

# Hyoukjun Kwon

ASSISTANT PROFESSOR @ UCI (EECS DEPT.)  
2200 Engineering Hall, CA 92697

☎ (+1) 404-539-4457 | ✉ hyoukjun.kwon@uci.edu | 🏠 www.hyoukjunkwon.com | 📺 hyoukjun-kwon

## Professional Experience

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### University of California, Irvine, Irvine, CA

Assistant Professor, EECS

*Jan. 2023 - present*

### Meta (Facebook), Sunnyvale, CA

Research Scientist at Meta (Facebook) Reality Labs  
Manager: Dr. Liangzhen Lai

*Oct. 2020 - Dec. 2022*

### Facebook, Menlo Park, CA

Research Intern at AR/VR AI Research  
Manager: Dr. Vikas Chandra, Mentor: Dr. Liangzhen Lai

*May. 2019 - July. 2019*

### NVIDIA, Westford, MA

Research Intern at Architecture Research Group  
Manager: Dr. Steve Keckler, Mentor: Dr. Michael Pellauer

*May. 2018 - Aug. 2018*

### NVIDIA, Westford, MA

Research Intern at Architecture Research Group  
Manager: Dr. Steve Keckler, Mentor: Dr. Michael Pellauer

*May. 2017 - Aug. 2017*

### Georgia Institute of Technology, Atlanta, GA

Graduate Research Assistant  
Advisor: Prof. Tushar Krishna

*Aug. 2015 - Jul. 2020*

## Education

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### Georgia Institute of Technology

PhD in Computer Science

*Aug. 2015 - Jul. 2020*

- Advisor: Prof. Tushar Krishna and Dr. Michael Pellauer (co-advisor)
- Committee: Prof. Vivek Sarkar, Prof. Hyesoon Kim, and Prof. Alexey Tumanov
- Thesis Title: Data- and Communication-centric Approaches to Model and Design Flexible Deep Neural Network Accelerators
- Honor: Honorable mention, ACM SIGARCH/IEEE CS TCCA Outstanding dissertation award,  
**(Selected as one of the three best dissertations in the computer architecture area in 2020)**

### Seoul National University (SNU)

BS in CSE (Computer Science and Engineering)  
BS in EMS (Environmental Material Science)

*Mar. 2007 - Feb. 2015*

- Advisor: Prof. Jihong Kim (CSE) and Prof. Junjae Lee (EMS)

## Honors & Awards

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- 2021 **Honorable Mention**, ACM SIGARCH/IEEE CS TCCA Outstanding Dissertation Award 2021
- 2020 **Best Paper Award**, HPCA 2020
- 2020 **Top Pick**, IEEE MICRO Top Picks from 2019 Computer Architecture Conferences
- 2019 **Finalist**, Qualcomm innovation fellowship
- 2019 **Honorable Mention, Top Pick**, IEEE MICRO Top Picks from 2018 Computer Architecture Conferences
- 2018 **Finalist**, ACM Student research competition (SRC) at MICRO 2018

## Research Interests

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**Computer architecture**  
**HW accelerator for deep learning (DL) workloads**  
**Mapping and dataflow optimization on accelerators**  
**Cross-stack optimization of AI systems**  
**Network-on-Chips (NoCs)**  
**Machine learning**

## Book

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[B1] Tushar Krishna, **Hyoukjun Kwon**, Angshuman Parashar, Michael Pellauer, and Ananda Samajdar (*alphabetical order*), “*Synthesis lecture on computer architecture: Data Orchestration in Deep Learning Accelerators* ([Link](#))”, Morgan & Claypool Publishers, August 2020

## Peer-reviewed Publications

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[C20] Seah Kim, **Hyoukjun Kwon**, Jinook Song, Jihyuck Jo, Yu-Hsin Chen, Liangzhen Lai, Vikas Chandra, “*DREAM: A Dynamic Scheduler for Dynamic Real-time Multi-model ML Workloads*”, *In Proc. of the 29rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2023

[C19] **Hyoukjun Kwon**, Krishnakumar Nair, Jamin Seo, Jason Yik, Debabrata Mohapatra, Dongyuan Zhan, Jinook Song, Peter Capak, Peizhao Zhang, Peter Vajda, Colby Banbury, Mark Mazumder, Liangzhen Lai, Ashish Sirasao, Tushar Krishna, Harshit Khaitan, Vikas Chandra, Vijay Janapa Reddi, “*XR Bench: An Extended Reality (XR) Machine Learning Benchmark Suite for the Metaverse*”, *Sixth Conference on Machine Learning and Systems (MLSys)*, 2023

