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CURRENT POSITIONS:

- ***Professor***, School of Electrical and Computer Engineering, University of Tehran, August 1995-present.
  - ***Director***, Low-Power High-Performance Nanosystems Laboratory, School of Electrical and Computer Engineering, University of Tehran, 2005-present.
  - ***Director***, Silicon Intelligence Laboratory, School of Electrical and Computer Engineering, University of Tehran, 2015-present.

EDUCATION:

- ***Ph.D. Electrical Engineering***, University of Michigan, Ann-Arbor, U.S.A., Sept. 1991-Aug. 1994.
- ***M.Sc. Electrical Engineering***, University of Pittsburgh, Pittsburgh, U.S.A., Jan. 1990-April 1991.
- ***B.Sc. Electrical Engineering***, Sharif University of Technology, Tehran, Iran, Feb. 1984-Feb. 1988.

RESEARCH AREAS OF INTERESTS/EXPERIENCES:

- ❖ Low-Power High-Performance Circuits/Architectures/Systems.
- ❖ Nano-electronics.
- ❖ Optoelectronic Devices.

PROFESSIONAL SERVICES:

- International Journals
  - **Associate Editor**: ACM Journal of ACM Transactions on Design Automation of Electronic Systems, February 2009 – December 2012.
- International Conferences
  - **Technical Program Committee Member**: IEEE ISQED: Since 2007.
  - **Technical Program Committee Member**: IEEE ASQED: Since 2009–2015.
  - **Technical Program Committee Member**: IEEE DTIS: 2006–2010 and 2012–2018.
  - **Technical Program Committee Member**: IEEE ISVLSI: 2011.
  - **Technical Program Committee Member**: IEEE GLSVLSI: 2007 – 2008.
  - **Technical Program Committee Member**: Student (Ph.D.) Forum of IEEE ASP-DAC: 2006–2008.
  - **Technical Program Committee Member**: Interdisciplinary Engineering Design Education Conference (IEDEC): 2012–2014.

PROFESSIONAL EXPERIENCES:

- ***Research Fellow***, VLSI group, Department of Electrical and Computer Engineering, University of Waterloo, Jan. 1999-Aug. 1999.
  Investigated substrate coupling in Mixed-Signal IC's.
- ***Research Fellow***, VRG, Department of Electrical and Computer Engineering, University of Toronto, Sept. 1998-Dec. 1998.
  Investigated RF power MOSFET design, modeling and fabrication.
- ***Research Fellow***, Center for Display Technology & Manufacturing, EECS Dept., University of Michigan, 1994-1995.
  Investigated field-emission microelectronic devices for flat panel display applications.
  Developed Finite Element Programs for Modeling Field Emitters.

PREVIOUS UNIVERSITY ADMINISTRATIVE SERVICES:

- ***Vice Dean of Engineering for Undergraduate and Graduate Studies***, College of Engineering, University of Tehran, Jan. 2010-May 2015.
- ***Director,*** Nanoelectronics Center of Excellence, University of Tehran, 2005-2007.
- ***Head,*** Electronics Division, School of Electrical and Computer Engineering, University of Tehran, 2005-2007.
- ***Member***, IT Committee**,** School of Electrical and Computer Engineering, 2003-2006.
- ***Member***, University Informatics Policy Making Committee, 2000- 2003.
- ***Head***, Engineering Division, Center for E-Learning, 2002-2003.
- ***Head***, Informatics Center, College of Engineering, 1999-2002.
- ***Head***, Computer Center, School of Electrical and Computer Engineering, 1999-2001.

PUBLICATIONS

BOOK CHAPTER:

1. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, “Ultra-low Power Implementation of Neural Networks Using Inverter-based Memristive Crossbars” in *Book Chapter Contribution Invitation: Electronic Design for AI, IoT and Hardware Security*, Springer, 2023.
2. A. Fayyazi, M. Ansari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, “Inverter-Based Memristive Neuromorphic Circuit for Ultra-Low-Power IoT Smart Applications,” in Hardware Architectures for Deep Learning, M. Daneshtalab and M. Modaressi, IET, 2020.
3. M. Hemmat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, “Robust Hybrid TFET-MOSFET Circuits in Presence of Process Variations and Soft Errors” in T. Hollstein, J. Raik, S. Kostin, A. Tšertov, I. O'Connor, R. Reis (eds.) *VLSI-SoC: System-on-Chip in the Nanoscale Era – Design, Verification and Reliability*, VLSI-SoC 2016. IFIP Advances in Information and Communication Technology, vol. 508. Springer, Cham, DOI:10.1007/978-3-319-67104-8_3, 2017.
4. X. Zhang, **A. Afzali-Kushaa**, T.B. Norris, G.I. Haddad, and J.P. Sung “Investigations Towards Far-Infrared (THz) Lasers Based on Quantum Wells” in *Long Wavelength Infrared Emitters Based on Quantum Wells and Superlattices*, Gordon & Beach Publishers, 1999.

JOURNALS:

1. F. Ebrahimi-Azandaryani, O. Akbari, M. Kamal, **A. Afzali-Kusha**, M. Pedram, "Accuracy Configurable Adders with Negligible Delay Overhead in Exact Operating Mode," in *ACM Transactions on Design Automation of Electronic Systems*, vol. 28, no. 1, pp 1–14, doi: 10.1145/3549936.
2. S. Taghipour, M. Kamal, R. Niaraki-Asli, A. Afzali-Kusha and M. Pedram, "LCHC-DFT: A Low-Cost High-Coverage Design-for-Testability Technique to Detect Hard-to-Detect Faults in STT-MRAMs in the Presence of Process Variations," in *IEEE Transactions on Device and Materials Reliability*, vol. 22, no. 4, pp. 477-487, Dec. 2022, doi: 10.1109/TDMR.2022.3201754.
3. M. Ahmadzadeh, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "A2P-MANN: Adaptive Attention Inference Hops Pruned Memory-Augmented Neural Networks," Accepted for publication in *IEEE Transactions on Neural Networks and Learning Systems*, January 26, 2022.
4. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Loading-Aware Reliability Improvement of Ultra-Low Power Memristive Neural Networks," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 68, no. 8, pp. 3411-3421, Aug. 2021.
5. M-A Maleki, A-R Nabipour-Meybodi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "An Energy-Efficient Inference Method in Convolutional Neural Networks Based on Dynamic Adjustment of the Pruning Level," in *ACM Transactions on Design Automation of Electronic Systems*, vol. 26, no. 6, Nov. 2021, pp 1–20.

6. M. Soltani, M. Kamal, **A. Afzali-Kusha,** and M. Pedram, "An Adaptive Memory Side Encryption Method for Improving Security and Lifetime of PCM-based Main Memory," in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, **DOI:** 10.1109/TCAD.2021.3093832.
7. S. Taghipour, M. Kamal, R. Niaraki-Asli, **A. Afzali-Kusha**, and M. Pedram, "CD-DFT: A Current-Difference Design-for-Testability to Detect Short Defects of STT-MRAM Under Process Variations," in *IEEE Transactions on Device and Materials Reliability*, vol. 21, no. 3, pp. 436-443, Sept. 2021.
8. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Reliability Enhancement of Inverter-Based Memristor Crossbar Neural Networks Using Mathematical Analysis of Circuit Non-Idealities," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 68, no. 10, pp. 4310-4323, Oct. 2021.
9. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "LATIM: Loading-Aware Offline Training Method for Inverter-Based Memristive Neural Networks," in *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 68, no. 10, pp. 3346-3350, Oct. 2021.
10. E. Tanghatari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Distributing DNN training over IoT edge devices based on transfer learning, in *Neurocomputing*, vol. 467, 2022, pp. 56-65.
11. R. Yarmand, M. Kamal, **A. Afzali-Kusha**, M. Pedram, "OPTIMA: An Approach for Online Management of Cache Approximation Levels in Approximate Processing Systems," in *IEEE Transactions on Very Large-Scale Integration Systems (TVLSI)*, vol. 29, no. 2, pp. 434-446, Feb. 2021.
12. S. Amanollahi, M. Kamal, **A. Afzali-Kusha**, M. Pedram, "Circuit-Level Techniques for Logic and Memory Blocks in Approximate Computing Systems," Proceedings of the IEEE, vol. 108, no. 12, pp. 2150-2177, 2020.
13. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "INTERSTICE: Inverter-Based Memristive Neural Networks Discretization for Function Approximation Applications," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 28, no. 7, pp. 1578-1588, July 2020.
14. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Offline Training Improvement of Inverter-based Memristive Neural Networks Using Inverter Voltage Characteristic Smoothing," *IEEE Transactions on Circuits and Systems II: Express Briefs*, doi: 10.1109/TCSII.2020.2997384.
15. P. Haghi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "O⁴-DNN: A Hybrid DSP-LUT-Based Processing Unit With Operation Packing and Out-of-Order Execution for Efficient Realization of Convolutional Neural Networks on FPGA Devices," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 67, no. 9, pp. 3056-3069, September 2020, doi: 10.1109/TCSI.2020.2986350.
16. O. Akbari, M. Kamal, **A. Afzali-Kusha**, M. Shafique, and M. Pedram, "X-CGRA: An Energy-Efficient Approximate Coarse-Grained Reconfigurable Architecture," in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, vol. 39, no. 10, pp. 2558-2571, Oct. 2020.
17. N. Samimi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Res-DNN: A Residue Number System-Based DNN Accelerator Unit," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 67, no. 2, pp. 658-671, Feb. 2020.
18. E. Bank-Tavakoli, S.A. Ghasemzadeh, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "POLAR: A Pipelined/Overlapped FPGA-Based LSTM Accelerator," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 28, no. 3, pp. 838-842, March 2020.

