

# Hesam Eddin Shabani

U.S. Permanent Resident

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## Education

- 2019–2023 **Ph.D., Electrical Engineering, Computer Architecture Concentration,** *Lehigh University, Bethlehem, PA, USA.*  
Dissertation title: *"Hierarchical Network-on-Chip Design for Interposer-Based Systems and DNN Accelerators"*  
Supervisor: Prof. Xiaochen Guo
- 2009–2012 **M.Sc., Computer Engineering - Computer Architecture,** *Islamic Azad University - Science and Research Branch, Tehran, Iran.*  
Thesis title: *"Improving Performance of Multi-core Chips Using Optical Communication Infrastructure"*  
Supervisor: Prof. Midia Reshadi
- 2005–2009 **B.Sc., Computer Engineering, Hardware,** *Islamic Azad University - Farahan Branch, Farmahin, Markazi, Iran.*  
Thesis title: *"Design Explorer Robot"*  
Supervisor: Dr. Mahdiar Hosseinghadiry

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## Research Interests

- Computer Architecture, (Design & Modeling)
- High Performance Computing
- Interconnection Networks
- Deep Neural Network (DNN) Accelerators
- Silicon Interposer-Based Systems
- Chip Multiprocessor Nano-Photonic Networks-on-Chip
- Arithmetic Processors

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## Publications

### Conference Papers

- 2023 **H. Shabani**, A. Singh, B. Youhana, and X. Guo, "HIRAC: A Hierarchical Accelerator with Sorting-based Packing for SpGEMMs in DNN Applications", In Proceedings of The 29th *IEEE International Symposium on High-Performance Computer Architecture (HPCA '23)*. Montreal, QC, Canada, 2023, pp. 247-258.
- 2019 **H. Shabani**, and X. Guo, "ClusCross: A New Topology for Silicon Interposer-Based Network-on-Chip", In Proceedings of The 13th *IEEE/ACM International Symposium on Networks-on-Chip (NOCS '19)*. Association for Computing Machinery, New York, NY, USA, Article 7, 1–8.

- 2019 S. Y. H. Mirmahaleh, M. Reshadi, [H. Shabani](#), and X. Guo, "Flow mapping and data distributing on mesh-based deep learning accelerator", In Proceedings of The 13th *IEEE/ACM International Symposium on Networks-on-Chip (NOCS '19)*. Association for Computing Machinery, New York, NY, USA, Article 13, 1-8.
- 2013 [H. Shabani](#), M. Reshadi "A low Loss non-blocking photonic switch for Silicon Nano-Photonic Networks-on-Chip", The 14th *Nanotechnology Iranian student conference*, Tehran, Iran, 2013. (in Persian)
- 2011 [H. Shabani](#), M. Hatamirad, A. Reza, M. Reshadi, "A Low Loss and Low Power Photonic On-chip Router Supporting XY Routing in Networks-on-Chip", The First *CSUT Conference on Computer, communication and information Technologies*, Tabriz, Iran, 2011.(in Persian)

### Journal Papers

- 2016 [H. Shabani](#), A. Roohi, A. Reza, M. Reshadi, N. Bagherzadeh, and R.F. DeMara, "Loss-Aware Switch Design and Non-Blocking Detection Algorithm for Intra-Chip Scale Photonic Interconnection Networks", *IEEE Transactions on Computers*, 65 (6), 1789-1801. **June featured paper.**
- 2014 A. Reza, H. Sarbazi-Azad, A. Khademzadeh, [H. Shabani](#), and B. Niazmand, "A loss aware scalable topology for photonic on chip interconnection networks," *The Journal of Supercomputing*, vol. 68, pp. 106-135.
- 2013 [H. Shabani](#), A. Roohi, A. Reza, H. Khademolhosseini, and M. Reshadi, "Parallel-XY: a novel loss-aware non-blocking photonic router for silicon nano-photonic networks-on-chip", *Journal of Computational and Theoretical Nanoscience*, Vol.10, No.6, P. 1510.
- 2012 M. Hatamirad, A. Reza, [H. Shabani](#), M. Reshadi, "Loss-Aware Router Design Approach for Dimension-Ordered Routing Algorithms in Photonic Networks-on-Chip", *International Journal of Computer Science Issues*, Vol.9, Issue 4, No.1, July.

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### Professional Activities

- 2022-2023 **Ph.D Candidate**, Department of Electrical and Computer Engineering, Lehigh University, Bethlehem, PA, USA.
- 2021-2023 **Teaching Assistant**, Department of Electrical and Computer Engineering, Lehigh University, Bethlehem, PA, USA.
- 2019-2023 **Research Assistant**, Department of Electrical and Computer Engineering, Lehigh University, Bethlehem, PA, USA.
- 2012-2018 **Research Assistant**, Many-core based system Lab, Department of Computer Engineering, Islamic Azad University-Science and Research Branch, Tehran, Iran.
- 2015 **Technical Paper Reviewer**, Journal of Computers and Electrical Engineering (CAEE)(Publisher: Elsevier).

