

# Jeonghyun Woo

PH.D. STUDENT · ELECTRICAL AND COMPUTER ENGINEERING · UNIVERSITY OF BRITISH COLUMBIA (UBC)

4025, 2332 Main Mall, Vancouver, BC, Canada V6T 1Z4

☎ (+1) 778-929-7902 | ✉ [jhwoo36@ece.ubc.ca](mailto:jhwoo36@ece.ubc.ca) | 🏠 [jeonghyunwoo0306.github.io/](https://jeonghyunwoo0306.github.io/) | 📺 [jeonghyunwoo0306](#) | 🔗 [LinkedIn](#) | 🎓 [Google Scholar](#)

## Research Interests

My research broadly spans the area of **computer architecture/systems, security, memory systems, and AI/ML**, with specific emphasis on the following areas:

- **Memory Security:** Developing techniques to secure memory systems, with a focus on RowHammer attacks and defenses. Investigating novel security attacks, performance degradation (Denial-of-Service) attacks, and timing-side channel vulnerabilities. Actively developing secure and low-overhead RowHammer mitigations, including per-row activation counting (PRAC)-based solutions, which are expected to become standard RowHammer mitigations for future DRAM products.
- **AI/ML Security:** Investigating emerging threats in AI/ML security, including LLM Jailbreaking attacks, and developing robust defenses to mitigate these risks.
- **Microarchitecture Designs:** Designing high-performance, energy-efficient microarchitectures by leveraging advanced compression techniques for prefetching, branch prediction, and cache replacement policies to optimize system efficiency.

## Education

### University of British Columbia (UBC)

PH.D. IN ELECTRICAL AND COMPUTER ENGINEERING

- Advisor: [Prof. Prashant Nair](#)
- GPA: 4.00/4.00

*Vancouver, BC, Canada*

*Sep. 2022 - Nov. 2026 (Expected)*

### Hanyang University (HYU)

M.S. IN ELECTRONICS AND COMPUTER ENGINEERING

- Advisor: [Prof. Ki-Seok Chung](#)
- **Dissertation:** Row-hammering Mitigation Architecture for High Reliable DRAM
- GPA: 4.00/4.00

*Seoul, South Korea*

*Mar. 2018 - Feb. 2020*

### Hanyang University (HYU)

B.S. IN ELECTRONIC ENGINEERING

- Advisor: [Prof. Ki-Seok Chung](#)
- **Dissertation:** Implementation of an FPGA-based CNN Accelerator using SDSoc
- GPA: 3.89/4.00 (Graduating with Honors - Summa Cum Laude)

*Seoul, South Korea*

*Mar. 2012 - Feb. 2018*

## Publications

### PREPRINTS AND IN SUBMISSION

- [P.2] [Jeonghyun Woo](#), Joyce Qu, Gururaj Saileshwar, and Prashant Nair. “**When Mitigations Backfire: Timing Channel Attacks and Defense for PRAC-Based Rowhammer Mitigations**”. In *52nd Annual International Symposium on Computer Architecture (ISCA’25)*. 2025.
- [P.1] Zachary Coalson, [Jeonghyun Woo](#), Shiyang Chen, Yu Sun, Lishan Yang, Prashant Nair, Bo Fang, and Sanghyun Hong. “**PrisonBreak: Jailbreaking Large Language Models with Fewer Than Twenty-Five Targeted Bit-flips**”. In *46th IEEE Symposium on Security and Privacy (S&P’25)*. 2025. [\[Arxiv\]](#)

### CONFERENCE PUBLICATIONS

- [C.4] [Jeonghyun Woo](#), Shaopeng (Chris) Lin, Prashant Nair, Aamer Jaleel, and Gururaj Saileshwar. “**QPRAC: Towards Secure and Practical PRAC-based Rowhammer Mitigation using Priority Queues**”. In *31st International Symposium on High-Performance Computer Architecture (HPCA’25)*. Mar. 2025. (Acceptance Rate: 21.0%). [\[Code\]](#)
- [C.3] [Jeonghyun Woo](#) and Prashant Nair. “**DAPPER: A Performance-Attack-Resilient Tracker for RowHammer Defense**”. In *31st International Symposium on High-Performance Computer Architecture (HPCA’25)*. Mar. 2025. (Acceptance Rate: 21.0%).
- [C.2] [Jeonghyun Woo](#), Gururaj Saileshwar, and Prashant Nair. “**Scalable and Secure Row-Swap: Efficient and Safe Row Hammer Mitigation in Memory Systems**”. In *29th International Symposium on High-Performance Computer Architecture (HPCA’23)*. Feb. 2023. (Acceptance Rate: 25.0%). [\[Paper\]](#) [\[Code\]](#) [\[Slides\]](#)  
[\[Best Paper Award \(One of Two Best Papers in 364 Submissions\)\]](#)