19. M. Soltani, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "RandShift: An Energy-Efficient Fault-Tolerant Method in Secure Nonvolatile Main Memory," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 28, no. 1, pp. 287-291, Jan. 2020.
20. R. Yarmand, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "DART: A Framework for Determining Approximation Levels in an Approximable Memory Hierarchy," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 28, no. 1, pp. 273-286, Jan. 2020.
21. F. Ebrahimi-Azandaryani, O. Akbari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Block-Based Carry Speculative Approximate Adder for Energy-Efficient Applications," *IEEE Transactions on Circuits and Systems II (TCAS-II)*, vol. 67, no.1, pp. 1371-141, 2020.
22. M. Ansari, A. Fayyazi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "OCTAN: An On-Chip Training Algorithm for Memristive Neuromorphic Circuits," *IEEE Transactions on Circuits and Systems I (TCAS-I)*, vol. 66, no. 12, pp. 4687-4698, 2019.
23. S.S. Nabavi-Larimi, M. Kamal, and **A. Afzali-Kusha**, "BIMS: Built-in Intermediate Memory Structure to Improve Multi-Level Phase Change Memories," *Tabriz Journal of Electrical Engineering*, vol. 49, no. 3, pp. 1405-1414, Fall 2019.
24. G. Pasandi, K. Mehrabi, B. Ebrahimi, S.M. Fakhraei, **A. Afzali-Kusha**, and M. Pedram, "Low-power data encoding/decoding for energy-efficient static random access memory design," in *IET Circuits, Devices & Systems*, vol. 13, no. 8, pp. 1152-1159, 2019.
25. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "TOSAM An Energy Efficient Truncation and Rounding Based Scalable Approximate Multiplier," in *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 27, no. 5, pp. 1161-1173, 2019.
26. S. Sayyah-Ensan, M.H. Moaiyeri, B. Ebrahimi, S. Hessabi, and **A. Afzali-Kusha**, "A low-leakage and high-writable SRAM cell with back-gate biasing in FinFET technology," *Journal of Computational Electronics*, vol. 18, pp. 519–526, March, 2019.
27. M. Pashaeefar, M. Kamal, **A. Afzali-Kusha**, and M Pedram, "A Theoretical Framework for Quality Estimation and Optimization of DSP Applications Using Low-Power Approximate Adders," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 66, no. 1, pp. 327-340, 2019.
28. S. Tabatabaei-Nikkhah, M. Zahedi, M. Kamal, **A. Afzali-Kusha**, M. Pedram, "ACHILLES: Accuracy-Aware High-Level Synthesis Considering Online Quality Management," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*TCAD*), vol. 38, no. 8, pp. 1465-1173, 2018.
29. O. Akbari, M. Kamal, **A. Afzali-Kusha**, M. Pedram, and M. Shafique, "Towards Approximate Computing for Coarse-Grained Reconfigurable Architectures," *IEEE Micro*, vol. 38, no. 6, pp. 63-72, 2018.
30. M. Pashaeefar, M. Kamal, **A. Afzali-Kusha**, and M Pedram, "Approximate Reverse Carry Propagate Adder for Energy-Efficient DSP Applications," *IEEE Transactions on Very Large Scale Integration Systems* (*TVLSI*), vol. 26, no. 11, pp. 2530-2541, 2018.
31. A. Fayyazi, M. Ansari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "An Ultra Low-Power Memristive Neuromorphic Circuit for Internet of Things Smart Sensors", *IEEE Internet of Things Journal*, vol. 5, no. 2, pp. 1011-1022, 2018.