[W2] **Hyoukjun Kwon**, Krishnakumar Nair, Jinook Song, Colby Banbury, Mark Mazumder, Peter Capak, Yu-Hsin Chen, Liangzhen Lai, Tushar Krishna, Harshit Khaitan, Vikas Chandra, Vijay Janapa Reddi, “*MetaBench: Real-Time Multi-Modal Benchmark for Metaverse*”, *Third Workshop on Benchmarking Machine Learning Workloads on Emerging Hardware @ MLSys2022 (MLBench)*, 2022, **Received the best paper award**

[C18] Jiaqi Gu, **Hyoukjun Kwon**, Dilin Wang, Wei Ye, Meng Li, Yu-Hsin Chen, Liangzhen Lai, Vikas Chandra, and David Z. Pan, “*Multi-Scale High-Resolution Vision Transformer for Semantic Segmentation*”, *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022

[J5] Prasanth Chatarasi, **Hyoukjun Kwon**, Angshuman Parashar, Michael Pellauer, Tushar Krishna and Vivek Sarkar, “*Marvel: A Data-Centric Approach for Mapping Deep Learning Operators on Spatial Accelerators*”, *ACM Transactions on Architecture and Code Optimization (TACO)*, 2021

[C17] Gordon E Moon, **Hyoukjun Kwon**, Geonhwa Jeong, Prasanth Chatarasi, Sivasankaran Rajamanickam,

Tushar Krishna, “Evaluating Spatial Accelerator Architectures with Tiled Matrix-Matrix Multiplication”, *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 2021

[C16] Eric Qin, Geonhwa Jeong, William Won, Sheng-Chun Kao, **Hyoukjun Kwon**, Sudarshan Srinivasan, Dipankar Das, Gordon E. Moon, Sivasankaran Rajamanickam, Tushar Krishna, “Extending Sparse Tensor Accelerators to Support Multiple Compression Formats”, *The 35th IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, 2021

[C15] **Hyoukjun Kwon**, Liangzhen Lai, Michael Pellauer, Tushar Krishna, Yu-Hsin Chen, Vikas Chandra, “Heterogeneous Dataflow Accelerators for Multi-DNN Workloads”, *The 27th IEEE International Symposium on High-Performance Computer Architecture (HPCA)*, 2021

[J4] **Hyoukjun Kwon**, Michael Pellauer, Angshuman Parashar, Tushar Krishna, “Flexion: A Quantitative Metric for Flexibility in DNN Accelerators”, *IEEE Computer Architecture Letters (CAL)*, 2021

[C14] **Robert Guirado and Hyoukjun Kwon (equal contribution)**, Sergi Abadal, Eduard Alarcon, Tushar Krishna, “Dataflow-Architecture Co-Design for 2.5D DNN Accelerators using Wireless Network-on-Package”, *The 26th Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2021

[J3] Jinwoo Kim, Gauthaman Murali, Heechun Park, Eric Qin, **Hyoukjun Kwon**, Venkata Chaitanya Krishna, Nihar Dasari, Arvind Singh, Minah Lee, Hakki Torun, Kallol Roy, Madhavan Swaminathan, Saibal Mukhopadhyay, Tushar Krishna, Sung Kyu Lim, “Architecture, Chip, and Package Co-design Flow for 2.5D Integration of Reusable IP Chiplets”, *IEEE Transactions on Very Large Scale Integration (VLSI) Systems (VLSI)*, 2020

[C13] Lei Yang, Zheyu Yan, Meng Li, **Hyoukjun Kwon**, Liangzhen Lai, Tushar Krishna, Vikas Chandra, Weiwen Jiang, Yiyu Shi, “Co-Exploration of Neural Architectures and Heterogeneous ASIC Accelerator Designs Targeting Multiple Tasks”, *The 57th Annual Design Automation Conference (DAC)*, 2020

[J2] **Hyoukjun Kwon**, Prasanth Chatarasi, Michael Pellauer, Angshuman Parashar, Vivek Sarkar, Tushar Krishna, “MAESTRO: A Data-Centric Approach to Understand Reuse, Performance, and Hardware Cost of DNN Dataflows”, *IEEE MICRO: Top-Picks in Computer Architecture Conferences in 2019 (Top-Picks)*, 2020

