Elaheh Sadredini

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Education

University of Virginia, Charlottesville, VA   Ph.D.
Dept. of Computer Science, Advisor: Prof. Kevin Skadron   Aug. 2014 – May 2019
Dissertation: Accelerating Complex Pattern Recognition Processing with In-Memory Accelerator Architectures

Iran University of Science and Technology, Tehran, Iran   M.Sc.
Dept. of Computer Engineering, Advisor: Prof. Zain Navabi   Sept. 2010 – Nov. 2012

Iran University of Science and Technology, Tehran, Iran   B.Sc.
Dept. of Computer Engineering   Sept. 2006 – Sept. 2010

Professional Experience

University of California, Riverside, Assistant Professor   July 2020 – Current

University of Virginia, Postdoctoral Research Associate   May 2019 – June 2020
- Member of the Center for Research in Intelligent Storage and Processing in Memory (CRISP), Semiconductor Research Corporation (SRC).

University of Virginia, Graduate Research Assistant   Aug 2014 – May 2019
- Member of the Center for Research in Intelligent Storage and Processing in Memory (CRISP), Semiconductor Research Corporation (SRC).
- Member of the Center for Future Architectures Research (CFAR), Semiconductor Research Corporation (SRC).
- Member of the Center for Automata Processing, University of Virginia.

eBay Inc., Research Intern, San Jose, CA   Summer 2018

Apple Inc., Special Project Intern, Cupertino, CA   Summer 2017

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

University of Tehran, Graduate Research Assitant, Tehran, Iran   October 2010 – July 2013

Honors and Awards

○ Hellman Fellowship Award, 2022-2023.
○ University of California Regents Faculty Fellowship (Assistant Professors), 2021-2022.
○ Best paper nominee for our paper, Grapefruit, FCCM, 2020.
○ Best paper nominee for our paper, Impala, HPCA, 2020.
○ Best of CAL award for our paper, in Computer Architecture Letters (CAL), 2019.
○ Best paper candidate, IEEE International Symposium on Workload Characterization (IISWC), Florida, 2019.
○ Best presentation award, SRC TECHCON, Austin, TX, Sept. 2019.
○ ISO graduation award, Selected among all the international graduate students at the University of Virginia, May 2019.
○ John A. Stankovic graduate research award for outstanding research, Dept. of Computer Science, University of Virginia, 2018-2019.
○ Second place in 15th annual University of Virginia Engineering Research Symposium (UVERS) for exceptional presentation of graduate research, Charlotteville, VA, March, 2019.
○ Best presentation award, SRC Techcon, Austin, TX, Sept. 2018.
○ Graduate student award for outstanding research, Dept. of Computer Science, University of Virginia, 2017-2018
○ Best paper award, Computer Frontiers, Como, Italy, May 2016.

Teaching

○ Winter 2023, CS 277- Data Centric Computer Architecture, CSE/ECE Department, UC Riverside.
   - Overall review: currently teaching

○ Fall 2022, CS 213 - Multiprocessor Architecture and Programming, CSE Department, UC Riverside.

- Overall review: 4.9/5

○ Spring 2022, *CS 161 - Design and Architecture of Computer Systems*, CSE Department, UC Riverside.
  - Overall review: 4.72/5

○ Fall 2021, *CS 213 - Multiprocessor Architecture and Programming*, CSE Department, UC Riverside.
  - Overall review: 4.82/5

○ Spring 2021, *CS 161 - Design and Architecture of Computer Systems*, CSE Department, UC Riverside.
  - Overall review: 4.77/5

○ Winter 2021, *CS 213 - Multiprocessor Architecture and Programming*, CSE Department, UC Riverside.
  -Overall review: 4.56/5

○ Fall 2020, *CS 260 - Seminar on Memory-Centric Computing Systems*, CSE Department, UC Riverside.
  - Overall review: 4.92/5

Publications

Conference Papers

1. Jingyao Zhang and **Elaheh Sadredini**. "Inhale: Enabling High-Performance and Energy-Efficient In-SRAM Cryptographic Hash for IoT." *IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2022 (acceptance rate: 22%)*.

