GEONHWA JEONG

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RESEARCH INTERESTS

Computer architecture, Hardware/software co-design, Domain specific accelerators, Reconfigurable architecture, Interconnection network, Deep learning

EDUCATION

Ph.D. Student in Computer Science   Aug. 2019 - Current
Advisor: Prof. Tushar Krishna

Georgia Institute of Technology (Georgia Tech)

Bachelor of Science in Creative IT Engineering   Mar. 2013 - Feb. 2019
Double Major in Computer Science and Engineering   *Summa Cum Laude*

Pohang University of Science and Technology (POSTECH)

RESEARCH EXPERIENCES

Synergy Lab at Georgia Tech   Nov. 2019 - Current
Research Assistant (Advisor: Prof. Tushar Krishna)   *Atlanta, USA*

To fully exploit available parallelism in spatial accelerators, it is important to schedule and map the input data efficiently to the processing elements maximizing data reuse. I am working on optimizing the dataflow considering both software and hardware. Also, I am leading a project to efficiently integrate a systolic array based matrix engine in CPU to accelerate deep learning workloads, like Intel AMX.

High Performance Architecture Lab at Georgia Tech   Sep. 2019 - Nov. 2019
Research Student (Advisor: Prof. Hyesoon Kim)   *Atlanta, USA*

The Unified Virtual Memory with GPU and CPU not only gets rid of programmers burden a lot but also enables running a program with the working set size larger than the GPU capacity. I worked on efficient page prefetching mechanisms with various workloads.

Computer Vision Lab at POSTECH   Sep. 2018 - Feb. 2019
Research Student (Advisor: Prof. Suha Kwak)   *Pohang, Republic of Korea*

Since there has been the disparity between target task and surrogate task for self-supervised learning, our team conducted the research on task-specific self-supervised learning with object detection as the target task.

Compiler Optimization Research Lab at POSTECH   Sep. 2017 - June 2018
Research Student (Advisor: Prof. Hanjun Kim)   *Pohang, Republic of Korea*

I was engaged in three projects including implementation of IoT platform for various types of users (manufacturer, service developer, user), development of programmable magnetic

blocks to teach computational thinking to kids and development of hot function/basic block detector using LLVM compiler.

Database and Data Mining Lab at POSTECH Mar. 2015 - Nov. 2015
Research Student (Advisor: Prof. Wook-Shin Han) *Pohang, Republic of Korea*

I was involved in a team to develop a new graph database system which can process a large amount of streaming data. I participated in the initial design of the query processing engine and the development of memory management system to support the engine.

WORK EXPERIENCES

Facebook May 2021 - Aug 2021
Research Engineering Intern *Seattle, USA*

I worked on workload characterization at datacenter-scale services at Facebook and explored offloading opportunities.

Intel Labs May 2020 - Aug 2020
Graduate Technical Intern *Oregon, USA*

I implemented a performance model for a new architectural feature of CPU and built a framework to validate the model by comparing against RTL results.

VoyagerX Feb. 2019 - July 2019
Software Engineer *Seoul, Republic of Korea*

I developed a mobile application for automatic meeting notes with speaker diarization using a deep learning model to extract feature vectors from voice data.

Samsung Research July 2018 - Aug. 2018
Field Training *Seoul, Republic of Korea*

I was involved in a team developing a cloud management system, which is used by the members of Samsung Research to develop their own programs, in GitOps manner to keep the more robust system.

Korea Augmentation to the US Army Nov. 2015 - Aug. 2017
Service Member *Seoul, Republic of Korea*

I served mandatory military service as a movement specialist with the United States Army and participated in three combined exercises (KR 17, UFG 17, and KR 18).

Kakao Corp. Jan. 2015 - Feb. 2015
Intern *Seongnam, Republic of Korea*

I developed an abuse detection system to automatically identify abusers to prevent general users from being exposed to inappropriate posts and comments.

PUBLICATIONS

[1] 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)** *(Special Section on Innovative R&D toward the Exascale Era), 2021 (to appear).*

[2] **Geonhwa Jeong**, Eric Qin, Ananda Samajdar, Christopher J. Hughes, Sreenivas Subramoney, Hyesoon Kim, Tushar Krishna, "RASA: Efficient Register-Aware Systolic Array Matrix Engine for CPU." *Proc. of the 58th Annual Design Automation Conference* **(DAC)***, Dec 2021 (to appear).*

[3] 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." *Proc. of the 35th IEEE International Parallel Distributed Processing Symposium* **(IPDPS)***, May 2021*

[4] Jan Moritz Joseph, Lennart Bamberg, **Geonhwa Jeong**, Ruei-Ting Chien, Rainer Leupers, Alberto Garcia-Ortiz, Tushar Krishna, Thilo Pionteck, "Bridging the Frequency Gap in Heterogeneous 3D SoCs through Technology-Specific NoC Router Architectures." *Proc. of the 26th Asia and South Pacific Design Automation Conference* **(ASP-DAC)***, Jan 2021 (to appear).*

[5] Sheng-Chun Kao, **Geonhwa Jeong**, Tushar Krishna, "ConfuciuX: Autonomous Hardware Resource Assignment for DNN Accelerators using Reinforcement Learning." *Proc. of 53rd Annual IEEE/ACM International Symposium on Microarchitecture* **(MICRO)***, Oct 2020.*

[6] Kyoungmin Kim, In Seo, Wook-shin Han, Jeong-Hoon Lee, Sungpack Hong, Hassan Chafi, Hyungyu Shin, **Geonhwa Jeong**, "TurboFlux: A Fast Continuous Subgraph Matching System for Streaming Graph Data." *Proc. of the 44th International Conference on Management of Data,* **(SIGMOD)***, June 2018.*

HONORS AND AWARDS

Scholarship from Kwanjeong Educational Foundation	Sep. 2019 - Current
University Scholarship for Student Mentoring Program	Sep. 2017 - Dec. 2018
National Scholarship from ICT Creative Consilience Program	Mar. 2013 - Feb. 2019
Scholarship from Korea Hydro & Nuclear Power	Mar. 2018
Army Achievement Medal from the US Army	Aug. 2017

SKILLS

Programming	C/C++, SystemC, Java, Verilog, Ocaml
Scripting	Python, Javascript, PHP, Perl
Others	Hadoop, Spark, Tensorflow, PyTorch

EXTRA-CURRICULAR ACTIVITIES

Student Mentoring Program at POSTECH	Sep. 2017 - Dec. 2018
Qualcomm IT Tour	June 2018
Einstein Class of Korea Hydro & Nuclear Power	Dec. 2017 - Feb. 2018
Proud Postechian Club	Sep. 2017 - Dec. 2017