# Jongse Park

**April 2023**


**Contact Information**

School of Computing
KAIST
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**Research Interests**

Computer architecture, hardware acceleration, machine learning, distributed systems, approximate computing technologies.

**Employment**

**Assistant Professor**. **KAIST** Dec. 2019–date
**Product Engineer**. **Bigstream Solutions Inc.** Jun. 2018–Nov. 2019

**Education**

**Ph.D. in Computer Science. Georgia Institute of Technology** Aug. 2013–Aug. 2018

- Advisor: Dr. Hadi Esmaeilzadeh
- Dissertation: *Breaking the Abstractions for Productivity and Performance in the Era of Specialization*

**M.S. in Computer Science. KAIST** Feb. 2012

- Advisor: Dr. Seungryoul Maeng
- Thesis: *Dynamic Resource Reconfiguration on the Cloud for Improving Data Locality*

**B.E. in Computer Science and Engineering. Sogang University** Feb. 2010

- Graduated with Honors

**Honors and Awards**

Distinguished paper award. IEEE Symposium on High Performance Computer Architecture. 2016
"TABLA: A Unified Template-Based Framework for Accelerating Statistical Machine Learning"

Honorable Mention in IEEE Micro Top Picks from 2014 Computer Architecture Conferences. 2015
"General-Purpose Code Acceleration with Limited-Precision Analog Computation"

Kwanjeong Foundation Scholarship, Kwanjeong Educational Foundation (KEF) 2013–2018

National Full Scholarship, KAIST 2010–2012

Dean's Honored Graduate, Ranked $3^{rd}$ among graduates of the class of 2010 2010

DMC General Management Track Scholarship, Samsung Electronics Co., Ltd 2009

Academic Scholarship, Sogang University, 7 semesters 2004–2009

**Refereed Journal Articles**

1. S. Noh, J. Koo, S. Lee, **J. Park**, and J. Kung, "FlexBlock: A Flexible DNN Training Accelerator with Multi-Mode Block Floating Point Support" in *IEEE Transactions on Computers (**TC**)*,, 2023.
2. S. Lee, R. Hwang, **J. Park**, and M. Rhu, "HAMMER: Hardware-friendly Approximate Computing for Self-attention with Mean-redistribution and Linearization" in *IEEE Computer Architecture Letters (**CAL**)*, 2023.
3. W. Seo, S. Cha, Y. Kim, J. Huh, and **J. Park**, " SLO-aware Inference Scheduler for Heterogeneous Processors in Edge Platforms" in *Transactions on Architecture and Code Optimization (**TACO**)*, 2021.
4. D. Mahajan, K. Ramkrishnan, R. Jariwala, A. Yazdanbakhsh, **J. Park**, B. Thwaites, A. Nagendrakumar, A. Rahimi, H. Esmaeilzadeh, K. Bazargan, "AXILOG: Abstractions for Approximate Hardware Design and Reuse," in ***IEEE Micro**, special issue on Alternative Computing Designs and Technologies*, October 2015.

**Refereed Conference Papers**

1. Sunho Lee, Seonjin Na, Jungwoo Kim, Jongse Park, and Jaehyuk Huh, "Tunable Memory Protection for Secure Neural Processing Units" in *The 40th IEEE International Conference on Computer Design (**ICCD**)*, October 2022.

2. Bokyeong Kim, Soojin Hwang, Sanghoon Cha, Chang Hyun Park, Jongse Park, and Jaehyuk Huh, "Supporting Dynamic Translation Granularity for Hybrid Memory Systems" in *The 40th IEEE International Conference on Computer Design (**ICCD**)*, October 2022.

3. Joon Kyung Kim, Byung Hoon Ahn, Sean Kinzer, Soroush Ghodrati, Rohan Mahapatra, Brahmendra Yatham, Dohee Kim, Parisa Sarikhani, Babak Mahmoudi, Divya Mahajan, Jongse Park, Hadi Esmaeilzadeh, "Yin-Yang: Programming Abstraction for Cross-Domain Multi-Acceleration", in ***IEEE Micro**, special issue on Compiling for Accelerators*, 2022.

