SHENGKAI (SAM) XU

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SUMMARY

As an international student with a strong engineering background and a passion for innovative technologies, I strive to make a positive impact by driving change through my work.

EDUCATION

M.Sc. Computer Engineering | University of North Carolina at Charlotte   Aug 2022 - Aug 2024
- Research in Deep Learning and Computer Vision on Edge Devices/Servers

B.Sc. Computer Engineering | University of North Carolina at Charlotte   Jan 2018 - Dec 2022
- Dean's List
- Concentration in Machine Learning
- Minor in Mathematics

SKILLS

Programming	Python, SQL, Embedded C, C++, VHDL
ML/AI	Pytorch, TensorFlow, Keras, Panda, scikit-learn
Embedded System	ESP32, STM32, Arduino, RaspberryPi
CAD	SOLIDWORKS, EAGLE, KiCAD
Cloud Service	AWS, Google Cloud, OpenAI, RunPod
Misc	Git, GitHub, Linux, Vivado, LaTex

EXPERIENCE

Research Assistant | TeCSAR   Aug 2022 - Jan 2023
- Researched and developed an AI pipeline for civilian security and public safety systems, with a specific focus on video processing and anomaly action detection
- *TeCSAR (Transformative Computer Systems and Architecture Research Lab) is a UNC Charlotte research lab led by Dr. Hamed Tabkhi. The lab uses machine learning, deep learning, and data analytics to improve community safety, health, and well-being.*

Embedded Firmware Engineer | Oxit   May 2021 - May 2023
Awarded Letter of Recommendation for excellent performance
- Responsible for research and development initiatives aimed at crafting innovative tools to enhance project efficiency. Proficiently designed and implemented IoT automation pipelines within both AWS and Google Cloud environments.
- One of my major contributions was designing module libraries that streamlined embedded applications for different chip-sets
- *Oxit is an engineering company specializing in low-power, long-range RF communication technology for IoT applications, including LoRa.*

PROJECTS

AI-Powered Discord ChatBot | PyTorch, Huggingface.co, LangChain, PrivateGPT   *2023*
○ LLM-Discord-Bot
- Developed an advanced Discord assistant bot integrating LangChain and Hugging Face's large language models, enabling complex user interactions. This bot runs locally, ensuring privacy and data security for Discord communities. Showcased expertise in AI and chatbot technology, significantly enhancing user engagement and experience in private Discord servers.

Fungus Classifier on Edge device | TensorFlow, TensorFlowLite, Android   *2023*
○ Applied-AI-Fungus-Detector
- Designed and developed a mobile-based fungus image classification application to aid in foraging and wilderness survival. The solution features an AI model that runs locally on mobile devices, ensuring functionality in remote areas without internet or cellular service, thus enhancing the reliability and accessibility for users in outdoor environments.

SR-GAN Implementation | PyTorch, TensorFlow, Generative Adversarial Networks *2023*

 Applied-AI-SRGAN
- Developed a binary classification model using an existing dataset, followed by implementing an SRGAN (Super-Resolution Generative Adversarial Network) to upscale down-sampled data to high-resolution. Subsequently, a second binary classification model utilizing SRGAN outputs. This project focused on comparing the performance and results between the two models, demonstrating the effectiveness of SRGAN in enhancing data resolution for improved classification accuracy.

Pet Detector | Keras, Embedded C, Nvidia Jetson Nano, ESP32, TensorFlow Lite, OpenCV *2022*
- Implemented transfer learning with Edge Impulse's FOMO (Faster Objects, More Objects) model to develop a pet activity detection system for office pets. Successfully deployed the solution on edge devices, including Nvidia Jetson Nano and ESP32 embedded systems, demonstrating proficiency in IoT and AI technologies for real-time monitoring applications.

Optical Inventory System | OpenCV, Robotic, Electronics, Raspberry Pi *2021*
- Developed an innovative inventory management system for Oxit, designed to monitor vaccine stocks in a medical refrigerator. Utilized a Raspberry Pi to control a camera mounted on a stepper motor, enabling precise X and Y axis movements. This system captured detailed images of individual shelf sections, which were then seamlessly stitched into a comprehensive image, providing the client with an efficient solution for real-time inventory tracking.

Mask Detector | PyTorch, Kaggle, YOLO, OpenCV *2020*
- Implemented YOLOv4/5 models to analyze mask usage in crowds from video footage, enabling statistical insights on mask-wearing in the surrounding area.

High-altitude Weather Balloon | Electronic, Embedded System, Wireless Communication *2020*
Sponsored by Wake Tech Community College and North Carolina Space Grant
- Engineered and executed a high-altitude weather balloon project, reaching an altitude of approximately 30,000 meters.
- Developed and integrated a specialized payload for advanced outer space air and pollen sampling. Successfully designed and implemented a retrieval system, ensuring the payload's safe and intact return to Earth post-data collection.

PUBLICATIONS

S. Xu, M. N. Hasan, R. E. Thomas, A. Lopez, and S. Shue, "Charlotte Area Traffic Light Dataset," in *IEEE HONET 2023*, 2023. In Press.

A new dataset with over 4,000 dashcam images from Charlotte, NC, includes diverse weather and lighting conditions to benchmark traffic light detection models.

The dataset reveals performance variations in models like YOLOv5 under different conditions, emphasizing region-specific factors in traffic light perception.

A. Brooks, B. Bryant, C. Spoerer, M. Lust, S. S. Xu, Y. Li, N. N. BouSaba, and D. Maity, "Path Planning for Robotic Delivery Systems," in *SoutheastCon 2022*, pp. 421-426, 2022. doi: `10.1109/SoutheastCon48659.2022.9764058`.

The study uses a modified Dijkstra's algorithm and a directed graph, based on GPS locations from Open Street Map, for efficient path planning across a university campus.

A node-abstraction method compresses the graph to reduce time complexity, significantly improving computation time in simulation results.

EXTRACURRICULAR

IEEE-Eta Kappa Nu 2022
Honor Society Member
- IEEE-HKN, founded in 1904, is an honor society within IEEE that fosters excellence in education and the profession, emphasizing scholarship, character, attitude, professional accomplishment, service, and leadership in electrical and computer engineering, and related IEEE fields.

UNC Charlotte Engineering Leadership Academy | Electronic, CAD, Hardware   2020 - 2021
UNC Charlotte Engineering Leadership Training

- The Leadership Academy is a two-year program that equips undergraduates with leadership skills through five modules taught by faculty and industry experts, including practical off-campus experiences, preparing for roles in the engineering industry.

Student Formula Society of Automotive Engineers | Electronic, CAD, Hardware   2019
UNC Charlotte Student Club

- Contributed to the electrical power and wiring department of the Student Formula Racing club, assisting the team in their participation in the Formula SAE Student engineering competition.

UNC Charlotte Area Robotic Team | 3D-Printing, CAD, Electronic, Embedded System   2018
UNC Charlotte Student Club

- Designed and programmed an autonomous robotic vehicle for IEEE SoutheastCon 2018, focusing on navigating diverse courses and solving complex challenges. This project involved creating a simulation of extraterrestrial environments to demonstrate the robot's potential for planetary exploration applications.

Vice President of Engineering Club | Leadership, Engineering Problem Solving   2017
Wake Tech Community College Student Club

- Assisted the President in overseeing club operations and ensuring that all activities aligned with the club's goals and objectives.
- Coordinated and planned events, workshops, or competitions related to engineering, fostering a collaborative environment for members to share ideas and work on projects.