Xiao HU

| +86 13102573778 | xiao.hu1997@outlook.com

EDUCATION

University of Florida, Florida, USA   08/2019 - 05/2021
- Major in Electrical and Computer Engineering, Minor in Computer Science
- Master of Science
- GPA: 3.5/4.0

East China Jiaotong University, Jiangxi, China   09/2015 - 06/2019
- Major in Software Engineering + Rail Transit Signal & Control
- Bachelor of Engineering
- GPA: 3.59/4.0 (WES)

INTERNSHIP EXPERIENCES

University of Waterloo   Security   *Supervisor: Meng Xu*
Research Assistant (remote)   07/2022 - present
- Mainly focused on IoT security and AFL improvements.
- Optimized the LLVM module of AFL, adding Pass to optimize the intermediate code and increase security.
- In addition, I added my trick to optimize the seed selection method of AFL to select seeds that produce vulnerable paths.

Institute of Software, Chinese Academy of Sciences   Security   *Supervisor: Jingzheng Wu*
Research Assistant   05/2021 – 05/2022

Project 1
- Obtain vulnerability information, virus information, system information, and other useful information of the industrial robot systems using the Agent program written in Go, C, C# and C++ in different industrial robot systems. Transmit the obtained information to the upper computer and the external online platform via the WIFI, serial, and CAN module.
- Realize the extraction and display of the system information from different robot systems (VxWorks, QNX, SylixOS, WinCE, and Linux), and the information acquired by the Agent program in the System on Chip can be transmitted to the host computer in different protocols via various ports.
- The next research method I want to carry out in this direction is to analyze the security analysis of the BSP layer. During the previous development process, I found that although the core kernel of a micro kernel system like VxWorks is not open source, the BSP layer is open source. , and each system function can be traced back to the deep function of BSP, which has great analytical value. For example, when writing an agent program based on the Sylixos system, I found that when multiple shell commands are called, the subsequent shell commands will obtain the results of the previous shell commands. This is due to the fact that the buffer was not cleared after the BSP was called before version 3.0. . This kind of analysis of kernel functions by function by function, or even isolating each function for analysis, I think it can also be applied to all open source complex kernel systems.

Project 2
- Proceed fuzzy test for common protocols (Modbus protocol) and private protocols (Siemens s7 protocol) to find out the vulnerabilities of the corresponding plc devices.
- Build a hardware test environment by myself and write an automatically generated message script in python to send s7 messages or Modbus messages to the plc device in the simulation environment, to determine whether an error result is generated according to the response message sent from plc.
- Next, I want to use the knowledge of AI to let the script automatically filter the generated messages and determine whether the generated results are correct, which can significantly reduce the time of fuzzing testing.

Institute of Automation, Chinese Academy of Sciences   Autonomous Driving   *Supervisor: Jundao Pan*
Research Assistant (remote)   02/2022 - 05/2022
- Participate in the autonomous driving robot project. Aim to realize a wheeled robot that can be driven automatically, including chassis control technology, autonomous driving navigation technology and autonomous driving mapping, planning and perception technology.
- Assemble the physical structure of a basic four-wheeler and write a control program based on arduino to control the motor and four wheels to let the car to move under the remote command, and realize PID speed control function through programming. By using the NEO-6M GPS module, programming to achieve GPGGA sentence parsing to obtain elevation information.
- At present, the autonomous navigation function is realized through gmapping and SLAM mapping function and configuration Navigation function package in ROS system on Raspberry Pi. (Still in development)
- After realizing the basic functions of the unmanned vehicle, my research focus will be on applying the Yolo V3 model previously realized by pruning to the binocular camera on the unmanned vehicle to combine it with SLAM to see if this will be more conducive to the construction of the vehicle. Real-time and accurate graphs.

Institute of Computing, Chinese Academy of Sciences   Embedded AI   *Supervisor: Hang Lu*
Research Assistant (remote)   12/2020 - 03/2021
- Develop CNN models suitable for embedded platforms.
- By quantizing the parameters of the AlexNet model for image recognition, the model training time on GPU and inference time on embedded platforms are significantly reduced without a significant loss in accuracy.
- The parameters of the Yolo V3 model used for video recognition are reduced by model pruning, thereby reducing model training time on GPU and inference time on embedded platforms without significantly reducing accuracy. Finally, the pruned model is deployed on the SoC, and pattern recognition is performed using a real-time camera to verify that the expectations are met.
- Achieved the training time of the quantified Alexnet model reduced by 30% amid accuracy declined only 0.08.

- Improved the precision of Yolo v3 model after pruning, achieved the recognition of each frame reduced by about 2latency/FPS and more accurate recognition of the objects in a video than the original model.

