

Ishan G. Thakkar

Curriculum Vitae

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Personal Information

Professional Experience

Aug 2013 – Present	Graduate Research and Teaching Assistant, Embedded Systems and High Performance Computing (EPiC) Laboratory, Colorado State University, Fort Collins, CO
Jan 2012 – May 2013	Graduate Research Assistant, Optoelectronics Research Group, Colorado State University, Fort Collins, CO
Jan 2011 – Dec 2011	Graduate Teaching Assistant, Electrical and Computer Engineering Department, Colorado State University, Fort Collins, CO
May 2011 – Aug 2011	Student Researcher, Microwave Systems Laboratory, Colorado State University, Fort Collins, CO
Jan 2009 – June 2009	Project Intern, Peach Technovations Pvt. Ltd., Gandhinagar, India

Education

2013 – Present	Ph.D. in Electrical Engineering, Colorado State University, Fort Collins, CO <u>Advisor</u> : Sudeep Pasricha
2013	M.S. in Electrical Engineering, Colorado State University, Fort Collins, CO <u>Thesis</u> : A plastic total internal reflection-based photoluminescence device for enzymatic biosensors <u>Advisor</u> : Kevin Lear
2009	B.E. in Electronics and Communication Engineering, L.D. College of Engineering, Ahmedabad, Gujarat, India

Awards and Honors

June 2017	Travel Award , ACM/SIGDA DAC PhD Forum
Jan. 2017	Travel Award , Graduate Student Council, Colorado State University
June 2016	Best Paper Award , ACM System Level Interconnect Prediction (SLIP) Workshop
Mar. 2016	Best Paper Award Finalist , IEEE Intl. Symp. on Quality Electronics Design (ISQED)

Research Activities

Research Interest Statement

My research focuses on addressing the design challenges of advanced computing systems employing emerging interconnect and memory subsystems. Specifically, my research contributes to modeling and cross-layer optimizations for silicon photonic interconnect, 3D-stacked DRAM and emerging nonvolatile memory (e.g., phase change memory) subsystems, with an emphasis on energy-efficient and reliable design.

Research Book Chapters

[BC1] Sudeep Pasricha, Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, "Enhancing Process Variation Resilience in Photonic NoC Architectures", *Photonic Interconnects for Computer Systems – Understanding and Pushing Design Challenges*, River Publishers, June 2017.

Peer-Reviewed Journal Publications

- [J5] **Ishan Thakkar**, Sudeep Pasricha, "DyPhase: A Dynamic Phase Change Memory Architecture with Symmetric Write Latency and Restorable Endurance", *first revision under review for IEEE Transactions on Computer Aided Design (TCAD)*, 2017.
- [J4] Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, Sudeep Pasricha, "HYDRA: Heterodyne Crosstalk Mitigation with Double Microring Resonators and Data Encoding for Photonic NoCs", *accepted to appear in the IEEE Transactions on Very Large Scale Integration (TVLSI)*, 2017.
- [J3] **Ishan Thakkar**, Sudeep Pasricha, "3D-ProWiz: An Energy-Efficient and Optically-Interfaced 3D DRAM Architecture with Reduced Data Access Overhead", *IEEE Transactions on Multi-Scale Computing Systems*, vol. 1, no. 3, pp. 168-184, Sept 2015.
- [J2] **Ishan Thakkar**, Sudeep Pasricha, "3D-WiRED: A Novel WIDE I/O DRAM With Energy-Efficient 3-D Bank Organization", *IEEE Design & Test*, vol. 32, no. 4, pp. 71-80, Aug 2015.
- [J1] **Ishan Thakkar**, Kevin L Lear, Jonathan Vickers, Brian Heinze and Kenneth Reardon, "A plastic total internal reflection photoluminescence device for enzymatic biosensing", *Lab Chip*, vol. 13, no. 34, pp. 4775-4783, Dec 2013.

Peer-Reviewed Conference Publications and Presentations (20-30% acceptance rate)

- [C12] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "Improving the Reliability and Energy-Efficiency of High-Bandwidth Photonic NoC Architectures with Multilevel Signaling," *IEEE/ACM International Symposium on Networks-on-Chip (NOCS)*, to appear in Oct 2017.
- [C11] Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, Sudeep Pasricha, "Analyzing Voltage Bias and Temperature Induced Aging Effects in Photonic Interconnects for Manycore Computing," *ACM System Level Interconnect Prediction Workshop (SLIP)*, Jun 2017.
- [C10] **Ishan Thakkar**, Sudeep Pasricha, "DyPhase: A Dynamic Phase Change Memory Architecture with Symmetric Write Latency", *IEEE International Conference on VLSI Design (VLSID)*, Jan 2017.

