Reza Rahimi

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Interests

- New processing paradigms, near-memory and in-memory processing, memory-centric architectures
- Accelerator design for AI applications
- Reconfigurable computing, parallel programming, performance analysis

Education

University of Virginia Charlottesville, VA — Ph.D.
Department of Computer Science, Dissertation Advisor: Prof. Kevin Skadron — August 2015 – December 2020

Dissertation Title: *Enabling Low-Overhead and Scalable Near-Data Pattern Matching Acceleration with Memory-Centric Architectures*
GPA: 3.91

Sharif University of Technology, Tehran, Iran — M.Sc.
Department of Computer Engineering. Thesis Advisor: Prof. Shohreh Kasaei — September 2008 – August 2011
Thesis Title: *Background Modeling for Video Object Tracking*
GPA: 3.85

Iran University of Science and Technology, Tehran, Iran — B.Sc.
Department of Computer Engineering — September 2003 – August 2008

Research and Job Experiences

University of Virginia, Graduate Research Assistant, Charlottesville, VA — Aug. 2017 – Dec. 2020

- Performed research on near/in-memory processing, memory systems, and FPGAs.
- Developed APSim, a framework for cycle accurate automata simulation, transformation, minimization, and performance modeling on memory-centric architectures.

Falcon Computing, Intern — Aug. 2020 – Nov. 2020

- Worked on DNN quantization and accelerator integration in TensorFlow.

Google, Intern — May. 2020 – July. 2020

- Worked on numerical analysis of cutting-edge machine learning workloads for Edge TPU.

Samsung Strategy and Innovation Center, Intern, San Jose, CA — May. 2018 – Aug. 2018

- Developed a set of tools with C++11 and Python to capture the characteristics of the message communication of a MPSOC and analyze the performance in time and frequency domains.

Honda Research Institute, Intern, Mountain View, CA — Jan. 2017 – Aug. 2017

- Developed efficient plugins and models for autonomous driving platform in Gazebo simulator using ROS (Robotic operating System) and C++11.
- Developed a novel navigation policy for autonomous driving in partially occluded intersections with Reinforcement Learning.

University of Virginia, Graduate Research Assistant, Charlottesville, VA — Fall 2015 – Dec. 2016

- Explored network QoS effects for industrial cloud robotics.
- Studied QoS performance evaluation in software switches.

Friedrich Alexander University (FAU), Intern, Erlangen, Germany — February 2014 – July 2014

- Developed an event-driven, cycle accurate hardware simulator using SystemC.
- Designed an XML-based language to describe the system architecture at run-time.

Software engineer at Samim Co., Tehran, Iran — September 2011 – January 2014

- Lead developer and architect for remote control and monitoring of embedded systems products.

Sharif University of Technology, Graduate Research Assistant, Tehran, Iran — September 2008 – August 2011

- Proposed a statistical approach for background subtraction in dynamic video scenes.

Relevant Computer Skills

Languages: Python, C/C++, Java, Verilog/VHDL, C#, MATLAB, bash, HTML, JavaScript, SQL
Tools and Libraries: TensorFlow, PyTorch, ROS, Gazebo, OpenCV, PCL, Boost, MPI, Hadoop, Spark, Vivado, CUDA, SystemC, Gem5, ModelSim
Others: Linux, GCC, CMake, Git

Publications

Conference Papers

- **Reza Rahimi**, Elaheh Sadredini, and Kevin Skadron. "Sunder: Enabling Low-Overhead and Scalable Near-Data Pattern Matching Acceleration." *Under Review*, 2020.
- **Reza Rahimi**, Elaheh Sadredini (equal contribution), and Kevin Skadron. "Enabling In-SRAM Pattern Processing with Low-Overhead Reporting Architecture." *IEEE Computer Architecture Letters (**CAL**)*, 2020.
- **Reza Rahimi**, Elaheh Sadredini, Mircea Stan, and Kevin Skadron. "Grapefruit: An Open-Source, Full-Stack, and Customizable Automata Processing on FPGAs." *The 28th IEEE International Symposium on Field-Programmable Custom Computing Machines **(FCCM)***, 2020 acceptance rate: 19.3%). **Best Paper Nominee.**
- **Reza Rahimi**, Elaheh Sadredini (equal contribution), Marzieh Lenjani, Mircea Stan, and Kevin Skadron. "Impala: Algorithm/Architecture Co-Design for In-Memory Multi-Stride Pattern Matching." *The 26th IEEE International Symposium on High-Performance Computer Architecture **(HPCA)***, 2020 (acceptance rate: 19%). **Best Paper Nominee.**
- Elaheh Sadredini, **Reza Rahimi**, Marzieh Lenjani, Mircea Stan, and Kevin Skadron. "FlexAmata: A Universal and Efficient Adaption of Applications to Spatial Automata Processing Accelerators." *The 25th International Conference on Architectural Support for Programming Languages and Operating Systems **(ASPLOS)***, 2020 (acceptance rate: 18%). **Accepted artifact with "evaluated and reusable" badge.**
- Elaheh Sadredini, **Reza Rahimi**, Vaibhav Verma, Mircea Stan, and Kevin Skadron. "eAP: A Scalable and Efficient in Memory Accelerator for Automata Processing." *52th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO'52**), 2019 (acceptance rate: 23%).*
- David Isele, **Reza Rahimi**, Akansel Cosgun, Kaushik Subramanian and Kikuo Fujimura. "Navigating Occluded Intersections with Autonomous Vehicles using Deep Reinforcement Learning." *IEEE International Conference on Robotics and Automation (**ICRA'18**)*.
- Kevin Angstadt, Arun Subramaniyan, Elaheh Sadredini, **Reza Rahimi**, Kevin Skadron, Westley Weimer, and Reetu Das. "ASPEN: A Scalable In-SRAM Architecture for Pushdown Automata." *51th Annual IEEE/ACM International Symposium on Microarchitecture (**MICRO'51**)*, 2018 (acceptance rate: 21%).
- Elaheh Sadredini, Deyaun Guo, Chunkun Bo, **Reza Rahimi**, Kevin Skadron, and Hongning Wang. " A Scalable Solution for Rule-Based Part-of-Speech Tagging on Novel Hardware Accelerators." *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD'18**)*, 2018 (acceptance rate: 14.5%).
- **Reza Rahimi**, Chencheng Shao, Malathi Veeraraghavan, Andrea Fumagalli, Jorge Nicho, J. Meyer, S. Edwards, C. Flannigan, P. Evans, "An Industrial Robotics Application with Cloud Computing and High-Speed Networking." *IEEE 1st International Conference on Robotic Computing (ICRC)*, Taiwan, 2017.
- Elaheh Sadredini, **Reza Rahimi**, Ke Wang, and Kevin Skadron. "Frequent Subtree Mining on the Automata Processor: Opportunities and Challenges." *ACM International Conference on Supercomputing (**ICS**)*, Chicago, June 2017 (Acceptance rate: 15.8%).
- **Reza Rahimi**, Malathi Veeraraghavan, Yoshihiro Nakajima, Hirokazu Takahashi, S Okamoto, N. Yamanaka. "A High-Performance OpenFlow Software Switch.", IEEE 17th *International Conference on High Performance Switching and Routing (HPSR)*, Yokohama, 2016.
- Elaheh Sadredini, **Reza Rahimi**, Paniz Froutan, Mahmood Fathy, and Zainalabedin Navabi. "An Improved Scheme for Pre-computed Patterns in Core-based SoC Architecture." *In Design & Test Symposium (EWDTS)*, IEEE, Armenia, 2016.
- Bruno Kleinert, **Reza Rahimi**, Marc Reichenbach, and Dietmar Fey. "Hardware-Software Co-simulation for Medical X-Ray Control Units." *In Proceedings of the 8th International Conference on Simulation Tools and Techniques (SIMUTools)*, ACM, 2015.

