimization Oct 2024
- Optimized **CUDA** SGEMM kernel using shared memory tiling and coalesced memory access.
- Achieved up to 3.3 TFLOPs throughput with a 7× speedup over naive implementations.

WORK EXPERIENCE

Full-Stack Developer, Purdue University (Prof. Sorin Adam Matei) Dec 2021 - Nov 2023
- Built interactive web apps (Flask, React, Vue, Docker) to support classroom engagement for 100+ students.
- Developed internal grant management system, reducing approval time by 40% via automated workflows.
- Designed visualization tools for historical troop movements using Node.js and JS Leaflet across 500+ data points.

VOLUNTEER

Network Engineer, Purdue EV Grand Prix May 2022
- Configured VLANs, firewalls, and wireless networks for 21 racing teams.
- Delivered **>98%** uptime and full track coverage using Cisco switches and Ubiquiti access points.

SKILLS

Languages: Python, C++, C, JavaScript, HTML, CSS
Tools: PyTorch, Docker, Git, Linux, PostgreSQL, MySQL, Selenium