2. Jingyao Zhang, Hoda Naghibijouybari, and **Elaheh Sadredini**. "Sealer: In-SRAM AES for High-Performance and Low-Overhead Memory Encryption." *ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED), 2022 (acceptance rate: 25%)*.

3. Hanning Chen, M. Hassan Najafi, **E. Sadredini**, and M. Imani. "Full Stack Parallel Online Hyperdimensional Regression on FPGA." *The 40th IEEE International Conference on Computer Design (ICCD), 2022, 2022*.

4. Z. Zou, H. Chen, P. Poduval, Y. Kim, M. Imani, **E. Sadredini**, R. Cammarota, and M. Imani. "BioHD: An Efficient Genome Sequence Search Platform Using HyperDimensional Memorization." *IEEE/ACM International Symposium on Computer Architecture (ISCA), 2022 (acceptance rate: 18%)*.

5. Mohsen Imani, Ali Zakeri, Hanning Chen, TaeHyun Kim, Prathyush Poduval, Hyunsei Lee, Yeseong Kim, **Elaheh Sadredini**, and Farhad Imani. "Neural Computation for Robust and Holographic Face Detection." *IEEE/ACM Design Automation Conference (DAC)*, 2022 (acceptance rate: 22%).

6. **Elaheh Sadredini**, Reza Rahimi, Mohsen Imani, and Kevin Skadron. "Sunder: Enabling Low-Overhead and Scalable Near-Data Pattern Matching Acceleration." *54th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO), 2021 (acceptance rate: 21%)*.

7. Prathyush Poduval, Zhuowen Zou, Xunzhao Yin, **Elaheh Sadredini**, Mohsen Imani. "Cognitive Correlative Encoding for Genome Sequence Matching in Hyperdimensional System." *IEEE/ACM Design Automation Conference (DAC)*, 2021 (acceptance rate: 23%).

8. **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.**

9. **Elaheh Sadredini**, Reza Rahimi (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.**

10. 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.**

11. Marzieh Lenjani, Patricia Gonzalez, **Elaheh Sadredini**, Shuangchen Li, Yuan Xie, Ameen Akel, Sean Eilert, Mircea R. Stan, and Kevin Skadron. "Fulcrum: a Simplified Control and Access Mechanism toward Flexible and Practical in-situ Accelerators." *The 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2020* (acceptance rate: 19%).

12. **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%)*.

13. Marzieh Lenjani, Patricia Gonzalez, **Elaheh Sadredini**, Arif Rahman, and Mircea Stan. "Evaluation of an Overflow-free Quantized Memory Hierarchy in General Purpose Processors." *IEEE International Symposium on Workload Characterization (IISWC), 2019.* **Best Paper Nominee.**

14. Jack Wadden, Tommy Tracy II, **Elaheh Sadredini**, Lingxi Wu, Chunkun Bo, Jesse Du, Yizhou Wei, Matthew Wallace, Jeffrey Udall, Mircea Stan, Kevin Skadron. "AutomataZoo: A Modern Automata Processing Benchmark Suite." *IEEE International Symposium on Workload Characterization (IISWC), 2018* (acceptance rate: 23%).

15. 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%).

16. **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%).

17. Chunkun Bo, Vinh Dang, **Elaheh Sadredini**, Kevin Skadron. "Searching for Potential gRNA Off-Target Sites for CRISPR/Cas9 using Automata Processing across Different Platforms." IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2018 (acceptance rate: 20%).

18. **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%).

19. J. Wadden, V. Dang, N. Brunelle, T. Tracy II, D. Guo, **E. Sadredini**, K. Wang, C. Bo, G. Robins, M. Stan, K. Skadron. "ANMLZoo: A Benchmark Suite for Exploring Bottlenecks in Automata Processing Engines and Architectures." *IEEE International Symposium on Workload Characterization (IISWC)*, October 2016.