32. S. Abolmali, M. Kamal, **A. Afzali-Kusha**, and M. Pedram "An Efficient False Path-Aware Heuristic Critical Path Selection Method with High Process Space Coverage," *ACM Transactions on Design Automation of Electronic Systems* (*TODAES*), vol. 23, no. 3, pp. 32:1-32:25, 2018.
33. F. Nakhaee, M. Kamal, **A. Afzali-Kusha**, M. Pedram, S. M. Fakhraie, and H. Dorosti, "Lifetime Improvement by Exploiting Aggressive Voltage Scaling during Runtime of Error-resilient Applications," *Integration, the VLSI Journal*, vol. 61, pp. 29-38, March 2018.
34. A. Iranfar, M. Kamal, **A. Afzali-Kusha**, M. Pedram, and D. Atienza, "TheSPoT: Thermal Stress-Aware Power and Temperature Management for Multiprocessor Systems-on-Chip," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (TCAD), vol. 37, no. 8, pp. 1532-1545, 2018.
35. M. Ansari, A. Fayyazi, A. Banagozar, M. A. Maleki, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "PHAX: Physical Characteristics Aware Ex-Situ Training Framework for Inverter-Based Memristive Neuromorphic Circuits," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, vol. 37, no. 8, pp. 1602-1613, 2018.
36. O. Akbari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "RAP-CLA: A Reconfigurable Approximate Carry Look-Ahead Adder," *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 65, no. 8, pp. 1089-1093, Aug. 2018.
37. S. Vahdat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "LETAM: A Low Energy Truncation-based Approximate Multiplier," *Computers and Electrical Engineering*, vol. 63C, pp. 1-17, October 2017.
38. S. Abolmali, N. Mansouri-Ghiasi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Efficient Critical Path Identification based on Viability Analysis Method Considering Process Variations," *IEEE Transactions on Very Large Scale Integration Systems (TVLSI)*, vol. 25, no. 9, September 2017, pp. 2668-2672.
39. O. Akbari, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Dual-Quality 4:2 Compressors for Utilizing in Dynamic Accuracy Configurable Multipliers," *IEEE Transactions on Very Large Scale Integration Systems (TVLSI)*, vol. 25, no. 4, April 2017, pp. 1352-1361.
40. R. Zendegani, M. Kamal, M. Bahadori, **A. Afzali-Kusha**, and M. Pedram, "RoBA Multiplier: A Rounding-Based Approximate Multiplier for High-Speed yet Energy-Efficient Digital Signal Processing," *IEEE Transactions on Very Large Scale Integration Systems (TVLSI)*, vol. 25, February 2017, pp. 393–401, DOI: 10.1109/TVLSI.2016.2587696.
41. M. Bahadori, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "An Energy and Area Efficient yet High-Speed Square-Root Carry Select Adder Structure," *Computers and Electrical Engineering*, vol. 58, February 2017, pp. 101–112.
42. M. Hemmat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Hybrid TFET-MOSFET Circuit: A Solution to Design Soft-Error Resilient Ultra-Low Power Digital Circuit," *Integration, the VLSI Journal*, vol. 57, January 2017, pp. 11–19.
43. M. Bahadori, M. Kamal, **A. Afzali-Kusha**, Y. Afsharnezhad, and E. Zahraie Salehi "CL-CPA: A Hybrid Carry-Lookahead/Carry-Propagate Adder for Low-Power or High-Performance Operation Mode," *Integration, the VLSI Journal*, vol. 57, January 2017, pp. 62–68.
44. K. Mehrabi, B. Ebrahimi, R. Yarmand, **A. Afzali-Kusha**, and H. Mahmoodi, "Read static noise margin aging model considering SBD and BTI effects for FinFET SRAMs," *Microelectronics Reliability*, vol. 65, October 2016, pp. 20–26.

