

Tushar Krishna

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RESEARCH INTERESTS

Computer Architecture: multicore, parallel, heterogeneous, spatial, AI/ML accelerators

Interconnection Networks: Networks-on-Chip, HPC switches, data-centers, FPGA networks

EDUCATION

- Feb 2014 Massachusetts Institute of Technology**
Ph.D. in Electrical Engineering and Computer Science
- *Advisor:* Li-Shiuan Peh
 - *Committee:* Srinivas Devadas and Joel Emer
 - *Thesis:* "Enabling Dedicated Single-Cycle Connections Over A Shared Network-on-Chip"
- Sep 2009 Princeton University**
M.S.E. in Electrical Engineering
- *Advisor:* Li-Shiuan Peh
 - *Thesis:* "Networks-on-Chip with Hybrid Interconnects"
- Aug 2007 Indian Institute of Technology (IIT), Delhi**
B.Tech. (Honors) in Electrical Engineering
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PROFESSIONAL APPOINTMENTS

- Sept'19 -- present Georgia Institute of Technology, Atlanta, GA, USA**
ON Semiconductor Professor (*Endowed Junior Professorship*)
School of Electrical and Computer Engineering
- Aug '15 – present Georgia Institute of Technology, Atlanta, GA, USA**
Assistant Professor
School of Electrical and Computer Engineering.
School of Computer Science (Adjunct).
- Jan '15 – Jul '15 Massachusetts Institute of Technology, SMART Center, Cambridge, MA, USA**
Post-doctoral Researcher.
- Nov '13 – Jan '15 Intel Corporation, VSSAD Group, Hudson, MA**
Research Engineer. Manager: Joel Emer
- Jun'10 – Aug '10 AMD (Advanced Micro Devices) Research, Bellevue, WA, USA**
Co-Op Engineer. Mentors: Bradford Beckmann and Steve Reinhardt
- Jun'09 – Aug '09 AMD Research, Bellevue, WA, USA**
Co-Op Engineer. Mentors: Bradford Beckmann and Steve Reinhardt
- Jun'08 – Aug '08 AMD, North Bridge Architecture Group, Sunnyvale, CA, USA**
Co-op Engineer. Mentor: Pat Conway
- May'06 – Jul '06 NVIDIA, Digital Hardware Design Group, Bangalore, India**
Summer Intern.

HONORS AND AWARDS

- 2021 **Roger P. Webb Award for Outstanding Junior Faculty Member** by School of ECE, Georgia Tech
- 2020 **Best Paper Award** at 28th IFIP/IEEE Int. Conference on Very Large Scale Integration (VLSI-Soc)
Paper ranked highest among 30 accepted papers out of 78 submissions that year.
- 2020 **Facebook Faculty Research Award**
9 winners out of 132 worldwide submissions
- 2020 **Best Paper Award** at 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA)
Paper ranked highest among 48 papers accepted out of 248 submissions that year.
- 2020 **IEEE Micro's Top Picks** from Computer Architecture¹
- 2019 **Facebook Faculty Research Award**
8 winners out of 88 worldwide submissions
- 2019 **Google Faculty Research Award**
158 winners out of 910 worldwide submissions
- 2019 **IEEE Micro's Top Picks** from Computer Architecture
- 2019 **Honorable Mention in IEEE Micro Top Picks** from Computer Architecture
- 2018 **Class of 1940 Course Survey Teaching Effectiveness Award**
Received a teaching evaluation of 5.0 / 5.0
- 2018 **NSF CISE Research Initiation Initiative (CRII) Award**
- 2017 **Best Paper Award** (Design Methods & Tools Track) at Design Automation and Test in Europe (DATE)
DATE has 4 tracks (D, A, T and E). Paper was ranked highest in the D track, making it one of the top 4 among 194 accepted papers out of 794 submissions that year.
- 2014 **Best Paper Award** at the 8th International Symposium on Networks-on-Chip (NOCS)
Paper ranked highest among 21 papers accepted out of 83 submissions that year/
- 2014 **IEEE Micro Top Picks** from Computer Architecture
- 2009 **IEEE Micro Top Picks** from Hot Interconnects Symposium
Special Issue featuring top papers from Hot Interconnects that year
- 2007-08 **Princeton Graduate Fellowship**
- 2007 ICIM Stay Ahead Award for the **Best Undergraduate Project in Computer Technology**, IIT Delhi
- 2004-2006 "National Initiative for Undergraduate Sciences" (NIUS) Fellowship, Homi Bhabha Centre for Science Education (HBCSE), India
- 2003, 2004 Merit prize for academic excellence, IIT Delhi
- 2003 **Gold Medal** at the Indian National Chemistry Olympiad
25 gold medalists out of ~75 invited for the Olympiad after a nationwide exam.

