# Yue Zhu

1-434-987-7146 | hvs6uc@virginia.edu CaveCanem1240.github.io

#### **EDUCATION**

University of Virginia, Charlottesville, VA

Master of Computer Science, GPA: 4.0/4.0

<u>Core Courses:</u> Advanced Embedded Computing Systems (A+), Autonomous Mobile Robots (A+), Cloud Computing (A+), Low Power Wireless Transceivers for IoT, Smart and Healthy Buildings, Network Security and Privacy, Computer Architecture ShanghaiTech University, Shanghai, China Aug 2017 - Jun 2021

ShanghaiTech University, Shanghai, China B.E. in Electronic Information Engineering

<u>Core Courses:</u> Introduction to Embedded Systems, Web & Text Mining, FPGA-based Hardware System Design, Machine Learning

#### SKILLS

**Programming:** Embedded C, Python (ROS, Web Crawler, MySQL, PyQt, and ML), Matlab, VHDL, Assembly, Web **Platform:** Nordic nRF52, Linux, ROS, Xilinx FPGA, STM-32, TM4C123, Arduino, Raspberry Pi, WeChat MiniProgram **Tools:** VS Code, Git, Altium Designer, Solidworks, Keil, Multisim, Docker, Vivado, Cadence, VMWare, MS Office suite

#### RESEARCH

Link Lab, University of Virginia

Research Assistant, Supervisor: Prof. Bradford Campbell

#### Software Defined Solar Sensor (paper submitted to IPSN 2024)

- Implemented an energy-harvesting software-defined sensor using a solar panel as the harvester as well as the sensor
- Designed the event-based mode-switching software to save energy while capturing and transmitting features to server
- Optimized power consumed by SA-ADC using mode-switching and improved accuracy using oversampling
- Developed a C library for time series feature extraction (time domain and FFT) on board and performed unit tests

#### Mechatronics and Energy Transformation Laboratory, ShanghaiTech

Research Assistant, Supervisor: Prof. Junrui Liang

#### Motion-powered Gameboy (paper accepted by Sensys 2022 [demo])

- Implemented the first robust, purely motion-powered battery-free personal electronic mobile gaming device
- Investigated the task-based energy management method on Cortex-M4F nRF52 SoC to meet the energy constraint
- Employed energy-aware checkpointing method using FRAM so that a snapshot could survive spanning power outages
- Designed and implemented PCB and 3D-printed mechanisms to form a user-friendly compact prototype

#### Battery-Free QR Tag

- Developed a BLE tag and a JavaScript mobile program that could perform pairing, throughput, and image updating
- Optimized energy consumption per frame from 72mJ to 3.3mJ by optimizing control flow, employing FRAM as non-volatile memory, minimizing idle power consumption, maximizing the idle period, and optimizing SPI

#### AWARDS & PUBLICATIONS

The 20th ACM Conference on Embedded Networked Sensor Systems (Sensys 2022)

*Motion-powered Gameboy* [*Publication*] Author: **Yue Zhu**, Xin Li\*, Junrui Liang\*

#### Best Paper, the 3rd International Conference on Vibration and Energy Harvesting Applications

Dynamic Analysis of a Transient Plucking Energy Harvester towards Battery-free Motion-sensing System [Award] Author: Xin Li, Guobiao Hu, Hong Tang, **Yue Zhu**, Junrui Liang\*

#### 2019 Texas Instruments National Undergraduate Electronic Design Contest, Shanghai

Circuit Parameters and Short-circuit Position Detection System [The Second Prize]

#### PROJECT

- **RTOS-based Gaming System on TM4C123G DK and MKII Booster Pack** (*demo*) March 2023 May 2023
- Implemented a graphic driver to enable multi-layer image generating and a simplified Plants vs. Zombies video game
- Optimized jitter and multi-thread utility using Dynamic Priority Scheduler and used semaphore to prevent deadlocks
- Implemented a page system, software drivers of FIFO for the joystick, and an interface for the PWM buzzer