45. M. Hemmat, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "Study On the Impact of Device Parameter Variations on Performance of III-V Homojunction and Heterojunction Tunnel FETs," *Solid-State Electronics*, vol. 124, October 2016, pp. 46–53.
46. H. Ahmadi-Balef, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "All-Region Statistical Model for Delay Variation based on Log-Skew-Normal Distribution," *IEEE Transactions on Computer-Aided Design*, vol. 35, September 2016, pp. 1503-1508.
47. M. Bahadori, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "A Comparative Study on Performance and Reliability of 32-bit Binary Adders," *Integration, the VLSI Journal*, vol. 53, March 2016, pp. 54–67.
48. M. Kamal, Q. Xie, M. Pedram, **A. Afzali-Kusha**, and S. Safari "An Efficient Temperature Dependent Hot Carrier Injection Reliability Simulation Flow," *Microelectronics Reliability*, vol. 57, February 2016, pp. 10–19.
49. M. Bahadori, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "High-Speed and Energy-Efficient Carry Skip Adder Operating Under a Wide Range of Supply Voltage Levels," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 24, no. 2, February 2016, pp. 421-433.
50. M. Kamal, **A. Afzali-Kusha**, S. Safari, and M. Pedram, "Yield and Speedup Improvements in Extensible Processors by Allocating Extra Cycles to Some Custom Instructions," *ACM Transactions on Design and Automation of Electronics Systems (TODAES)*, vol. 21, January 2016, pp. 28:1-28:25.
51. N. Jafarzadeh, M. Palesi, S. Eskandari, S. Hessabi, and **A. Afzali-Kusha**, "Low Energy yet Reliable Data Communication Scheme for Networks on Chip," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, DOI: 10.1109/TCAD.2015.2440311, vol. 34, no. 12, December 2015, pp. 1892 – 1904.
52. B. Ebrahimi, R. Asadpour, **A. Afzali-Kusha**, and M. Pedram, "A FinFET SRAM cell design with BTI robustness at high supply voltages and high yield at low supply voltages," *International Journal of Circuit Theory and Applications*, vol. 43, no. 12, pp. 2011–2024, December 2015, DOI: 10.1002/cta.2057.
53. M. Nejat, B. Alizadeh, and **A. Afzali-Kusha**, "Dynamic Flip-Flop Conversion: A Time-Borrowing Method for Performance," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, DOI:10.1109/TVLSI.2014.2366918, vol. 23, no. 11, November 2015, pp. 2724–2727.
54. N. Ghobadi and **A. Afzali-Kusha**, "Investigation and modeling of negative bias temperature instability (NBTI) and hot carrier injection (HCI) in nanometer multi-gate devices," *Iranian Journal of Electrical and Electronics Engineering*, vol. 12, no. 2, Fall 2015, pp. 1-14 (in Persian).
55. M. Kamal, **A. Afzali-Kusha**, S. Safari, and M. Pedram, "OPLE: A Heuristic Custom Instruction Selection Algorithm Based on Partitioning and Local Exploration," *ACM Transactions on Embedded Computing Systems (TECS)*, vol. 14, no. 4, September 2015, Article No. 72.
56. B. Eghbalkhah, M. Kamal, H. Afzali-Kusha, **A. Afzali-Kusha**, M. B. Ghaznavi-Ghoushchi, and M. Pedram, "Workload and Temperature Dependent Evaluation of BTI-Induced Lifetime Degradation in Digital Circuits," *Microelectronics Reliability*, vol. 55, issue 8, July 2015, pp. 1152–1162.
57. V. Akhlaghi, M. Kamal, **A. Afzali-Kusha**, and M. Pedram, "An Efficient Network on-Chip Architecture Based on Isolating Local and non-Local Communications," *Computers & Electrical Engineering*, Available online 19

December 2014, doi:10.1016/j.compeleceng.2014.12.002. vol. 45, July 2015, pp. 430-444.

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