4. Jinwoo Hwang, Minsu Kim, Daeun Kim, Seungho Nam, Yoonsung Kim, Dohee Kim, Hardik Sharma, Jongse Park, "CoVA: Exploiting Compressed-Domain Analysis to Accelerate Video Analytics", in *USENIX Annual Technical Conference (**ATC**)*, July 2022.

5. Seungbeom Choi, Sunho Lee, Yeonjae Kim, Jongse Park, Youngjin Kwon, and Jaehyuk Huh, "Serving Heterogeneous Machine Learning Models on Multi-GPU Servers with Spatio-Temporal Sharing", in *USENIX Annual Technical Conference (**ATC**)*, July 2022.

6. S. Lee, J. Kim, S. Na, **J. Park**, and J. Huh, "TNPU: Supporting Trusted Execution with Tree-less Integrity Protection for Neural Processing Unit" in *The 27th IEEE International Symposium on High-Performance Computer Architecture (**HPCA**)*, February 2022. [To appear]

7. S. Na, S. Lee, Y. Kim, **J. Park**, and J. Huh, "Common Counters: Compressed Encryption Counters for Secure GPU Memory" in *The 27th IEEE International Symposium on High-Performance Computer Architecture (**HPCA**)*, February 2021.

8. S. Ghodrati, H. Sharma, S. Kinzer, A. Yazdanbakhsh, **J. Park**, N. Kim, D. Burger, and H. Esmaeilzadeh, "Mixed-Signal Charge-Domain Acceleration of Deep Neural Networks through Interleaved Bit-Partitioned Arithmetic" in *The 29th International Conference on Parallel Architectures and Compilation Techniques (**PACT**)*, October 2020.

9. Y. Li, **J. Park**, M. Alian, Y. Yuan, Q. Zheng, P. Pan, R. Wang, A. Schwing, H. Esmaeilzadeh, N. Kim, "A Network-Centric Hardware/Algorithm Co-Design to Accelerate Distributed Training of Deep Neural Networks," *The 50th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO**)*, October 2018.

10. H. Sharma, **J. Park**, B. Samynathan, B. Robatmili, S. Mirkhani, H. Esmaeilzadeh, "From Tensors to FPGAs: Accelerating Deep Learning," *A Symposium on High Performance Chips (**Hot Chips**)*, August 2018.

11. H. Sharma, **J. Park**, N. Suda, L. Lai, B. Chau, J. Kim, V. Chandra, H. Esmaeilzadeh, "Bit Fusion: Bit-Level Dynamically Composable Architecture for Accelerating Deep Neural Networks," *International Symposium on Computer Architecture (**ISCA**)*, June 2018.

12. **J. Park**, H. Sharma, D. Mahajan, J. Kim, P. Olds, H. Esmaeilzadeh, "Scale-Out Acceleration for Machine Learning," in *The 50th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO**)*, October 2017.

13. **J. Park**, E. Amaro, D. Mahajan, B. Thwaites, H. Esmaeilzadeh, "AxGames: Towards Crowdsourcing Quality Target Determination in Approximate Computing," in *International Conference on Architectural Support for Programming Languages and Operating Systems (**ASPLOS**)*, April 2016.

14. H. Sharma, **J. Park**, D. Mahajan, E. Amaro, J. Kim, C. Shao, A. Mishra, H. Esmaeilzadeh "From High-Level Deep Neural Models to FPGAs," in *The 49th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO**)*, October 2016.

15. D. Mahajan, **J. Park**, E. Amaro, H. Sharma, A. Yazdanbaksh, J. Kim, H. Esmaeilzadeh, "Tabla: A Unified Template-based Framework for Accelerating Statistical Machine Learning," in *The 22nd IEEE Symposium on High Performance Computer Architecture (**HPCA**)*, March 2016.