[C12] Eric Qin, Ananda Samajdar, **Hyoukjun Kwon**, Vineet Nadella, Sudarshan Srinivasan, Dipankar Das, Bharat Kaul, Tushar Krishna, “SIGMA: A Sparse and Irregular GEMM Accelerator with Flexible Interconnects for DNN Training”, *The 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA)*, 2020

**Received the best paper award**

[C11] Robert Guirado, **Hyoukjun Kwon**, Sergi Abadal, Eduard Alarcon, Tushar Krishna, “Understanding the Impact of On-Chip Communication on DNN Accelerator Performance”, *The 26th IEEE International Conference on Electronics Circuits and Systems (ICECS)*, 2019

[C10] **Hyoukjun Kwon**, Prasanth Chatarasi, Michael Pellauer, Angshuman Parashar, Vivek Sarkar, Tushar Krishna, “Understanding Reuse, Performance, and Hardware Cost of DNN Dataflows: A Data-Centric Approach”, *The 52nd IEEE/ACM International Symposium on Microarchitecture (MICRO)*, 2019

**Selected as Top Picks in Computer Architecture Conferences in 2019**

[C9] Jinwoo Kim, Gauthaman Murali, Heechun Park, Eric Qin, **Hyoukjun Kwon**, Venkata Chaitanya Krishna, Nihar Dasari, Arvind Singh, Minah Lee, Hakki Torun, Kallol Roy, Madhavan Swaminathan, Saibal Mukhopad-

hyay, Tushar Krishna, Sung Kyu Lim, “Architecture, Chip, and Package Co-design Flow for 2.5D Integration of Reusable IP Chiplets”, *The 56th Design Automation Conference (DAC)*, 2019

[C8] Zhongyuan Zhao, **Hyookjun Kwon**, Sachit Kumar, Weiguang Sheng, Zhigang Mao, Tushar Krishna, “mRNA: Enabling Efficient Mapping Space Exploration on a Reconfigurable Neural Accelerator”, *The 20th IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)*, 2019

[J1] **Hyookjun Kwon**, Ananda Samajdar, Tushar Krishna, “A Communication-driven Approach for Designing Flexible DNN Accelerators”, *IEEE Micro Special Issue on Hardware Acceleration (IEEE Micro)*, 2018

[C7] Brian Lebednik, Sergi Abadal, **Hyookjun Kwon**, Tushar Krishna, “Architecting a Secure Wireless Network-on-Chip”, *The 12th IEEE/ACM International Symposium on Networks-on-Chip (NOCS)*, 2018

[C6] **Hyookjun Kwon**, Ananda Samajdar, Tushar Krishna, “MAERI: Enabling Flexible Dataflow Mapping over DNN Accelerators via Reconfigurable Interconnects”, *The 23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2018  
**Honorable mention for Top Picks in Computer Architecture Conferences in 2018**

[C5] **Hyookjun Kwon**, Ananda Samajdar, Tushar Krishna, “MAERI: Enabling Flexible Dataflow Mapping over DNN Accelerators via Reconfigurable Interconnects”, *The Inaugural Sysml Conference (Sysml)*, not archived, 2018

[W1] Brian Lebednik, Sergi Abadal, **Hyookjun Kwon**, Tushar Krishna, “Spoofing Prevention via RF Power Profiling in Wireless Network-on-Chip”, *The 3rd International Workshop on Advanced Interconnect Solutions and Technologies for Emerging Computing Systems (AISTECS)*, 2018

[C4] **Hyookjun Kwon**, Ananda Samajdar, Tushar Krishna, “Rethinking NoCs for Spatial Neural Network Accelerators”, *The 11th International Symposium on Networks-on-Chips (NOCS)*, 2017

[C3] Janardhan Rao Doppa, Ryan Gary Kim, Mihailo Isakov, Michel A. Kinsy, **Hyookjun Kwon**, Tushar Krishna, “Adaptive Manycore Architectures for Big Data Computing”, *The 11th International Symposium on Networks-on-Chips (NOCS)*, 2017

[C2] **Hyookjun Kwon**, William Harris, Hadi Esmailzadeh, “Proving Flow Security of Sequential Logic via Automatically Synthesized Relational Invariants”, *The 34th Computer Security Foundations (CSF)*, 2017

[C1] **Hyookjun Kwon**, Tushar Krishna, “OpenSMART: Single-Cycle Multi-hop NoC Generator in BSV and Chisel”, *The 18th IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)*, 2017

## Invited Talks

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### ML Workloads in AR/VR and Their Implication to ML System Design

