Marzieh Lenjani

● E-Mail: Marzieh.Lenjani@virginia.edu
● Phone: +1 929 370 8348
● Address: Department of Computer Science, University of Virginia, 85 Engineer's Way, Rice Hall 336, Charlottesville, VA 22904

Education

Ph.D. in Computer Science, The University of Virginia 2016-2022 (expected)
Dissertation: "Rethinking Control, Access, and Communication Mechanisms for Data-intensive Applications"
Selected courses: Machine learning, Deep learning in computer graphics, Advanced memory systems, 3D reconstruction using deep learning, Defense against the dark arts, Software analysis

M.Sc. in Computer Engineering, University of Tehran
Thesis: "Improved Cache and Memory Architecture for NoC-based MPSoC Platforms"

B.Sc. in Computer Engineering, Shahed University
Thesis: "A Verilog Code Generator for Automatic Interconnection Development for Multiple Reusable IP Cores with Incompatibilities "

Research Interests

- Near-cache computing, near-memory computing, and processing in memory (PIM)
- Computer architecture; cache and memory system; GPGPU; and accelerator design
- Identifying and resolving performance bottlenecks using profilers (e.g., NVporf)
- Mappping and optimization of applications on modern and emerging devices
- Performance and power modelling by developing a simulator or extending existing simulators (e.g., Gem5, GPGPUsim, CACTI-3DD, McPAT, and GPU-Wattch)
- CXL-based memory pooling
- Intra-device interconnection (e.g., NoC) and inter-device interconnection (e.g., NVLink, and CXL)

Research Publications

- **Marzieh Lenjani**, and Kevin Skadron, "Supporting Moderate Data Dependency, Position Dependency, and Divergence in PIM-based Accelerators", ***IEEE Micro***, 2022.
- Lingxi Wu, Rasool Sharifi, **Marzieh Lenjani**, Kevin Skadron, and Ashish Venkat, "Sieve: Scalable In-situ DRAM-based Accelerator Designs for Massively Parallel K-mer Matching", *The IEEE/ACM International Symposium on Computer Architecture (**ISCA**)*, 2021.
- **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.
  - Patented by Semiconductor Research Corporation (SRC),
  - A research highlight of the Center for Research in Intelligent Storage and Processing in-memory (CRISP)
- **Marzieh Lenjani**, Patricia Gonzalez, Elaheh Sadredini, M Arif Rahman, and Mircea R. Stan, " An Overflow-free Quantized Memory Hierarchy in General-purpose Processors," *International Symposium on Workload Characterization (**IISWC** 2019)*.
  - **Best Paper Candidate**
- Elaheh Sadredini, Reza Rahimi, **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.
  - **Best Paper Candidate**.

- Patricia Gonzalez-Guerrero, Tommy Tracy II, Xinfei Guo, Rahul Sreekumar, **Marzieh Lenjani**, and Kevin Skadron, and Mircea R. Stan. "Towards on-node Machine Learning for Ultra-low-power Sensors Using Asynchronous Σ Δ Streams", *ACM Journal on Emerging Technologies in Computing Systems (**JETC**)*, 16(4), 1-20, 2020.
- 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.
- **Marzieh Lenjani**, and Mahmoud Reza Hashemi, "Tree-based Scheme for Reducing Shared Cache Miss Rate Leveraging Regional, Statistical and Temporal Similarities," *IET Computers & Digital Techniques*, vol. 8, no. 1, pp. 30-48, 2014.

Patents

- Memory Devices Providing In-situ Computing Using Sequential Transfer of Row Buffered Data and Related Methods and Circuits
  Marzieh Lenjani, Patricia Gonzalez, Mircea Stan, Kevin Skadron
  Patent 11,049,551, Issued on June 29, 2021
- Scalable In-situ DRAM-Based Accelerators and Methods of Operating the Same
  Lingxi Wu, Rasool Sharifi, Marzieh Lenjani, Kevin Skadron
  Patent application funded by SRC, U.S. Patent Application No. 17/462,836.
- Memory Devices Providing Access Divergence, Load Balancing, and Fine-grained Communications in Subarray-level Accelerators and Related Methods and Circuits
  Marzieh Lenjani, Kevin Skadron
  Patent application funded by SRC, Filing in progress

Talks

- Rethinking Control, Access, and Communication Mechanisms for Data-intensive Applications
  - IBM Research, 6th Workshop on the Future of Computing Architectures (FOCA 2021), Oct 2021
- Pulley: An Algorithm/Hardware Co-optimization for Efficient In-memory Sorting
  - Micron Technology, Folsom (virtual), Sept 2021
- Fulcrum vs. Samsung's PIM
  - Micron Technology, Folsom (virtual), June 2021
- BERT-Fulcrum: Optimized Mapping of Natural Language Processing on Fulcrum
  - Micron Technology, Folsom (virtual), Feb 2021
- Graph-Fulcrum: Optimizing Fulcrum for Irregular Applications
  - Micron Technology, Folsom (virtual), Feb 2021, Oct 2020, and June 2020
- Fulcrum: a Simplified Control and Access Mechanism toward Flexible and Practical In-situ Computing
  - Industry:
    - AMD Research (co-speaker), Sunnyvale, Feb 2020
    - Micron Technology, Folsom (virtual), Feb 2020
  - Workshops and conferences:
    - Career Workshop for Women and Minorities in Computer Architecture, In conjunction with the MICRO-53, Virtual, October 2020.
    - HPCA, San Diego, Feb 2020
    - Computer Science Research Symposium, Charlottesville, Oct 2019
    - TECHCON, Austin, Sep 2019
    - TAPIA, San Diego, Sep 2019