    ***(Distinguished Paper Award)***

16. D. Mahajan, A. Yazdanbaksh, **J. Park**, B. Thwaites, H. Esmaeilzadeh, "Towards Statistical Guarantees in Controlling Quality Tradeoffs in Approximate Acceleration," in *International Symposium on Computer Architecture (**ISCA**)*, June 2016.

17. A. Yazdanbakhsh, **J. Park**, H. Sharma, P. Lotfi-Kamran, H. Esmaeilzadeh, "Neural Acceleration for GPU Throughput Processors," in *The 48th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO**)*, December 2015.

18. **J. Park**, H. Esmaeilzadeh, X. Zhang, M. Naik, W. Harris, "FlexJava: Language Support for Safe and Modular Approximate Programming," in *The 10th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (**FSE**)*, September 2015.

19. A. Yazdanbakhsh, D. Mahajan, B. Thwaites, **J. Park**, A. Nagendrakumar, S. Sethuraman, K. Ramkrishnan, N. Ravindran, R. Jariwala, A. Rahimi, H. Esmailzadeh, K. Bazargan, "Axilog: Language Support for Approximate Hardware Design," in *Design Automation and Test in Europe (**DATE**)*, March 2015.

20. R. S. Amant, A. Yazdanbakhsh, **J. Park**, B. Thwaites, H. Esmaeilzadeh, A. Hassibi, L. Ceze, D. Burger, "General-Purpose Code Acceleration with Limited-Precision Analog Computation," in *The 41th International Symposium on Computer Architecture (**ISCA**)*, June 2014.

    ***(Nominated for CACM Research Highlights; Honorable Mention in IEEE Micro Top Picks)***

21. B. Thwaites, G. Pekhimenko, A. Yazdanbakhsh, **J. Park**, G. Mururu, H. Esmaeilzadeh, O. Mutlu, T. Mowry, "Rollback-Free Value Prediction with Approximate Loads," in *The 24th International Conference on Parallel Architectures and Compilation Techniques (**PACT**)*, August 2014.

22. J. Choi, **J. Park**, J. Seol, and S. Maeng, "Isolated Mini-domain for Trusted Cloud Computing," in *The 13th International Symposium on Cluster, Cloud, and Grid Computing (**CCGrid**)*, May 2013.

23. **J. Park**, D. Lee, B. Kim, J. Huh, S. Maeng, "Locality-aware Dynamic VM Reconfiguration on MapReduce Clouds," in *The 21st International ACM Symposium on High-Performance Parallel and Distributed Computing (**HPDC**)*, June 2012.

**Refereed Workshop Papers**

1. H. Sharma, **J. Park**, E. Amaro, B. Thwaites, P. Kotha, A. Gupta, J. Kim, A. Mishra, H. Esmaeilzadeh, "DnnWeaver: From High-Level Deep Network Models to FPGA Acceleration," in *The Second Workshop on Cognitive Architectures (**CogArch**) in conjunction with ASPLOS*, April 2016.

2. D. Mahajan, A. Yazdanbakhsh, **J. Park**, B. Thwaites, H. Esmaeilzadeh, "Prediction-Based Quality Control for Approximate Accelerators," in *The Second Workshop on Approximate Computing Across the System Stack (**WACAS**) in conjunction with ASPLOS*, March 2015.

3. **J. Park**, K. Ni, X. Zhang, H. Esmaeilzadeh, M. Naik, "Expectation-Oriented Framework for Automating Approximate Programming,", in *The First Workshop on Approximate Computing Across the System Stack (**WACAS**) in conjunction with ASPLOS*, March 2014.

4. A. Yazdanbakhsh, B. Thwaites, **J. Park**, H. Esmaeilzadeh, "Methodical Approximate Hardware Design and Reuse," in *The First Workshop on Approximate Computing Across the System Stack (**WACAS**) in conjunction with ASPLOS*, March 2014.