RESEARCH FUNDING

- NSF (CNS)** "Edge Platform for Enabling Situation Awareness Applications"
PI: Kishore Ramachandran, Co-PI: Tushar Krishna
Total = \$500,000, my share = \$250,000.
Year: 2020-2023.
- NSF (CCF)** "PPOSS: Planning: Integrated Scalable Platform for Privacy-aware Collaborative Learning and Inference"
PI: Vivek Sarkar (GT), Co-PIs: Tushar Krishna, Alexey Tumanov (GT), Dawn Song (Berkeley), Jimeng Sun (UIUC)
Total: \$250,000, my share = \$50,000.
Year: 2020-2021.

¹ Every year, IEEE Micro publishes a special issue called *Top Picks from Computer Architecture* recognizing the year's top papers (12 as *Top Picks* and 10-12 more as *Honorable Mentions*) that have potential for long-term impact. In order for a paper to be considered, it must first have been accepted in a major computer architecture conference the previous year.

- Facebook** “HW/SW Co-Design of Next-Generation Training Platforms for DLRMs”
PI: Tushar Krishna
Total = my share = \$50,000.
Year: 2020.
- Intel** “System architecture design for large scale AI models”
PI: Tushar Krishna
Total = my share = \$75,000.
Year: 2020.
- Intel** “Tensor Extensions for Accelerating Sparse ML Inference”
PI: Tushar Krishna.
Total = my share = \$60,000.
Year: 2020.
- DARPA** “ARION: A Real-time HPC Platform with In-memory Non-Von-Neumann Processing and Optical Networking”
PI: Saibal Mukhopadhyay (GT), Co-PIs: Tushar Krishna, Madhavan Swaminathan, Santosh Pande, Justin Romberg (GT), Keren Bergman, Luca Carloni, Mingyu Seok (Columbia)
Total = \$13.4 Million, my share = \$500,000.
Year: 2020-2023.
- Department of Energy (DoE)** “Artificial Intelligence focused ARchitectures and Algorithms (ARIAA)”
[Department of Energy Center with Pacific Northwest National Lab (PNNL), Sandia National Lab (SNL) and Georgia Tech].
<https://www.news.gatech.edu/2019/11/05/national-labs-georgia-tech-collaborate-ai-research>
PIs: Roberto Gioiosa (PNNL), Siva Rajamanickam (Sandia National Labs), Tushar Krishna (GT)
Total = 5.5M, my share = \$510,000.
Year: 2019-2022.
- Intel** “Tensor Extensions for Accelerating Sparse ML Inference”
PI: Tushar Krishna.
Total = my share = \$60,000.
Year: 2019.
- NSF (OAC)** “Enabling Rapid Design and Deployment of Deep Learning Models on Hardware Accelerators”.
PI: Tushar Krishna.
Total = my share = \$500,000.
Year: 2019-2022.
- Facebook** “ML-Driven HW-SW Co-Design of Efficient Tensor Core Architectures”.
PI: Tushar Krishna.
Total = my share = \$50,000.
Year: 2019
- Google** “Using ML to Design Efficient ML Accelerators”.
PI: Tushar Krishna.
Total = \$66,000.
Year: 2019.
- Intel** “Design of Scalable Deep Learning Training Accelerators for Sparse and Irregular GEMMS”.
PI: Tushar Krishna
Total = \$75,000.
Year: 2018.