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- [C9] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "Mitigation of Homodyne Crosstalk Noise in Silicon Photonic NoC Architectures with Tunable Decoupling", *ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS)*, Oct 2016. **(26% acceptance rate)**
- [C8] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "Run-Time Laser Power Management in Photonic NoCs with On-Chip Semiconductor Optical Amplifiers", *IEEE/ACM International Symposium on Networks-on-Chip (NOCS)*, Aug 2016.
- [C7] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "A Comparative Analysis of Front-End and Back-End Compatible Silicon Photonic On-Chip Interconnects", *ACM System Level Interconnect Prediction Workshop (SLIP)*, Jun 2016. **(Best Paper Award)**
- [C6] Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, Sudeep Pasricha, "PICO: Mitigating Heterodyne Crosstalk Due to Process Variations and Intermodulation Effects in Photonic NoCs", *IEEE/ACM Design Automation Conference (DAC)*, Jun 2016.
- [C5] Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, Sudeep Pasricha, "Process Variation Aware Crosstalk Mitigation for DWDM based Photonic NoC Architectures", *IEEE International Symposium on Quality Electronic Design (ISQED)*, Mar 2016. **(Best Paper Award Finalist)**
- [C4] **Ishan Thakkar**, Sudeep Pasricha, "Massed Refresh: An Energy-Efficient Technique to Reduce Refresh Overhead in Hybrid Memory Cube Architectures", *IEEE International Conference on VLSI Design (VLSI)*, Jan 2016.
- [C3] **Ishan Thakkar**, Sudeep Pasricha, "A Novel 3D Graphics DRAM Architecture for High-Performance and Low-Energy Memory Accesses", *IEEE International Conference on Computer Design (ICCD)*, Oct 2015.
- [C2] Sudeep Pasricha, **Ishan Thakkar**, "Re-architecting DRAM memory systems with 3D Integration and Photonic Interfaces", *Memory Architecture and Organization Workshop (MeAOW)*, Oct 2014.
- [C1] **Ishan Thakkar**, Sudeep Pasricha, "3D-Wiz: A Novel High Bandwidth, Optically Interfaced 3D DRAM Architecture with Reduced Random Access Time", *IEEE International Conference on Computer Design (ICCD)*, Oct 2014.

Peer-Reviewed PhD Forum

- [PF1] **Ishan Thakkar**, "Design and Optimization of Emerging Network-Memory Subsystems for Future Manycore Architectures", at the *ACM/IEEE Design Automation Conference (DAC) PhD Forum*, June 2017.

Conference Tutorials

- [TU1] A. T-Sanial, Sudeep Pasricha, P. Pande, K. Chakrabarty, "3D Integration: Quo Vadis?" *Full day tutorial at IEEE Design Automation and Test in Europe Conference, (DATE)*, Mar 2017. **My Contributions:** prepared the material presented by Sudeep Pasricha.

Invited Talks

- [T1] Sudeep Pasricha, **Ishan Thakkar**, "Re-architecting DRAM memory systems with 3D Integration and Photonic Interfaces", *Memory Architecture and Organization Workshop (MeAOW)*, Oct 2014.

Peer-Reviewed Conference Poster Presentations

- [CP5] **Ishan Thakkar**, "Design and Optimization of Emerging Network-Memory Subsystems for Future Manycore Architectures", in *PhD Forum at the ACM/IEEE Design Automation Conference (DAC)*, June 2017.
- [CP4] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "Mitigation of Homodyne Crosstalk Noise in Silicon Photonic NoC Architectures with Tunable Decoupling", *ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS)*, Oct 2016. **(26% acceptance rate)**
- [CP3] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "Run-Time Laser Power Management in Photonic NoCs with On-Chip Semiconductor Optical Amplifiers", *IEEE/ACM International Symposium on Networks-on-Chip (NOCS)*, Aug 2016.
- [CP2] Sai Vineel Reddy Chittamuru, **Ishan Thakkar**, Sudeep Pasricha, "PICO: Mitigating Heterodyne Crosstalk Due to Process Variations and Intermodulation Effects in Photonic NoCs", *IEEE/ACM Design Automation Conference (DAC)*, Jun 2016.
- [CP1] **Ishan Thakkar**, Sudeep Pasricha, "A Novel 3D Graphics DRAM Architecture for High-Performance and Low-Energy Memory Accesses", *IEEE International Conference on Computer Design (ICCD)*, Oct 2015.