[C.1] Kwangrae Kim, Jeonghyun Woo, Junsu Kim, and Ki-Seok Chung. “**HammerFilter: Robust Protection and Low Hardware Overhead Method for RowHammer**”. In *39th International Conference on Computer Design (ICCD’21)*. Oct. 2021. (Acceptance Rate: 24.4%). **[Paper]** **[Slides]** **[Video]**

## WORKSHOP PUBLICATIONS AND POSTERS

[W.1] Kwangrae Kim, Junsu Kim, Jeonghyun Woo, and Ki-Seok Chung. “**HammerFilter: Robust Protection and Low Hardware Overhead Method for Row-Hammering**”. *Work-in-Progress (WIP) poster in 58th Design Automation Conference (DAC’21)*. Dec. 2021. **[Poster]**

## DOMESTIC (KOREAN) CONFERENCE PUBLICATIONS

[D.2] Jeonghyun Woo and Ki-Seok Chung. “**A Method to Find the Optimal Probability for Probability-driven Additional Row Refresh to Prevent DRAM Row Hammering**”. In *The Korean Institute of Communications and Information Sciences Winter Conference*. Jan. 2019.

[D.1] Changwoo Lee\*, Jeonghyun Woo\*, Sang-Soo Park, and Ki-Seok Chung. “**Implementation of an FPGA-based CNN Accelerator using SDSoC**”. In *The Korean Institute of Communications and Information Sciences Fall Conference*. Nov. 2017. (\*Equal Contribution). **[Code: 300+ Stars]** **[Outstanding Paper Award]**

## Honors and Awards

2023	<b>HPCA 2023 Best Paper Award</b> → One of Two Best Papers in 364 Submissions	Canada
2023	HPCA 2023 Student Travel Grant	Canada
2022-2024	Faculty of Applied Science Graduate Award, University of British Columbia (UBC) → \$16,600 CAD in Total	Canada
2018-2019	Hanyang Graduate School Scholarship → 70% of Tuition (≈ \$9,200 CAD per Year)	South Korea
2016, 2017	Hanyang Academic Excellence Award → Top 1% ranked in University (≈15,000 Students)	South Korea
2016	Hanyang Academic Excellence Award → Top 3% ranked in University (≈15,000 Students)	South Korea
2016-2017	Hanyang Alumni Association Scholarship → Full Tuition (≈\$10,000 CAD per Year)	South Korea
2016	Excellent Tutor Award in Engineering Mathematics Tutoring Program, Hanyang University (HYU)	South Korea
2012-2013	Hanyang University Scholarship → Full Tuition (≈\$10,000 CAD per Year)	South Korea

## Experience

### Systems and Architectures (STAR) Lab, University of British Columbia (UBC)

Vancouver, BC, Canada

#### GRADUATE RESEARCH ASSISTANT

Sep. 2022 - Present

- Advisor: Prof. Prashant Nair
- Conducting research on computer architecture, memory systems, security, and AI/ML.
- Publishing papers in top-tier architecture and security venues and delivering presentations.

### University of British Columbia (UBC)

Vancouver, BC, Canada

#### GRADUATE TEACHING ASSISTANT

Sep. 2022 - Present

- Computer Architecture (CPEN 411): Fall 2022, Fall 2023, and Fall 2024
- Digital Systems and Microcomputers (CPEN 312): Spring 2025

### Architecture Research Group (ARG), NVIDIA Research

Westford, MA, USA

#### RESEARCH INTERN

May. 2024 - Aug. 2024

- Manager: Dr. David Nellans and Mentor: Dr. Aamer Jaleel
- Explored secure and low-overhead Per Row Activation Counting (PRAC)-based RowHammer mitigations.

### Vertical Systems Research (VSR), Micron Technology

Folsom, CA, USA

#### SYSTEMS RESEARCH ENGINEERING INTERN

May. 2023 - Aug. 2023

- Manager: Ameen Akel and Mentor: Dr. Chun-Yi Liu
- Explored RowHammer solutions for future High-Bandwidth Memory (HBM).

### Systems Platform Research Group, University of Illinois Urbana-Champaign (UIUC)

Champaign, IL, USA

#### GRADUATE RESEARCH ASSISTANT

Aug. 2020 - Jan. 2021

- Advisor: Prof. Jian Huang
- Integrated Non-Volatile Memory (NVM) into programmable switch data planes, achieving 2× lower packet latency than the prior TEA approach while maintaining line-rate packet processing.
- Explored crash consistency challenges in integrating NVM into GPUs, demonstrating inefficiencies in existing solutions via architectural simulations.

## Embedded System on Chip (ESoC) Lab, Hanyang University (HYU)

Seoul, South Korea

GRADUATE RESEARCH ASSISTANT

Mar. 2018 - Feb. 2020

- Advisor: Prof. Ki-Seok Chung
- Proposed a reliable, low-overhead probabilistic RowHammer mitigation surpassing the state-of-the-art PARA and PRoHIT.
- Designed a new efficient retention-aware refresh scheme for highly scaled-down DRAMs.
- Implemented an FPGA-based Foveated Rendering decoder using Verilog for an industry-funded project with LG Display.