20. Ke Wang, **Elaheh Sadredini**, and Kevin Skadron. "Sequential Pattern Mining with the Micron Automata Processor." *ACM International Conference on Computing Frontiers (CF)*, Italy, May 2016 (Acceptance rate: 26%). **Best Paper Award.**

21. Ke Wang, Kevin Angstadt, Chunkun Bo, Nathan Brunelle, **Elaheh Sadredini**, Tommy Tracy II, Jack Wadden, Mircea Stan, Kevin Skadron. "An Overview of Micron's Automata Processor." *Proceedings of the Eleventh IEEE/ACM/IFIP International Conference on Hardware/Software Codesign and System Synthesis*, 2016.

22. **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.

23. **Elaheh Sadredini**, Mohammadreza Najafi, Mahmood Fathy, and Zainalabedin Navabi. "BILBO-friendly hybrid BIST architecture with asymmetric polynomial reseeding." *In 16th CSI International Symposium on Computer Architecture and Digital Systems (CADS)*, IEEE, Iran, 2012.

Journal Papers

1. **Elaheh Sadredini**, Reza Rahimi (equal contribution), and Kevin Skadron. "Enabling In-SRAM Pattern Processing with Low-Overhead Reporting Architecture." *IEEE Computer Architecture Letters (CAL)*, 2020.

2. **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.* **Best of CAL Award.**

3. Ke Wang, **Elaheh Sadredini**, and Kevin Skadron. "Hierarchical Pattern Mining with the Micron Automata Processor." *International Journal of Parallel Programming (IJPP)*, Jan. 2017, DOI: 10.1007/s10766-017-0489-y.

Other Proceedings and Workshops

1. **Elaheh Sadredini**, Reza Rahimi, Vaibhav Verma, Mircea Stan, Kevin Skadron. "Scalable and Efficient In-Memory Interconnect Architecture for Automata Processing." *SRC TECHCON*, 2019. **Best Presentation Award.**

2. **Elaheh Sadredini**, Reza Rahimi, Vaibhav Verma, Mircea Stan, Kevin Skadron. "Scalable and Efficient In-Memory Interconnect Architecture for Automata Processing." *Career Workshop for Women and Minorities in Computer Architecture*, 2019.

3. **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.* **Best Presentation Award.**

4. Chunkun Bo, **Elaheh Sadredini**, Kevin Skadron. "Fast Searching for Potential gRNA Off-Target Sites for CRISPR/Cas9 using Automata Processing." SRC TECHCON, 2017.

5. **Elaheh Sadredini**, Deyaun Guo, Chunkun Bo, Reza Rahimi, Kevin Skadron, and Hongning Wang. "Accelerating Rule-Based Part-of-Speech Tagging on the Micron's Automata Processor." ACM Capital Region Celebration of Women In Computing, Georgetown University, 2017.

6. **Elaheh Sadredini**, Mohammad Hashem Haghbayan, Mahmood Fathy, and Zainalabedin Navabi. "Test Generation and Scheduling for a Hybrid BIST Considering Test Time and Power Constraint." *arXiv:1711.08974*, November 2017.

7. **Elaheh Sadredini**, Reza Rahimi, Ke Wang, and Kevin Skadron. Frequent Subtree Mining on the Automata Processor: Opportunities and Challenges." *In the Center for Future Architecture (C-FAR), SRC,* Nov. 2017.

8. **Elaheh Sadredini**, Ke Wang, and Kevin Skadron. "A New and Efficient Approach to Mine Frequent Subtrees Using the Micron Automata Processor." *In the Center for Future Architecture (C-FAR), SRC,* Nov. 2015.