Journal Papers

- Elaheh Sadredini, **Reza Rahimi**, Vaibhav Verma, Mircea Stan, Kevin Skadron. "A Scalable and Efficient in-Memory Interconnect Architecture for Automata Processing." *IEEE Computer Architecture Letters (**CAL**), 2019. **Selected as on of three "Best of***

CAL" out of 46 accepted papers in 2019.

- M. Veeraraghavan, T. Sato, M. Buchanan, **Reza Rahimi**, S. Okamoto, N. Yamanaka. "Network Function Virtualization: A Survay." ***IEICE Transactions on Information and Systems****, May, 2017.* ***Received the IEICE Communication Society Excellent Paper Award and Best Tutorial Paper Award.***

Others

- Elaheh Sadredini, **Reza Rahimi**, Vaibhav Verma, Mircea Stan, Kevin Skadron. "Scalable and Efficient In-Memory Interconnect Architecture for Automata Processing." *SRC TECHCON, 2019.*
- Elaheh Sadredini, Deyaun Guo, Chunkun Bo, **Reza Rahimi**, Hongning Wang, Kevin Skadron. "A Scalable Solution for Rule-Based Part-of-Speech Tagging on Novel Hardware Accelerators." *SRC TECHCON, 2018.*

Patents

- Elaheh Sadredini, **Reza Rahimi**, Mircea Stan, and Kevin Skadron. "Methods, Circuits, Systems, and Manufacture for State Machine Interconnect Architecture Using Embedded DRAM." *U.S. Patent No. US10,580,481, Granted in March 2020.*
- Elaheh Sadredini, **Reza Rahimi**, Ke Wang, and Kevin Skadron. "Methods, Circuits, and Articles of Manufacture for Frequent Sub-Tree Mining using Non-Deterministic Finite State Machines", *U.S. Patent Application No. US16/246,641.*
- David Isele, **Reza Rahimi**, Akansel Cosgun, Kaushik Subramanian, Kikuo Fujimura. "Systems and methods for generating instructions for navigating intersections with autonomous vehicles", *U.S. Patent Application No. US15/968,460.*

Honors and Awards

- Best paper nominee for our paper, Grapefruit, FCCM 2020.
- Best paper nominee for our paper, Impala, HPCA 2020.
- Our CAL paper is selected as one of three "Best of CAL" out of 46 accepted papers in 2019, by the Editorial Board of IEEE Computer Architecture Letters (CAL), December. 2019.
- Received the IEICE Communication Society Excellent Paper Award and Best Tutorial Paper Award, Tokyo, May, 2019.
- Selected as runner up in 14^{th} annual University of Virginia Engineering Research Symposium (UVERS) for exceptional graduate research, Charlotteville, VA, March, 2018.
- Ranked 6th (out of 30,000) in nation-wide graduate study entrance exam, Iran, 2008.

Posters

- **Reza Rahimi**, Elaheh Sadredini, Mircea Stan, Kevin Skadron, "Impala: Algorithm/Architecture Co-Design for In-Memory Multi-Stride Pattern Matching" *ACM SRC (Student Research Competition) at MICRO-52, 2019.*
- **Reza Rahimi**, Chencheng Shao, Malathi Veeraraghavan, Andrea Fumagalli, Jorge Nicho, J. Meyer, S. Edwards, C. Flannigan, P. Evans, "Industrial Cloud Robotics across Software Defined Networks" *In US-Ignite Summit 2016.*

References

References available upon request.