NSF CRII (SHF) “Enabling Neuroevolution in Hardware”.
PI: Tushar Krishna.
Total = \$175,000.
Year: 2018-2019.

DARPA “A Vertically-Integrated Design Flow for IP Reuse and Heterogeneous Integration”.
PI: Sung-Kyu Lim, Co-PIs: Tushar Krishna, Saibal Mukhopadhyay, Madhavan Swaminathan.
Total = \$3,719,691. My share = \$400,000.
Year: 2017-2019.

PUBLICATIONS: BOOKS

“Data Orchestration in Deep Learning Accelerators”

Tushar Krishna, Michael Pellauer, Angshuman Parashar, Hyoukjun Kwon, and Ananda Samajdar
Synthesis Lectures on Computer Architecture. Morgan & Claypool Publishers. August 2020

- [Total Downloads: 398](#)

“On-Chip Networks”, Second Edition

Natalie Enright Jerger, **Tushar Krishna**, and Li-Shiuan Peh.

Synthesis Lectures on Computer Architecture. Morgan & Claypool Publishers. June 2017

- [Total Downloads: 1712](#)

PUBLICATIONS: BOOKS CHAPTERS

Interconnect Modeling for Homogeneous and Heterogeneous Multiprocessors

Srikant Bharadwaj and Tushar Krishna

Network-on-Chip Security and Privacy, Springer, May 2021

“Application Benchmarking” chapter

Geoffrey Burr, Tom Conte, Paolo Gargini, Vladimir Getov, Yoshihiro Hayashi, Takeshi Iwashita, Vijay Janapa Reddi, Masaaki Kondo, **Tushar Krishna**, Peter M. Kogge, Anoop Nair, Dam Sunwoo, Josep Torrelas, Peter Torelli

International Roadmap for Devices and Systems, 2020 Edition.

PUBLICATIONS: REFEREED JOURNALS

TPDS 2021 “Evaluating Spatial Accelerator Architectures with Tiled Matrix-Matrix Multiplication”

Gordon E. Moon, Hyoukjun Kwon, Geonhwa Jeong, Prasanth Chatarasi, Sivasankaran Rajamanickam and **Tushar Krishna**

IEEE Transactions on Parallel and Distributed Systems (Special Section on Innovative R&D toward the Exascale Era), 2021

TVLSI 2021 “Clock Delivery Network Design and Analysis for Interposer-Based 2.5-D Heterogeneous Systems”

Gauthaman Murali, Heechun Park, Eric Qin, Hakki Mert Torun, Majid Ahadi Dolatsara, Madhavan Swaminathan, **Tushar Krishna** and Sung Kyu Lim

In IEEE Transactions on Very Large Scale Integration (VLSI) Systems, Apr 2021

CAL 2021 “Flexion: A Quantitative Metric for Flexibility in DNN Accelerators”

Hyounkjun Kwon, Michael Pellauer, Angshuman Parashar and **Tushar Krishna**

IEEE Computer Architecture Letters, Jan 2021

TVLSI 2020 “Architecture, Chip, and Package Co-design Flow for 2.5D IC Design Enabling Heterogeneous IP Reuse”

Jinwoo Kim, Gauthaman Murali, Heechun Park, Eric Qin, Hyoukjun Kwon, Venkata Chaitanya Krishna Chekuri, Nael Mizanur Rahman, Nihar Dasari, Arvind Singh, Minah Lee, Hakki Mert Torun, Kallol Roy, Madhavan Swaminathan, Saibal Mukhopadhyay, **Tushar Krishna**, and Sung Kyu Lim

IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2020

TACO 2020 “EcoTLB: Eventually Consistent TLBs”

Steffen Maass, Mohan Kumar, Taesoo Kim, **Tushar Krishna**, and Abhishek Bhattacharjee
ACM Transactions on Architecture and Code Optimization, 2020

IEEE Micro Top Picks 2020 “MAESTRO: A Data-Centric Approach to Understand Reuse, Performance, and Hardware Cost of DNN Mappings”

Hyoukjun Kwon, Prasanth Chatarasi, Michael Pellauer, Angshuman Parashar, Vivek Sarkar, and **Tushar Krishna**
IEEE Micro (Special Issue: Top Picks from the Computer Architecture Conferences), May/June 2020

IEEE Micro Top Picks 2019 “Synchronized Progress in Interconnection Networks (SPIN): A New Theory for Deadlock Freedom”

Aniruddh Ramrakhyani, Paul Gratz, and **Tushar Krishna**
IEEE Micro (Special Issue: Top Picks from the Computer Architecture Conferences), May/June 2019

IEEE Micro Special Issue 2018 “A Communication-Centric Approach for Designing Flexible DNN Accelerators”

Hyoukjun Kwon, Ananda Samajdar, and **Tushar Krishna**
IEEE Micro Special Issue on Hardware Acceleration, Nov/Dec 2018

JSSC 2017 2019 citations “Eyeriss: An Energy-Efficient Reconfigurable Accelerator for Deep Convolutional Neural Networks”

Yu-Hsin Chen, **Tushar Krishna**, Joel Emer, and Vivienne Sze
IEEE Journal of Solid State Circuits Conference, ISSCC Special Issue, Jan 2017

TOCS 2015 “Efficient Control and Communication Paradigms for Coarse-Grained Spatial Architectures”

M. Pellauer, A. Parashar, M. Adler, B. Ahsan, R. Allmon, N. Crago, K. Fleming, M. Gambhir, A. Jaleel, **T. Krishna**, D. Lustig, S. Maresh, V. Pavlov, R. Rayess, A. Zhai, and J. Emer
ACM Transactions on Computer Systems, Sep 2015

IEEE Micro Top Picks 2014 “SMART: Single-Cycle Multihop Traversals Over A Shared Network-on-Chip”

Tushar Krishna, Chia-Hsin Owen Chen, Woo-Cheol Kwon, and Li-Shiuan Peh
IEEE Micro (Special Issue: Top Picks from the Computer Architecture Conferences), May/June 2014

IEEE Computer 2013 “Single-Cycle Multihop Asynchronous Repeated Traversal: A SMART Future for Reconfigurable On-Chip Networks”

Tushar Krishna, Chia-Hsin Owen Chen, Sunghyun Park, Woo-Cheol Kwon, Suvinay Subramanian, Anantha P. Chandrakasan, and Li-Shiuan Peh
IEEE Computer, 46(10): 48-55, Oct 2013
youtu.be/k_I8yc_CjBU
Webex Chat with Guest Editor:

TVLSI 2012 “SWIFT: A Low-Power Network-On-Chip Implementing the Token Flow Control Router Architecture With Swing-Reduced Interconnects”

Jacob Postman, **Tushar Krishna**, Christopher Edmonds, Li-Shiuan Peh, and Patrick Chiang
IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 21(8): 1432-1446, Aug 2012

- CAN 2011** “The gem5 simulator”
4593 citations N. Binkert, B. Beckmann, G. Black, S. K. Reinhardt, A. Saidi, A. Basu, J. Hestness, D. R. Hower, **T. Krishna**, S. Sardashti, R. Sen, K. Sewell, M. Shoaib, N. Vaish, M. D. Hill and D. A. Wood
SIGARCH Computer Architecture News, 39(2): 1-7, May 2011
- IEEE Micro Top Picks 2009** “Express Virtual Channels with Capacitively-Driven Global Links”
Tushar Krishna, Amit Kumar, Jacob Postman, Patrick Chiang, Mattan Erez, and Li-Shiuan Peh
IEEE Micro (Special Issue: Top Picks from Hot Interconnects 16), 29 (4): 48-61, Jul/Aug 2009

