Jinsong Zhang

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Education

University of Liverpool *Liverpool, UK* *Sep 2022 - Jun 2024*
B.Eng. in Electrical and Electronic Engineering
Xi'an Jiaotong-Liverpool University *Suzhou, China* *Sep 2020 - Jun 2022*
B.Eng. in Electronic Science and Technology
Major GPA: 3.69/4.00

Skills

Programming: Linux, ROS, C/C++, Verilog, Python, MATLAB, Assembly, HTML, CSS
Software: Git, VS Code, MATLAB, PyCharm, Anaconda, Jupyter Notebook, Arduino, Quartus II, Multisim

Research Experience

FPGA Accelerated CNN for Digit Recognition *University of Liverpool, UK* *Nov 2022 – Nov 2023*
Researcher, *Undergraduate Research Fellowship*
Designed and implemented a Convolutional Neural Network (CNN) using Verilog on Altera's FPGA board for real-time handwritten digit recognition using the MNIST dataset.

- Designed fixed-point computation in place of floating-point operations for easy implementation on FPGA.
- Implemented a Register-Transfer Level CNN on FPGA using ReLU activation, optimizing by reducing the number of fully connected layers and filters per convolutional layer.
- Utilized FPGA efficiently to achieve high-performance and low-latency inference for real-time applications.

YOLOv5s-Powered Vision System for Distributing Robot Swarms *Westlake University, China* *Jun 2023 – Sep 2023*
Researcher, *Visiting Student*
Developed and implemented an innovative vision system, integrating the YOLO v5s model with ROS (Robot Operating System), for real-time object detection within a distributed robot swarm.

- Curated a comprehensive object detection dataset by leveraging ROS in conjunction with cameras.
- Conducted YOLOv5s model training with a custom dataset and deployed Triton Inference Servers with YOLO v5s model on each robot in the swarm.
- Reduced latency by converting image preprocessing and ROS topic publishing Python code to C++. Implemented object detection for a swarm of robots, enhancing overall intelligence and coordination capabilities.

Real-time Slope Perception Module for UAV *Westlake University, China* *May 2023 – Jul 2023*
Researcher, *Visiting Student*
Designed and implemented a cutting-edge perception module for unmanned aerial vehicles (UAVs) utilizing a combination of four laser distance sensors and an Inertial Measurement Unit (IMU).

- Developed a sophisticated slope perception algorithm tailored for real-time monitoring of inclined surfaces.
- Developed a visually intuitive real-time interface to communicate with the microcontroller, facilitating the monitoring and analysis of slope data.
- Integrated the slope perception algorithm seamlessly with the sensor module using Keil, enabling UAVs to perceive and navigate inclined terrains in real-time.

Verification Analysis of FedAvg in Non-IID dataset *Xi'an Jiaotong-Liverpool University, China* *Jun 2022 - Sep 2022*
Undergraduate Researcher, *Summer Undergraduate Research Fellowship*
Conducted experiments and evaluations on the Federated Averaging (FedAvg) algorithm using the MNIST dataset to compare the performance of various methods in handling non-identically distributed data.

- Implemented and executed experiments applying FedAvg algorithm to assess its efficacy in federated learning scenarios, specifically focusing on non-IID data distributions.
- Analyzed and compared the performance of FedAvg with different approaches, shedding light on its convergence for scenarios involving non-identically distributed dataset in the context of MNIST digit recognition.

Projects

UART Serial Communication Implemented in Verilog HDL on FPGA *Digital System Design* *Oct 2023 – Nov 2023*
Developed and implemented a versatile UART communication module in Verilog, seamlessly integrating transmitter and receiver functionalities on an Altera FPGA board for establishing reliable bidirectional communication with a computer.

- Crafted dedicated transmit and receive modules for UART serial communication, incorporating essential components such as shift registers, baud rate generators, and controllers to facilitate efficient data transmission and reception.
- Utilized ModelSim to meticulously simulate and analyze each module, ensuring optimal stability, robustness, and portability of the transmission and reception processes.

Image Processing for Object Recognition *Year 2 Project* *Sep 2022 - May 2023*
Developed and implemented an autonomous visual tracking system on a small car using Jetson Nano as the main processing unit, integrating computer vision, deep learning and automatic control technologies.

- Developed a small car equipped with a camera for perception capabilities and generated a runway dataset through camera-based trials.
- Conducted training sessions for the ResNet model using the custom dataset, enabling the small car to make informed decisions for autonomous navigation and path following based on visual inputs.
- Implemented a PID controller as the motor control module to ensure precise and responsive adjustments, facilitating stable and accurate movements in accordance with the visual feedback.