        - Center for Research in Intelligent Storage and Processing in-memory (CRISP) Annual Review, Nov 2019
- An Overflow-free Quantized Memory Hierarchy in General-purpose Processors
    - Center for Research in Intelligent Storage and Processing in-memory (CRISP) Annual Review, Virtual, Nov 2020
    - IISWC, Orlando, Nov 2019
- A 3D In-memory Architecture for Exploiting Internal Memory Bandwidth in an Area-constrained Logic Layer
    - SRC JUMP - CRISP Theme 1/Task 1 meeting, Charlottesville, Nov 2018.
- Architectural Support for Quantization to Reduce Data Movement in Approximate Applications
    - Career Workshop for Women and Minorities in Computer Architecture, In conjunction with the MICRO-50, Boston, October 2017.
- A Case for Architectural Support for Quantization: An Approximation Technique to Reduce the Cost of Data Movement
    - Grad Cohort Workshop 2017, Washington, DC, Apr 2017.

Honors and Awards

- Best paper candidate, HPCA, San Diego, Feb 2020.
- Best paper candidate, IISWC, Orlando, Nov 2019.
- John A. Stankovic Outstanding Graduate Research Award, May 2021.
- Ranked in the top 0.5% in the Iranian Nationwide University Entrance Exam of Bachelor's degree among more than 400,000 participants, 2002.
- Ranked in the top 1% in the Iranian Nationwide University Entrance Exam of Master's degree in the field of Computer Engineering among more than 10,000 participants, 2007.
- ACM scholarship recipient to attend the 3rd Career Workshop for Women and Minorities in Computer Architecture, in conjunction with the MICRO-50, Boston, Oct 2017.
- Scholarship recipient to attend the Grad Cohort Workshop 2017, Washington, DC, Apr 2017.
- Selected for ACM's student research competition (SRC), sponsored by Microsoft Research, San Diego, Sep 2019.
- ACM scholarship recipient to attend the TAPIA Conference, Sep 2019.
- Scholarship recipient to attend IISWC, Orlando, Nov 2019.

Teaching Experience

- Teaching Assistant: Computer Architecture, Advance Computer Architecture, Software Development Methods
    - Department of Computer Science, University of Virginia.
    - School of Electrical and Computer Engineering, University of Tehran.
- Instructor: C++ Programming, Digital System Design
    - College of Engineering, Shahed University
    - Azad University, Parand

Skills and Experience

C++, CUDA, Python (Panda, NumPy, Scikit-Learn, Matplotlib, Seaborn); Deep learning (TensorFlow, PyTorch); Bash; SQL; OpenMP; MPI parallel programming; Embedded C programming; Verilog and VHDL hardware design; Simulation (GEM5, SESC, GPGPU-Sim), Gunrock, Accelerators (GPU, GraphCore IPU)

Professional Experience

- ICT Subsidiary of Pasargad Financial Group (FANAP), Tehran, Iran, 2010–2013, Senior Software developer
    - Selected Projects
        - A POS (Point of Sale) application (Installed on more than 50000 devices)
        - E-Ticket charger application (For the public transport organization in Mashhad city)
        - A loyalty application (for two chain stores)
    - Experience
        - Embedded programing, low-level communication with embedded devices (Modem, Card readrs, LAN interfaces), and Network security algorithms (MAC, SHA1)

Service

- Moderator, Panel on Career Path for CRISP Students, November 2021
- Peer co-review for Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2021
- Computer Science Department Representative, Society of Woman Engineers (SWE), University of Virginia (2018, and 2019)
- Peer co-review for IEEE Computer Architecture Letters, 2019
- Peer review for the Journal of Supercomputing (13x)
- Peer review for IET Computers & Digital Techniques (3x)
- Volunteer at the University of Virginia Open House program, 2019
- Volunteer at Tech-Girls (http://www.tech-girls.org/supporters.html), 2018

References

Kevin Skadron (Ph.D. Dissertation Advisor)
Harry Douglas Forsyth Professor, Department of Computer Science, University of Virginia
E-mail: skadron @virginia.edu
Web Page: http://www.cs.virginia.edu/~skadron/

Mircea R. Stan (Co-author and dissertation committee member)
Professor, Electrical & Computer Engineering, University of Virginia
E-mail: mircea@virginia.edu
Web Page: https://engineering.virginia.edu/faculty/mircea-r-stan

Ashish Venkat (Co-author and dissertation committee member)
Assistant Professor, Department of Computer Science, University of Virginia
E-mail: venkat@virginia.edu
Web Page: http://www.cs.virginia.edu/venkat/

Yangfeng Ji (Dissertation committee member)
Assistant Professor, Department of Computer Science, University of Virginia
E-mail: yj3fs@virginia.edu
Web Page: https://yangfengji.net/