Joey Ah-kiow

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Education

University of Calgary	Sept 2018 – Present
B.Sc. in Electrical Engineering, GPA 3.75	Expected Graduation: May 2023

- Minor in Computer Engineering
- Relevant coursework: Digital Systems Design, Data Structures and Algorithms, Principles of Software Development

Experience

University of Calgary	Feb 2022 – Present
Research Assistant	Calgary, AB

- Working in the area of hardware security in Dr. Benjamin Tan's research group
- Collaborating with a PhD student from NYU to explore the security implications of High-Level Synthesis (HLS) tools
- Developing HLS-synthesizable C/C++ code for algorithms like AES and reviewing resulting RTL design with manual inspection and simulation to identify security vulnerabilities, and determine systematic ways to detect and mitigate them
- Investigating static analysis methods to automate the detection of security vulnerabilities at the RTL design stage
- Reviewed and simulated RTL code for RISC-V SoCs and currently writing custom IP to voluntarily introduce security vulnerabilities to use as a "testbed" for vulnerability detection tools
- Exploring hardware security literature on state-of-the-art topics like IFT, fuzzing and security property mining
- Learned foundational security concepts such as confidentiality, integrity, availability, access control and cryptography

TC Energy	May 2021 – Present
Field Data Program Management Intern	Calgary, AB

- Communicating with internal and external stakeholders to ensure adherence to official specifications and provide support
- Revising official engineering documents to reflect updates to existing processes/requirements and document new ones
- Created a Power BI report to visualize and easily identify issues in cathodic protection data, saving $180000 per year
- Automated the pre-population of web-based forms for integrity excavations, saving $400000 per year
- Developed a Python script to automate the data extraction of ~150 Excel-based forms, reducing manual effort by 80 hours

Projects

Hack@DAC 2022	May 2022 – June 2022
Hardware Security Competition	

- Competed as a solo undergraduate student against graduate students and industry professionals in the world's biggest hardware security competition
- Completed security verification of the RTL designs of a security-enhanced CVA6/OpenPiton RISC-V SoC during phase 1 and Google's OpenTitan SoC during phase 2 by reviewing specifications of various IP like RISC-V, AES, etc., understanding and defining security requirements, finding security vulnerabilities and proposing mitigations
- Placed 3rd in the first phase and invited to the 2022 Design Automation Conference (DAC) to participate in the second phase as one of the top 3 finalists, eventually finishing the competition in 2nd place
- Presented my approach and findings at the 2022 Design Automation Conference in front of industry professionals and academia to reinforce the complexity of finding security vulnerabilities in RTL designs and motivate future work in the field

Proximity-controlled System	Jan 2021 – Apr 2021
Course Project	

- Designed and simulated a proximity-controlled system using VHDL and implemented on the Terasic DE10-Lite FPGA board
- Used an ADC to interface a proximity sensor and output the readings to seven-segment displays in voltage or distance
- Controlled the frequency of a buzzer and the brightness of an LED array from the proximity sensor output using PWM
- Averaged the last 256 sensor readings using a pipelined adder tree to smooth system input with minimal performance hit
- Developed self-checking VHDL testbenches for all modules to verify functional correctness

Skills

Programming: C, C++, VHDL, Verilog/SystemVerilog, Java, Python, C#, SQL, MATLAB
Hardware: FPGA, PIC, Arduino, MIPS, RISC-V
Software: LTSpice, NI Multisim, Git, Quartus, ModelSim, Verilator, GTKWave, Intel HLS Compiler, Siemens Catapult HLS