Aug 2022 – Dec 2023 (Expected)

Virginia, USA Aug 2023 – Present

Shanghai, China

July 2020 - March 2022

#### Malicious URL detection using Machine Learning (PDF)

- Developed a system to classify malicious URLs using lexical features, host-based features, and content-based features •
- Implemented a multi-thread crawler to filter inactive URLs, and fetch Whois data & HTML content of active URLs •
- Implemented tools to extract attributes and investigated performances using different features and learning models

### Human Activity Recognition using 1D-CNN & tri-axial accelerometers (PDF)

- Developed a 1D-CNN to classify human activities on labeled raw data collected from a tri-axial accelerometer •
- Constructed and fit a 1D-CNN model with preprocessed training data
- Achieved an accuracy of 94.81% on the test set

#### **Battery-Free E-ink Tag (Capstone Project)**

- Designed a battery-free display IoT node by integrating bistable energy harvesters and an E-ink display in board-level
- Optimized energy consumption per frame from 72mJ to 9mJ by modifying the update strategy with the flash-based checkpointing method, reducing idle power consumption, and maximizing the idle period
- Realized battery-free display on the Nordic nRF52 platform

## AES Secure System (VHDL Code)

- Nov 2020 Dec 2020 Designed and implemented an AES encryptor that can be configured to inputs of 128, 192, and 256-bit on FPGA
- Implemented the testbench to autonomously test the functionality of the AES entity, including reading test cases, • generating output, comparing results, and obtaining the success rate

## Systolic Matrix Multiplication Module on Xilinx FPGAs (VHDL Code)

- Implemented a PE module that performs the multiply-accumulate operation, a cascaded counter module to generate the address of input data, a shift register FIFO module to control the cycle of data arrival
- Implemented the testbench to autonomously process the systolic array and output the result to a file

## Digital Integrated Circuit Design: 4 bits Processor with 16x8 bits SRAM

- Designed schematic and layout for 4 bits arithmetic logic unit with 16x8 bits data SRAM using Cadence •
- Optimized the worst-case delay of the ALU and SRAM to below 2ns with mirror adder and logical efforts

## **Multi-capacitors Repeating Coilgun**

- Designed and simulated the circuit schematic and developed the corresponding user interface based on Arduino •
- Designed PCB using Altium Designer and iterated hardware prototypes
- Optimized the maximum voltage capability from 60V to 150V by using IGBT instead of power MOSFET

## **Circuit Parameters and Short-circuit Position Detection System**

- Jul 2019 Aug 2019 Developed RTOS-based RLC circuit parameters and short-circuit position detection system on the STM-32 platform
- Investigated theoretical characteristic frequencies of RLC combined circuits using Bode Plot and MATLAB
- Developed the algorithm to classify the structure of unknown RLC circuits at theoretical characteristic frequencies •

## Independent Project: Multi-device Collaborative Object Recognition (Code)

- Realized the edge computing based on Linux (user and server), Raspberry Pi (computing nodes), Intel Neural Compute Sticks (computing resources), and using SMB (Server Message Block) as the file transfer protocol
- Optimized the time consumption of collaboration per frame to 1.39s (compared to 2.21s on PC as the baseline)

#### How to Write Answers with Stronger Traffic-driving Capability on Quora (*Poster*) Jul 2018 - Aug 2018

- Built model to estimate the future upvotes for new posts, and the final cross-validated accuracy was 89%
- Developed a crawler to fetch discussions on two topics: Republican Party and Democratic Party •
- Proposed the conclusion that the following five variables were significant in increasing the answer's upvote count: length of sentence, lexical diversity, sentiment polarity, readability, and total word counts and subjectivity

## Oct 2020 - Nov 2020

#### Jun 2020 - Jul 2020

Jun 2020 - Jul 2020

March 2023 - April 2023

March 2023 - April 2023

Oct 2020 - July 2021

Nov 2018 - Dec 2018