Harrison Williams

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Research Interests

I am broadly interested in embedded/IoT system design, computer architecture, and networking. My PhD research focuses on novel chip- and board-level hardware designs alongside software techniques to bring new capabilities to and improve the efficiency of batteryless energy harvesting systems.

Education

Virginia Tech — Blacksburg, VA
PhD, Computer Science — 2019 – 2024 (Expected)
PhD Advisor: Dr. Matthew Hicks
Dual B.S., Electrical & Computer Engineering — 2015 – 2019

Conference Publications

[3] **Practical Considerations of Energy Harvesting Source in Minimization of Age of Information with Updating Erasures**. Fariborz Lohrabi Pour, Harrison Williams, Matthew Hicks, and Dong Sam Ha. *International Symposium on Circuits & Systems (ISCAS), 2023.*

[2] **Failure Sentinels: Ubiquitous Just-in-time Intermittent Computation via Low-cost Hardware Support for Voltage Monitoring**. Harrison Williams, Michael Moukarzel, and Matthew Hicks. *International Symposium on Computer Architecture (ISCA), 2021.*

[1] **Forget Failure: Exploiting SRAM Data Remanence for Low-overhead Intermittent Computation**. Harrison Williams, Xun Jian, and Matthew Hicks. *Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2020.*

Preprints

- **A Software Caching Runtime for Embedded NVRAM Systems**. Harrison Williams and Matthew Hicks. *In preparation.*
- **Energy-Adaptive Buffering for Efficient, Responsive, and Persistent Batteryless Systems**. Harrison Williams and Matthew Hicks. *Under review.*
- **Residual Sentinels: Scavenging Post-computation Utility in Energy Harvesting Systems with Just-right Power-down Voltage Monitoring**. Harrison Williams and Matthew Hicks. *Under review.*
- **A Difference World: High-performance, NVM-invariant, Software-only Intermittent Computation**. Harrison Williams*, Saim Ahmad*, and Matthew Hicks. *Under review.*

*Equal contribution.

Funding

[1] **NSF SHF: Small: Circuit Support for Maintaining the Continuous-power Abstraction in Energy Harvesting Systems**

- Principal Investigator: Dr. Matthew Hicks.
- Timeframe: 2023-09-01 to 2026-08-31.
- Total: $450,000.
- Role: Co-author. My work on hardware support for batteryless systems was the basis of this grant. I provided preliminary data and wrote the grant with Dr. Hicks.

Research Experience

Graduate Research Assistant 2019 – Present

Virginia Tech *Blacksburg, VA*

- Designed and implemented a circuit board for power-adaptive energy buffering using variable capacitor banks on energy harvesting systems.
- Designed standalone low-voltage circuit enabling software-free peripheral operation on energy harvesting systems.
- Designed low-power, variable-resolution integrated voltage supervision circuits.
- Developed software libraries using volatile data retention for intermittent execution on batteryless systems using memory-constrained microcontrollers.

Undergraduate Research Assistant 2017 – 2019

Virginia Tech *Blacksburg, VA*

- Worked with faculty and other undergraduate students to develop a system to detect recycled microcontrollers and processors based on memory decay.
- Built hardware and software systems to rapidly age microcontrollers and collect/analyze memory startup statistics.

Professional Experience

Technical Intern Summers 2017, 2018

Raytheon Missile Systems *Tucson, AZ*

- Member of verification team supporting programs in the configurable digital logic department.
- Developed tests for combinational logic and state machines.
- Designed software abstractions for simulating communication interfaces across missile hardware stack.

Technical Reviewing

External Reviewer:

Architectural Support for Programming Languages and Operating Systems	ASPLOS '24, '23, '20
European Conference on Computer Systems	EuroSys '22
Transactions on Embedded Computing Systems	TECS '21
Design Automation Conference	DAC '20
Languages, Compilers, Tools and Theory of Embedded Systems	LCTES '20
International Workshop on Energy Harvesting & Energy-Neutral Sensing Systems	ENSsys '19

Recognition

Davenport Leadership Scholarship 2022

NSF Graduate Research Fellowship Program 2021

Honorable Mention

Teaching

Graduate Teaching Assistant 2019

Virginia Tech *Blacksburg, VA*

- Teaching Assistant for CS 4264: "Principals of Computer Security", an undergraduate class on the foundation of building, using, and managing secure systems.
- Developed and graded homework and projects, graded tests.
- Held office hours and helped students with completing projects and understanding class material.