Ian Glen Neal

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Research Interests

In my research, I want to eliminate the intellectual barrier-to-entry for developers who want to use emerging hardware to develop efficient and reliable systems. To this end, I aim to create tools which developers can use to automatically reason about the characteristics of new hardware so that they can better leverage its capabilities without sacrificing the correctness of their applications. My current focus is in the development of efficient and reliable systems using emerging persistent main memory technologies. I am also interested in developing verifiably secure hardware systems and tools which allow for easier development of secure systems.

Education

The University of Michigan Sept. 2018–Present

Ph.D. in **Computer Science** (Candidate)

Advisor: Assistant Professor **Baris Kasikci**

GPA: 3.961

The University of Texas at Austin Aug. 2013–May 2018

B.S. in **Computer Science**

Special Honors: Turing Scholars Honors Program

Thesis: The Advantages of a Transactional Interface: Porting Applications to TxFS

B.S. in **Electrical Engineering**

Senior Design Project: Wearable Biometric Monitor

Minor in **Biblical Hebrew**

Peer-Reviewed Publications

[1] Kevin Loughlin, **Ian Neal**, Jiacheng Ma, Elisa Tsai, Ofir Weisse, Satish Narayanasamy, Baris Kasikci. DOLMA: Securing Speculation with the Principle of Transient Non-Observability. *To Appear* In Proceedings of the 30th USENIX Security Symposium (USENIX Security '21). August 2021. https://www.usenix.org/conference/usenixsecurity21/presentation/loughlin.

[2] **Ian Neal**, Andrew Quinn, Baris Kasikci. HIPPOCRATES: Healing Persistent Memory Bugs Without Doing Any Harm. *To Appear* In Proceedings of the 26th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '21). April 2021.

[3] **Ian Neal**, Gefei Zuo, Eric Shiple, Tanvir Ahmed Khan, Youngjin Kwon, Simon Peter, Baris Kasikci. Rethinking File Mapping for Persistent Memory. In Proceedings of the 19th USENIX Conference on File and Storage Technologies (FAST '21). February 2021. https://www.usenix.org/conference/fast21/presentation/neal.

[4] **Ian Neal**, Ben Reeves, Ben Stoler, Andrew Quinn, Youngjin Kwon, Simon Peter, Baris Kasikci. AGAMOTTO: How Persistent is your Persistent Memory Application?. In Proceedings of the 14th USENIX Symposium on Operating Systems Design and Implementation (OSDI '20). November 2020. https://www.usenix.org/conference/osdi20/presentation/neal. **IEEE Micro 2021 Top Picks Honorable Mention.**

[5] Ofir Weisse, **Ian Neal**, Kevin Loughlin, Thomas F. Wenisch, and Baris Kasikci. NDA: Preventing Speculative Execution Attacks at Their Source. In Proceedings of the 52nd Annual IEEE/ACM International Symposium on Microarchitecture (MICRO 2019). October 2019. **IEEE Micro 2019 Top Picks Honorable Mention.** https://dl.acm.org/doi/10.1145/3352460.3358306

[6] Yige Hu, Zhiting Zhu, **Ian Neal**, Youngjin Kwon, Tianyu Cheng, Vijay Chidambaram, and Emmett Witchel. TxFS: Leveraging File-System Crash Consistency to Provide ACID Transactions. In 2018 USENIX Annual Technical Conference (USENIX ATC 18). July 2018. **Awarded Best Paper.** https://www.usenix.org/conference/atc18/presentation/hu

Patents

Video Frame Brightness Filter US Patent App. 16/210,380

User-Specific Video Frame Brightness Filter US Patent App. 16/210,578

Color-Specific Video Frame Brightness Filter US Patent App. 16/210,667

Employment

University of Michigan Ann Arbor, Michigan, USA

Graduate Research Assistant Sept. 2018–Present

- Creating novel techniques for improving the reliability of system software for persistent main memory (PM)
- Created Agamotto [4], a symbolic-execution-based approach to finding bugs in PM systems
- Created Hippocrates [2], a compiler tool for automatically fixing bugs found in PM systems
- Optimized file-mapping structures for PM file systems, leading to up to 45% increases in overall throughput [3]
- Developed techniques for secure speculative execution on modern processors (Spot [1], NDA [5])
- Developed **Lapidary**, a framework for accelerating microarchitecture simulations

Microsoft Redmond, Washington, USA

Software Engineering Intern May 2018–Aug. 2018

- Created real-time video processing module to automatically adjust brightness for low-vision users
- Led invention of novel techniques for smooth brightness adjustment

The University of Texas Austin, Texas, USA

Undergraduate Research Assistant Aug. 2017–May 2018

- Aided in the development and evaluation of TxFS [6]
- Modified applications to work with a transactional interface as an Honor's Thesis project

Microsoft Bellevue, Washington, USA

Software Engineering Intern May 2017–Aug. 2017

- Designed C# web client library and PowerShell Cmdlet for Exchange data acquisition
- Improved existing REST service by adding features and eliminating defects

Google Seattle, Washington, USA

Software Engineering Intern May 2016–Aug. 2016

- Designed new modular optimization for Flume C++ backend to remove redundant operations
- Implemented optimization tasks that could be run at any time and still maintain graph invariants

Tableau Software Seattle, Washington, USA

Software Engineering Intern May 2015–Aug. 2015

- Created Puppet manifests to deploy product code and support software
- Created extensive validation tests and automated current infrastructure

Tableau Software Seattle, Washington, USA

Software Engineering Intern May 2014–Aug. 2014

- Created ETL scripts to recover and transform product usage data for internal analysis
- Repaired and maintained existing data set for use by marketing and quality assurance teams

Open-Source Projects

Lapidary: Creating beautiful gem5 simulations Released July 2019

Source available at: https://github.com/efeslab/lapidary

- Creates checkpoints on bare-metal to avoid the weeks of simulation required to create checkpoints
- Performs short simulations over many checkpoints using the SMARTS sampling methodology
- Used in the evaluation of NDA [5] and Spot [1]

Technical Skills

- **Languages**: Proficient in C, C++, Python. Familiar with C#, Java
- **Frameworks**: Proficient with LLVM, KLEE, PMDK, pandas, matplotlib

Honors and Awards

IEEE Micro 2021 IEEE Top Picks Honorable Mention	**2021**
IEEE Micro 2019 IEEE Top Picks Honorable Mention	**2019**
Richard H. Orenstein Graduate Fellowship in Memory of Murray Orenstein	**2018–2019**
USENIX Annual Technical Conference Best Paper Award	**2018**
National Science Foundation (NSF) Research Experiences for Undergraduates (REU) Grant	**2018**
CRA Outstanding Undergraduate Researcher Award (Honorable Mention)	**2017**
Dusty and Doris Duesterhoeft Endowed Presidential Scholarship	**2017**
Leola W. and Charles H. Hugg Trust Scholarship	**2013–2016**
College of Natural Sciences Book Award for Academic Excellence	**2016**
Boyce Family Scholarship	**2016**
Carl R. Trull Endowed Presidential Scholarship	**2015**
Edward Morgan and Rebecca Brown Case Endowed Presidential Scholarship	**2014**