## Hanyang University (HYU)

Seoul, South Korea

GRADUATE TEACHING ASSISTANT

Mar. 2018 - Dec. 2019

- VLSI Engineering (ELE 3081): Fall 2019
- SoC Design (ITE 4003): Spring 2018

## Teaching and Mentoring Experience

### TEACHING EXPERIENCE

#### Computer Architecture (CPEN 411)

University of British Columbia (UBC)

TEACHING ASSISTANT

2022 - 2024

- Led labs/tutorials, implemented auto graders for assignments, held office hours, and graded exams and assignments.

#### VLSI Engineering (ELE 3081)

Hanyang University (HYU)

TEACHING ASSISTANT

Sep. 2019 - Dec. 2019

- Led labs, held office hours, and graded exams and assignments.

#### SoC Design (ITE 4003)

Hanyang University (HYU)

TEACHING ASSISTANT

Mar. 2018 - Jun. 2018

- Developed lab assignments on Altera FPGA boards, led labs, and graded exams and assignments.

## Talks

- Aug. 2024 **Towards Secure and Low-Overhead PRAC-Based RowHammer Mitigations**, End-of-Intern Talk at NVIDIA Westford, USA
- Aug. 2023 **RowHammer Mitigations for Future High-Bandwidth Memory**, End-of-Intern Talk at MICRON Folsom, USA
- Feb. 2023 **Scalable and Secure Row-Swap: Efficient and Safe Row Hammer Mitigation in Memory Systems**, at HPCA'23 Montreal, Canada
- Nov. 2017 **Implementation of an FPGA-based CNN Accelerator using SDSoC**, at KICS'17 Fall Conference Daegu, South Korea

## Service

- Sep. 2024 **Student Volunteer**, at ISSWC'24 Vancouver, Canada
- Mar. 2023 **Student Volunteer**, at ASPLOS'23 Vancouver, Canada

## Academic Projects

### Investigating the Potential of Data Compression for Optimized LLC Replacement

Advanced Computer Architecture

UNIVERSITY OF BRITISH COLUMBIA (UBC), INSTRUCTOR: PROF. MIESZKO LIS

Jan. 2023 - Apr. 2023

- Conducted a comprehensive evaluation of existing LLC replacement methods to assess their effectiveness and limitations.
- Demonstrated 72.7% of cache lines are compressible by 10B or more, showing the potential of using compression for better replacement policies.
- Proposed a preliminary compression-assisted replacement method to optimize performance while minimizing storage overhead.

### Revisiting Address Translation on Intel Optane DC PMEM using Big-Memory Applications

Graduate Operating Systems

UNIVERSITY OF BRITISH COLUMBIA (UBC), INSTRUCTOR: PROF. MARGO SELTZER

Sep. 2022 - Dec. 2022

- Quantified address translation overhead in Optane DC PMEM systems using graph processing, HPC, and genomics workloads.
- Showed significant overhead with 4KB pages and demonstrated huge pages reduce overhead for applications sized tens of GB.

### Implementing Forward Operation of a Modified LeNet-5 in CUDA

Applied Parallel Programming

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN (UIUC)

Nov. 2020 - Dec. 2020

- Implemented five optimized forward-pass of convolutional layers using CUDA by leveraging shared memory, constant memory, and loop unrolling.
- Performed performance analysis with GPU performance profiling tools Nsight-Systems and Nsight-Compute.
- Source Code: [https://github.com/jeonghyunwoo0306/ece408PJ\\_Fa2020](https://github.com/jeonghyunwoo0306/ece408PJ_Fa2020)

## 32-Bit 5-Stage Pipelined MIPS Processor

HANYANG UNIVERSITY (HYU)

- Implemented a 32-bit 5-stage pipelined MIPS processor using Verilog.
- Performed an FPGA demonstration on Xilinx ZedBoard.

*Computer Architecture*

*Apr. 2016 - Jun. 2016*

## 8-Bit LCD Password Timer

HANYANG UNIVERSITY (HYU)

- Implemented an 8-bit LCD password timer using Assembly Language.

*Microprocessor*

*Nov. 2013 - Dec. 2013*

## Skills

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**Programming Languages** C/C++, Python, Perl, CUDA, Verilog, Bash Script, Assembly Language, Go

**Simulators** Ramulator, ChampSim, Gem5, DRAMSim2, GPGPU-Sim, MGPUSim

**Tools** Pin, SimPoint, Xilinx Vivado, Xilinx SDSoc, Intel Quartus

## Relevant Coursework

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- Advanced Computer Architecture, UBC
- Graduate Operating Systems, UBC
- Applied Parallel Programming, UIUC
- SoC Design, HYU
- Embedded System Design, HYU
- VLSI Engineering, HYU
- Computer Architecture, HYU
- Operating Systems, HYU
- Microprocessor, HYU
- Data Structures, HYU
- Digital Logic Design, HYU