Patents

- **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 No. 16/246,641, granted in April 2022.*
- **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. 10,580,481, Granted in March 2020.*
- Ke Wang, **Elaheh Sadredini**, and Kevin Skadron. "Disjunctive Rule Mining with Finite Automatan Hardware." *U.S. Patent Serial No. US15/475,819, Granted in November 2019.*
- Ke Wang, **Elaheh Sadredini**, and Kevin Skadron. "Sequential Pattern Mining with the Micron Automata Processor." *U.S. Patent Application No. 15/198521.*
- Chunkun Bo, **Elaheh Sadredini**, Vinh Dang, and Kevin Skadron. "Methods, Circuits, Systems, and Articles of Manufacture for Searching a Reference Sequence for a Target Sequence within a Specified Distance." *U.S. Patent Application No. 15/932,287.*

Grants and Gifts

- IEEE Diversity Inclusion Project Program, $10,500, Role: co-PI, 2022-2023.
- Google exploreCSR, $32,000, Role: co-PI, 2022-2023
- Hellman Fellowship, $30,000, 2022-2023.
- University of California Omnibus Travel Only Awards, $900, 2022.
- NSF BPC-AE: An Extended CAHSI Alliance to Broaden Participation in Graduate Studies, $2.9M, Role: Senior Personnel, 2021 - 2024
- HEERF fund, University of California, Riverside $40,000, 2021-2023.
- Hyve Solutions: "Automated Optical Inspection", $15,000, January 2021.
- University of California Regents Faculty Fellowship, $4,500, 2021-2022.
- University of California Omnibus Travel Only Awards, $900, 2021.
- Xilinx, Inc, Received an FPGA board to support our research ($6,495), 2021.

Students

PhD Students

- Jingyao Zhang (2021- present)
- Sahar Ghoflsaz (2022- present)
- Nurlan Nazaraliyev (2022 - present)

Undergraduate Students

- Johnny To, Intern (Summer 2021)
- Quinterrageneva Waltereze, Intern (Summer 2021)
- Srikar Voleti (Feb 2021 - July 2021)
- Martin Mejia Martinez, undergrad researcher (March 2022 - present)
- Jayan Patel, undergrad researcher (March 2022 - present)

Professional Services

- **Program Committee**
  - ASPLOS YArch'23: Young Architect Workshop, co-located with ASPLOS, 2023
  - IPDPS'23: 37th IEEE International Parallel Distributed Processing Symposium, 2023
  - MICRO'22 SRC: ACM Student Research Competition in MICRO Conference, 2022.
  - PACT'22 SRC: ACM Student Research Competition in PACT Conference, 2022.
  - MICRO'22: IEEE/ACM International Symposium on Microarchitecture, 2022.
  - ICCD'22: International Conference on Computer Design, 2022.
  - HiPC'22: International Conference on High Performance Computing, Data, and Analytics, 2022.
  - ICCD'21: International Conference on Computer Design, 2021.
  - HiPC'21: International Conference on High Performance Computing, Data, and Analytics, 2021.
  - PACT'21: International Conference on Parallel Architectures and Compilation Techniques, 2021.
  - DUAC'21: International Workshop on Deployment and Use of Accelerators, 2021.
  - GPGPU'20: General Purpose Processing Using GPU @ PPoPP, 2020.
- **External Reviewer Committee**
  - ISCA'23: The International Symposium on Computer Architecture, 2023
  - MICRO'21: IEEE/ACM International Symposium on Microarchitecture, 2021.
  - ASPLOS'21: International Conf. on Architectural Support for Programming Languages and Operating Systems, 2021.
- **Invited Reviewer**
  - Computer Architecture Letters, 2022
  - IEEE Transactions on Computers, 2022
  - ACM Transactions on Parallel and Distributed Systems (TPDS), 2021
  - ACM Journal on Emerging Technologies in Computing Systems (JETC), 2020
  - Journal of Systems Architecture, 2018
  - IET Computers and Digital Techniques, 2018.
  - Journal of Supercomputing, 2017.
- **Conference & Workshop Organizer**
  - Publicity chair, IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), 2023
  - Session Chair, 55th IEEE/ACM International Symposium on Microarchitecture (MICRO), 2022
- **Broadening Participation in Computing**
  - Co-organizer, Career Workshop for Inclusion and Diversity in Computer Architecture (CWIDCA), 2022 (co-located with MICRO 2022).
  - Quad fellowship reviewer and interviewer, 2022.
  - Faculty advisor in SECURE program, ECE Department, UC Riverside, 2022-2023.
  - Google exploreCSR workshop co-organizer, CSE Department, UC Riverside, 2021.
  - Panelist, Career Workshop for Inclusion and Diversity in Computer Architecture (CWIDCA), Title: Creating and Maintaining a Diverse and Inclusive Computer Architecture Community, 2021.
  - Faculty advisor in technology team, Society of Women Engineers (SWE), UC Riverside, 2020-2021.
  - Reviewer for student scholarship applications: Hopper Down Under, 2019.
  - Session chair in Grace Hopper Celebration, Florida, 2017.
- **Others**
  - Cal-Bridge Computer Scicence program mentor, 2022.
  - Faculty judge, Undergraduate Research & Creative Activities Research Symposium, UCR, 2022.
  - HPCA 2022 Trip Report in ACM SIGARCH and IEEE TCCA