Research Posters (Non-Conference)

- [P2] **Ishan Thakkar**, Sai Vineel Reddy Chittamuru, Sudeep Pasricha, "A Comparative Analysis of Front-End and Back-End Compatible Silicon Photonic On-Chip Interconnects", *ACM/IEEE Design Automation Conference Work in Progress (WIP)*, Jun 2016.
- [P1] **Ishan Thakkar**, Sudeep Pasricha, "Improving the Performance and Power Efficiency of Memory with 3D Stacking and High-Bandwidth Optical Interfacing", *CSU Ventures Innovation Forum*, Apr 2016.

Patents Submitted

- [PAT1] U.S. provisional patent application serial no. 61/970,155, titled "Low Cost Chemical and Biochemical Sensor", filed on 3/25/14.
Inventors: **Ishan Thakkar**, Kevin L Lear, Kenneth F Reardon.

Educational Activities

M.S. Students Currently Supervising

Present Rohit Kudre, M.S., CSU, Department of ECE (Sudeep Pasricha, Advisor)

2016-2017 Sai Kiran Koppu, M.S., CSU, Department of ECE (Sudeep Pasricha, Advisor)
M.S. Project – “Analysis of Front-End and Back-End Compatible Silicon Photonic On-Chip Interconnects”. Graduated in May, 2017.

Teaching Experience

Sept 2016 Guest lecturer on the topic of “On-Chip Communication: Buses and Networks-on-Chip (NoCs)” in a graduate level course in hardware-software design for embedded systems (ECE-561)

Aug 2016 Guest lecturer on the topic of “System-C Tutorial” in a graduate level course in hardware-software design for embedded systems (ECE-561)

Oct 2015 Guest lecturer on the topic of “On-Chip Communication: Buses and Networks-on-Chip (NoCs)” in a graduate level course in hardware-software design for embedded systems (ECE-561)

Aug 2015 – Dec 2015 Teaching assistant for a graduate level course in computer organization and design (ECE-452)

Aug 2011 – Dec 2011 Teaching assistant. Taught assembly level programming to junior students in an undergraduate course (ECE-251)

Jan 2011 - May 2011 Teaching assistant in a graduate level course in engineering risk analysis (ECE-531)

May 2010 – Jul 2010 Expert lectures on “Preparing for Quantitative Aptitude Tests” to senior-level undergraduate students at Genesis Consultants, Institute for Management and Foreign Studies (IMFS), India

Jul 2009 – May 2010 Ad-hoc lecturer. Taught full courses with titles “Basics of programming using C and C++” and “Elements of Electrical Engineering” to sophomore undergraduate students at the Venus International College of Technology (VICT), Gandhinagar, Gujarat, India

2009 – 2010 Expert lectures on the topic of “Robust Hardware Design for Remotely Controlled Robocars” to undergraduate students at the Venus International College of Technology (VICT), Gandhinagar, Gujarat, India

Professional Service

Professional Society Membership

IEEE Student Member (since 2013)

ACM Student Member (since 2017)

Conference Organization Committee Member

2017 Publicity Chair - 8th International Green and Sustainable Computing Conference (IGSC)

Conference Technical Program Committee (TPC) Member

- 2018 31st International Conference on VLSI Design and 17th International Conference on Embedded Systems
- 2017 8th International Green and Sustainable Computing Conference (IGSC)

Activities as a Reviewer/External Reviewer

- 2017 IEEE/ACM Design Automation Conference (DAC)
- 2016 – Present Transactions on Computer-Aided Design of Integrated Circuits and Systems
- 2016 IEEE/ACM International Symposium on Networks-on-Chip (NOCS)
- 2016 - Present Transactions on Embedded Computing Systems
- 2015 - Present Transactions on Multi-Scale Computing Systems
- 2015 – Present IEEE Transactions on Very Large Scale Integration Systems
- 2015 Transactions on Design Automation of Electronic Systems
- 2014 - Present Journal on Emerging Technologies in Computing Systems