Institute of Automation, Chinese Academy of Sciences   Industry Control   *Supervisor: Fei Xu*
Research Assistant   02/2018 - 04/2018
- Developed an industrial control system which adopted and combined two different communication modes(MODBUS TCP & MODBUS RTU) of MODBUS control protocol to control the position servo motor and a large number of lights and fans. By combining the advantages of RTU protocol and TCP protocol and making up for each shortcoming.
- The programming of the control program is completed by using C++ programming language and calling MFC framework, and another set of visual PC software is designed by using the configuration software.
- Certified with Copyright of Computer Software for *Intelligent Device Control System Based on Double Layer Network of Modbus*, 2018SR528477

PROJECT EXPERIENCES

Realization of Compression and Decompression Algorithm in Embedded System   *Supervisor: Prabhat Mishra*
                                                                                     04/2021-05/2021
- Completed the code decompression and compression algorithm of the operating system, including the commonly used dictionary direct index algorithm, the multi-bit bit-mask algorithm and the newly proposed RLE algorithm

Jihang Innovation - A New Era of Unmanned Aerial Operation
Technician   12/2020 - 2/2021
- Took charge of the Camera Mode Recognition and training of the neural network
- Used Dichotomy and Bayesian Optimization to adjust parameter so that the final accuracy was improved to 99.5%
- Gained a profound understanding of the neural network's design, grasped some methods of adjusting the parameters, and understood the combined application of deep learning and unmanned aerial vehicles
- Won the silver prize for out-standing performance in the 6th China International College Students' 'Internet+' Innovation and Entrepreneurship Competition

MIPS Design and Implementation of the Five-Stage Pipeline   *Supervisor: Prabhat Mishra*
                                                                                     03/2020-06/2020
- Realized that the simulator could load the specified MIPS text file and generate cycle-by-cycle simulation of the MIPS code, and generate/print the contents of registers, queues and memory data for each cycle

Intelligent Household Security System Project   *Supervisor: Bo wei*
Developer   01/2019 - 05/2019
- Independently completed the project from transplantation of the bottomed operating system to the establishment and debugging of the software and hardware environment
- Wrote the intermediate device driver, web page and the final interactive script of uploading and delivering the data
- Adopted a layered sense to develop the whole system, used different data structures to upload and deliver the data streams to fit for the field facility and environment, and realized an intelligent household security system from the bottom to the users
- The project was awarded the excellent graduation project

Development of Radar-Based Basic Parameter Measurement System for Overhead Contact System
                                                                              Supervisor: Zhongbin Chen
Group Leader (overall duties: marketing, research scheduling, programming, debugging, etc.)   05/2018 – 08/2018
- Assembled and remolded LMS511 radar and embedded it into the rail inspection vehicle to realize dynamic monitoring, and made matched equipment, such as transformer and 24V powers supply
- Rewrote the program for driver interface, realized detecting algorithms for Catenary guide height and Catenary pull-out value, designed data parsing algorithm to measure the parameters of railway overhead contact system and added to the user-oriented driver program wrote with qt of C++
- Achieved Special Scholarship for Innovation and Entrepreneurship
- Being selected into "Jeme Tien Yow Class" for both academic excellence and standout research and innovative ability

PUBLICATIONS

Xiao Hu, Hao Wen. (2021). Research on Model Compression for Embedded Platform through Quantization and Pruning, *ICAITA 2021 Conference* (Published)
Xiao Hu, Guanzhong Ye, Chunxiao Xu. (2018). Double layer network communication based on Modbus protocol. *Electric Engineering*, Journal, ISSN: 1002-1388 (Published)

AWARDS AND HONORS

- International-Level Silver Prize in the Organizing Committee of China International College Students' 'Internet+' Innovation and Entrepreneurship Competition -Top 3% (11/2020)
- University-Level Engineering Achieve Awd Wvr M (09/2020, 01/2020, 08/2019) University of Florida
- Outstanding Graduate Awd (06/2019) East China Jiaotong University
- University-Level 1st Class Scholarship (11/2017) East China Jiaotong University
- University-Level 2nd Class Scholarship (12/2016) East China Jiaotong University
- University-Level 3rd Class Scholarship (12/2018) East China Jiaotong University
- University-Level Merit Student (12/2018, 11/2017, 12/2016) East China Jiaotong University
- Excellent Student Leader (12/2016) East China Jiaotong University
- University-level Innovation and Entrepreneurship Scholarship (12/2018) East China Jiaotong University
- University-Level Award on Science and Technology (04/2017) East China Jiaotong University
- University-Level 1st Prize in Dual-basis Software Development Competition (04/2018) East China Jiaotong University
- Province-Level 3rd Prize in "Maker in China" Innovation and Entrepreneurship Competition in Jiangxi Province (04/2018)