The Fourth Workshop on Benchmarking Machine Learning Workloads on Emerging Hardware (MLBench'23)

Jun. 2023

## **XR Bench: An Extended Reality (XR) Machine Learning Benchmark Suite for the Metaverse**

Industry-Academia Partnership Workshop- AI and Cloud Workshop @ UCSD

*Apr. 2023*

## **XR Bench: An Extended Reality Machine Learning Benchmark Suite for the Metaverse**

ML Performance Benchmarking Deep Learning Systems Workshop (MLPerf-Bench'23)

*Feb. 2023*

## **Accelerator System Design Challenges from Real-time and Multi-DNN Workloads**

IEEE International Conference on Artificial Intelligence Circuits and Systems - Tutorial

*Jun. 2022*

## **Heterogeneous Dataflow Accelerators for AR/VR Workload**

ACM SigArch Korea Workshop

*Aug. 2021*

## **Understanding hardware-mapping-model co-design space for efficient deep learning inference**

Seoul National University: AI Summer School 2021

*Aug. 2021*

## **Understanding Reuse, Performance, and Hardware Cost of DNN Accelerator Dataflows**

Pohang University of Science and Technology (Postech); Online Invited Talk – AI Seminar Series

*Aug. 2020*

## **An Open Source Framework for Exploring Dataflow and Generating DNN Accelerators Supporting Flexible Dataflow**

IBM Research, Yorktown Heights, New York

*Nov. 2018*

## **Services**

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### **Architecture, Compiler, and System Support for Multi-model DNN Workloads Workshop**

Workshop co-organizer (main PoC)  
([2021 at MICRO link](#)) , ([2022 at ISCA link](#))

*2021 (MICRO), 2022 (ISCA)*

### **Program Committee (PC)**

Conference on Machine Learning and System (MLSys)

*2024*

### **Program Committee (PC)**

The ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)

*2023 (Fall), 2024*

### **Technical Program Committee (TPC)**

Design Automation Conference (DAC)

*2023, 2024*

### **Technical Program Committee (TPC)**

IEEE International Parallel & Distributed Processing Symposium (IPDPS)

2024

### **Technical Program Committee (TPC)**

Design, Automation and Test in Europe Conference | The European Event for Electronic System Design & Test (DATE)

2023, 2024

### **Program Committee (PC)**

IEEE/ACM International Symposium on Computer Architecture (ISCA)

2023

### **Technical Program Committee (TPC)**

IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)

2023, 2024

### **Technical Program Committee (TPC)**

IEEE/ACM International Conference on Computer-Aided Design (ICCAD)

2023

### **External Review Committee (ERC)**

International Conference on Computer Vision (ICCV)

2023

### **External Review Committee (ERC)**

IEEE International Symposium on High-Performance Computer Architecture (HPCA).

2023

### **External Review Committee (ERC)**

The ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)

2023 (Spring and Summer)

### **External Review Committee (ERC)**

The European Conference on Computer Vision (ECCV)

2024

### **External Review Committee (ERC)**

International Conference on Computer Vision (ICCV)

2023

### **External Review Committee (ERC)**

Conference on Computer Vision and Pattern Recognition (CVPR)

2023, 2024

### **Technical Program Committee (TPC)**

The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC)

2022

### **Program Committee (PC)**

IEEE International Symposium on Workload Characterization (IISWC)

2022

### **External Review Committee (ERC)**

IEEE/ACM International Symposium on Computer Architecture (ISCA)

2021, 2022, 2024

### **External Review Committee (ERC)**

IEEE/ACM International Symposium on Microarchitecture (MICRO)

2021, 2022

### **Journal Reviewer**

IEEE Computer Architecture Letters

2020, 2021

### **Journal Reviewer**

IEEE MICRO

2019, 2022, 2023

### **Journal Reviewer**

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems

2021

### **Journal Reviewer**

ACM Transactions on Architecture and Code Optimization (TACO)

2019, 2020, 2021, 2022,  
2023, 2024

### **Journal Reviewer**

IEEE Transactions on Emerging Topics in Computing

2022

### **Journal Reviewer**

IEEE Transactions on Computers (TOC)

2019, 2020, 2021, 2022,  
2023, 2024

### **Journal Reviewer**

IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)

2020

### **Journal Reviewer**

IEEE Transactions on Neural Networks and Learning Systems (TNNLS)

2020

### **Journal Reviewer**

IEEE Open Journal of Circuits and Systems (CAS)

2020