Yue Zhu

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EDUCATION

University of Virginia, *Charlottesville, VA* *Aug 2022 – Dec 2023 (Expected)*
Master of Computer Science Track, **GPA: 4.0/4.0**
Core Courses: *Autonomous Mobile Robots (A+), Cloud Computing (A+), Low Power Wireless Transceivers for IoT, Smart and Healthy Buildings, Advanced Embedded Computing Systems, Network Security and Privacy*

ShanghaiTech University, *Shanghai, China* *Aug 2017 - Jun 2021*
B.E. in Electronic Information Engineering
Core Courses: *Introduction to Embedded Systems, Web & Text Mining, FPGA-based Hardware System Design, Machine Learning*

RESEARCH EXPERIENCE

Mechatronics and Energy Transformation Laboratory, *ShanghaiTech* *Shanghai, China*
Research Assistant, Supervisor: Prof. Junrui Liang *July 2020 - March 2022*

Motion-powered Gameboy (paper accepted by ACM Sensys2022 [*demo*])
- Implemented the first robust, purely motion-powered battery-free personal electronic mobile gaming device
- Investigated the task-based energy management method 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
- Investigated a battery-free full-duplex BLE E-ink display node based on task-based checkpointing that could robustly perform pairing, throughput, and image updating on Cortex-M4F Nordic nRF52 platform
- 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
- Developed a JavaScript-based mobile program to automatically fetch advertising signals and transmit data

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 Cup National Undergraduate Electronic Design Contest Shanghai Division
Circuit Parameters and Short-circuit Position Detection System **[***The Second Prize***]**

PROJECT EXPERIENCE

RTOS-based Gaming System *March 2023 - May 2023*
- Designed and implemented an RTOS-based gaming system on TM4C123G processor and MKII Booster Pack
- Optimized jitter and multi-thread utility using Dynamic Priority Scheduler and used semaphore to prevent deadlocks
- Implemented software drivers of FIFO & ADC for the joystick, PWM for tri-color LED & buzzer, and SPI for LCD
- Implemented menu structures for multiple games switching and internal configuration settings

Malicious URL detection using Machine Learning *March 2023 - April 2023*
- 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 *March 2023 - April 2023*
- 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 86.18% on the test set

Battery-Free E-ink Tag (Capstone Project) *Oct 2020 - July 2021*

- 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

Matrix Multiplication module (VHDL *Code*) *Oct 2020 - Nov 2020*

- Designed a hardware module targeting Xilinx FPGAs that multiply two matrices in a systolic fashion
- 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 *Jun 2020 - Jul 2020*

- 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 Coil Gun *Jun 2020 - Jul 2020*

- 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 replacing power MOSFET with IGBT

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*) *Nov 2018 - Dec 2018*

- 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 answer's upvote count: length of sentence, lexical diversity, sentiment polarity, readability, and total words counts and subjectivity

SKILLS

Programming: Embedded C, Python (ROS, Web text mining, and Tensorflow), VHDL, Web, JS, Assembly, Matlab
Platform: Nordic nRF52, Linux, ROS, Xilinx FPGA, STM-32, Arduino, Raspberry Pi, WeChat MiniProgram
Tools: Altium Designer, Solidworks, Keil, Multisim, Proteus, Vivado, Cadence, Git, VMWare