Talks and Panels

Invited Seminar Talks

- *Enabling Fast and Energy-Efficient Cryptography in Edge with Data-Centric Computing*
  - New York University Abu Dhabi, UAE, Dec 2022.

- *Moving Processing to Data: From Big Data Applications to Emerging Near-Data Computation*
  - University of Illinois Urbana-Champaign, IL, March 2020.
  - University of California at Santa Barbara, CA, March 2020.
  - Tufts University, MA, March 2020.
  - Indiana University, IN, March 2020.
  - George Mason University, DC, March 2020.
  - Penn State University, PA, February 2020.
  - University of California at Riverside, CA, February 2020.

- minds.ai, July 2020.

Other Selected Talks, Presentations, Posters, and Panels

○ (Panelist) Career Workshop for Inclusion and Diversity in Computer Architecture (CWIDCA), co-located with MICRO'21, Title: Creating and Maintaining a Diverse and Inclusive Computer Architecture Community, 2021.

○ (Talk) "Sunder: Enabling Low-Overhead and Scalable Near-Data Pattern Matching Acceleration." The 54th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO'54), 2021, Oct 2021.

○ (Panelist) After Grad: Academic Pathways Week, UCR, 2020.

○ (Talk) "Grapefruit: An Open-Source, Full-Stack, and Customizable Automata Processing on FPGAs." The 28th IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM), May 2020.

○ (Talk) "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), April 2020.

○ (Talk and Poster) "Impala: Algorithm/Architecture Co-Design for In-Memory Multi-Stride Pattern Matching." The 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA), San Diego, CA, Februray 2020.

○ (Talk and Poster) "eAP: A Scalable and Efficient In-Memory Accelerator for Automata Processing". 52th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-52), Columbus, Ohio, Oct. 2019.

○ (Talk) "Scalable and Efficient in-Memory Interconnect Architecture for Automata Processing". Career Workshop for Women and Minorities in Computer Architecture, Columbus, Ohio, Oct. 2019.

○ (Talk and Poster) "Scalable and Efficient in-Memory Interconnect Architecture for Automata Processing". SRC TECHCON, Austin, Sep. 2019.

○ (Talk and Poster) "A Scalable Solution for Rule-BasedPart-of-Speech Tagging on Novel Hardware Accelerators". SRC TECHCON, Austin, Sep. 2018.

○ (Talk) "Frequent Subtree Mining on the Automata Processor: Opportunities and Challenges". International Conference on Super-computing (ICS), Chicago, June 2017.

○ (Talk) "Accelerating Rule-Based Part-of-Speech Tagging on the Micron's Automata Processor", ACM Capital Region Celebration of Women In Computing, Georgetown University, February 2017.

○ (Talk and Poster) "Frequent Subtree Mining on the Automata Processor: Opportunities and Challenges." 3rd Career Workshop for Women and Minorities in Computer Architecture, in conjunction with the MICRO-50, Boston, October 2017.

○ (Poster) "Enabling Large-Scale Frequent Subtree Mining with GPU Acceleration." In Computing Research Association-Women (CRA-W) Grad Cohort, April 2017.

○ (Webinar) "Association Rule Mining and Sequential Pattern Mining on Micron's Automata Processor". In the Center for Automata Processing, April 2016 [Presentation Video].