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### Awards & Honors

- 2023 **HPCA'23 Student Travel Grant Award.**
- 2020 **Lehigh University Rossin College Doctoral Fellowship.**
- 2019 **NOCS-13 Student Travel Grant Award.**
- 2016 **Featured Paper of the June issue of credible Journal of IEEE Transactions on Computers, including video featured.**

2012 **Received Master's Degree with the Highest Honors**, from *Department of Computer Engineering, Islamic Azad University - Science and Research Branch, Due to the Best Research Results.*

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## Talks & Presentations

- 2023 **HIRAC: A Hierarchical Accelerator with Sorting-based Packing for SpGEMMs in DNN Applications**, *The 29th IEEE International Symposium on High-Performance Computer Architecture (HPCA '23), Montreal, Canada.*
- 2019 **ClusCross: A New Topology for Silicon Interposer-Based Network-on-Chip**, *IEEE/ACM International Symposium on Networks-on-Chip (NOCS '19), New York, USA.*
- 2019 **Flow mapping and data distributing on mesh-based deep learning accelerator**, *IEEE/ACM International Symposium on Networks-on-Chip (NOCS '19), New York, USA.*
- 2011 **A Low Loss and Low Power Photonic On-chip Router Supporting XY Routing in Networks-on-Chip**, *First CSUT Conference on Computer, communication and information Technologies, Tabriz, Iran.*
- 2010 **Reliability in Application Specific Mesh-based NoC Architectures**, *Islamic Azad University - Science and Research Branch, Tehran, Iran.*
- 2010 **A Novel Scheduling Strategy for an Efficient Deadlock Detection**, *Islamic Azad University - Science and Research Branch, Tehran, Iran.*
- 2009 **Hardware and Software issues of VLIW and EPIC**, *Advanced Computer Architecture Course, Islamic Azad University - Science and Research Branch, Tehran, Iran.*
- 2009 **Key Technologies for DVB-T2**, *Islamic Azad University - Science and Research Branch, Tehran, Iran.*
- 2008 **Automatic Speech Recognition**, *Islamic Azad University - Farahan Branch, Farmahin, Markazi, Iran.*

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## Teaching Experience

- 2023 **Microcontroller Laboratory**, *Teaching Assistance, Lehigh University, PA, USA.*
- 2021-2022 **FPGA Laboratory**, *Teaching Assistance, Lehigh University, PA, USA.*
- 2015 **Computer Networks**, *University of Applied Science and Technology, Iran.*
- 2015 **Networking Operating System Workshop**, *University of Applied Science and Technology, Iran.*
- 2013 **Operating Systems**, *Islamic Azad University - Sama Roudehen, Iran.*
- 2013 **Operating Systems Workshop**, *Islamic Azad University - Sama Roudehen, Iran.*
- 2013 **MATLAB Software**, *Islamic Azad University - Sama Roudehen Branch, Iran.*
- 2013 **Multimedia networking**, *ABA Institute of Higher Education, Iran.*
- 2013 **Data Communications**, *ABA Institute of Higher Education, Iran.*
- 2013 **Advisor on Some Theses**, *ABA Institute of Higher Education, Iran.*

### Titles of Theses:

-Satellite communications.

- Video Transmission in Wireless Multimedia Sensor Networks.
- Wireless Network-on-Chip (NOC).
- Implementation of digital circuits in UHF-band RFID chips.
- 2008 **Formal Languages and Automata**, *Teaching Assistance*, Islamic Azad University - Farahan Branch, Iran.
- 2006 **Differential Equations**, *Teaching Assistance*, Islamic Azad University - Farahan Branch, Iran.

## Additional Scientific & Research Activities

- **Data Value Compression on Sparse DNN Accelerators.**
- **Implementation of Digital Circuits in UHF-band RFID Chips (ISO 18000).**
- **Soft-Computing Based Techniques in Sensor Deployment in Environment.**
- **Design of a New Multiplier in Residue Number Systems.**
- **Implementation of a Scheduling Strategy for an Efficient Deadlock Detection.**

## Technical Skills

- **Hardware Description and Behavioral Languages:** SystemC, Verilog.
- **Standard Cell Library:** 45nm Synopsys.
- **Scripting Languages:** Matlab.
- **Programming Languages:** Python, C++, Assembly.
- **Design and Verification Tools:** PhoenixSim, BookSim, CACTI.
- **IDE & Compilers:** Eclipse, Gcc.
- **Library for Machine Learning:** PyTorch.
- **Operating Systems:** Windows, Linux, macOS.

## Language Skills

English **Fluent**  
 Persian **Excellent (Native Language)**

## References

- Dr. Xiaochen Guo**, *Associate Professor in The Department of Electrical and Computer Engineering at the Lehigh University, Bethlehem, PA, USA.*
- Dr. Nader Bagherzadeh**, *Full Professor in The Department of Electrical Engineering and Computer Science at The University of California, Irvine, CA, USA.*
- Dr. Mahdi Nikdast**, *Assistant professor in the Department of Electrical and Computer Engineering at Colorado State University, CO, USA.*
- Dr. Midia Reshadi**, *Marie Curie Research Fellow at the School of Computer Science and Statistics, Trinity College Dublin, Dublin, County Dublin, Ireland.*
- Dr. Arman Roohi**, *Assistant Professor in the School of Computing at the University of Nebraska–Lincoln, NE, USA.*