5. A. Yazdanbakhsh, R. Amant, B. Thwaites, **J. Park**, H. Esmaeilzadeh, A. Hassibi, L. Ceze, D. Burger, "Toward General-Purpose Code Acceleration with Analog Computation," in *The First Workshop on Approximate Computing Across the System Stack (**WACAS**) in conjunction with ASPLOS*, March 2014.

6. B. Thwaites, A. Yazdanbakhsh, **J. Park**, H. Esmaeilzadeh, "Bio-Accelerators: Bridging Biology and Silicon for General-Purpose Computing," in *Wild and Crazy Ideas (**WACI**) in conjunction with ASPLOS*, March 2014.

## Research Experience

**Research Assistant**. Alternative Computing Technology (ACT) Lab — Aug. 2013–Aug. 2018
- Georgia Institute of Technology
- Advisor: Dr. Hadi Esmaeilzadeh

**Visiting Researcher**. Alternative Computing Technology (ACT) Lab — Jan. 2018–Aug. 2018
- University of California, San Diego
- Advisor: Dr. Hadi Esmaeilzadeh

**Research Intern**. Architecture Research Group (ARG) — May 2017–Aug. 2017
- NVIDIA Research
- Mentors: Dr. Arslan Zulfiqar and Dr. Eiman Ebrahimi
- Manager: Dr. Steve Keckler

**Research Intern**. Catapult team — Jan. 2016–May 2016
- Microsoft Research
- Mentor: Dr. Eric Chung
- Manager: Dr. Doug Burger

**Research Assistant**. Computer Architecture (CA) Lab — Feb. 2010–Jul. 2013
- Korea Advanced Institute of Science and Technology (KAIST)
- Advisor: Dr. Seungryoul Maeng

## Teaching Experience

**Instructor.**

| | | |
|---|---|---|
| • CS510: | Computer Architecture | Spring 2023 |
| • CS230: | System Programming | Fall 2022 |
| • CS311: | Computer Organization | Spring 2022 |
| • CS230: | System Programming | Fall 2021 |
| • CS492: | Special Topic in Computer Science: System for Artificial Intelligence | Spring 2021 |
| • CS230: | System Programming | Fall 2020 |
| • CS492: | Special Topic in Computer Science: System for Machine Learning | Spring 2020 |

**Teaching Assistant.**

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|---|---|---|---|
| • CS3220: | Processor Design | Georgia Institute of Technology | Fall 2016 |
| • CS3220: | Processor Design | Georgia Institute of Technology | Fall 2014 |
| • CS8803: | Alternative Computing Technology | Georgia Institute of Technology | Spring 2014 |
| • CS211: | Digital System and Lab. | KAIST | Spring 2011 |
| • CS311: | Embedded Computer Systems. | KAIST | Fall 2010 |

## Technical Skills

Programming languages: C/C++, Java, Python, CUDA, Verilog, Bash, JavaScript, HTML
Development Tools: Tensorflow, Amazon EC2, Spark, Hadoop, Chord, LLVM

## References Available to Contact


**Hadi Esmaeilzadeh.** Associate Professor, UCSD — hadi@eng.ucsd.edu
- 9500 Gilman Drive, La Jolla, CA 92093 — +1 (206) 658-3952

**Doug Burger.** Technical Fellow, Microsoft — dburger@microsoft.com
- 1 Microsoft Way, Redmond, WA 98052

**Stephen W. Keckler.** Vice President, NVIDIA Research — skeckler@nvidia.com
- 11001 Lakeline Blvd, Austin, TX 78717

**Eric Chung.** Partner Group Engineering Manager, Microsoft Azure — erchung@microsoft.com
- 1 Microsoft Way, Redmond, WA 98052 — +1 (408) 477-5435

**Eiman Ebrahimi.** CEO, Protopia AI — eiman.ebrahimi@gmail.com
- Austin, TX — +1 (215) 573-1856

**Mayur Naik.** Professor, University of Pennsylvania — mhnaik@cis.upenn.edu
- 3330 Walnut St, Philadelphia, PA 19104 — +1 (215) 573-1856