PUBLICATIONS: REFEREED CONFERENCES

- DAC 2021** RASA: Efficient Register-Aware Systolic Array Matrix Engine for CPU
Geonhwa Jeong, Eric Qin, Ananda Samajdar, Christopher Hughes, Sreenivas Subramoney, Hyesoon Kim and **Tushar Krishna**
In Proc. of the 58th Annual Design Automation Conference, Dec 2021
Acceptance Rate: 23%
- SC 2021** “SEEC: Stochastic Escape Express Channel”
Best paper nominee Mayank Parasar, Natalie Enright Jerger, Paul Gratz, Joshua San Miguel and **Tushar Krishna**
In Proc. of International Conference for High Performance Computing, Networking, Storage, and Analysis, Nov 2021
Acceptance Rate: 23% (86/365)
- PACT 2021** “A Unified HW-SW Co-Design Ecosystem in MLIR for Evaluating Tensor Operators on Spatial Accelerators”
Geonhwa Jeong, Gokcen Kestor, Prasanth Chatarasi, Angshuman Parashar, Po-An Tsai, Siva Rajamanickam, Roberto Gioiosa and **Tushar Krishna**
In Proc. of 30th International Conference on Parallel Architectures and Compilation Techniques, Sep 2021
Acceptance Rate: 26% (25/96)
- ISCA 2021** “Enabling Compute-Communication Overlap in Distributed Training Platforms”
Saeed Rashidi, Srinivas Sridharan, Sudarshan Srinivasan, Matthew Denton, Amoghavarsha Suresh, Jade Nie and **Tushar Krishna**
In Proc of 48th International Symposium on Computer Architecture, Jun 2021
Acceptance Rate: 18.7% (76/406)
- IPDPS 2021** “Extending Sparse Tensor Accelerators to Support Multiple Compression Formats”
Eric Qin, Geonhwa Jeong, William Won, Sheng-Chun Kao, Hyoukjun Kwon, Sudarshan Srinivasan, Dipankar Das, Gordon E. Moon, Sivasankaran Rajamanickam and **Tushar Krishna**
In Proc of the 35th IEEE International Parallel & Distributed Processing Symposium, May 2021
- ISQED 2021** “Architecture, Dataflow and Physical Design Implications of 3D-ICs for DNN-Accelerators”
Jan Moritz Joseph, Ananda Samajdar, Lingjun Zhu, Rainer Leupers, Sung Kyu Lim, Thilo Pionteck and **Tushar Krishna**
In Proc of the 22nd International Symposium on Quality Electronic Design, Apr 2021

- ISPASS 2021** “E3: A HW/SW Co-design Neuroevolution Platform for Autonomous Learning in Edge Device”
Sheng-Chun Kao and **Tushar Krishna**
In Proc of the IEEE International Symposium on Performance Analysis of Systems and Software, Mar 2021
- HPCA 2021** “Pitstop: Enabling a Virtual Network Free Network-on-Chip”
Hossein Farrokhbakht, Henry Kao, Kamran Hasan, Paul Gratz, **Tushar Krishna**, Joshua San Miguel and Natalie Enright Jerger
In Proc of the 27th IEEE International Symposium on High-Performance Computer Architecture, Feb 2021
Acceptance Rate: 24% (63/258)
- HPCA 2021** “Heterogeneous Dataflow Accelerators for Multi-DNN Workloads”
Hyoukjun Kwon, Liangzhen Lai, Michael Pellauer, Yu-Hsin Chen, **Tushar Krishna**, Vikas Chandra
In Proc of the 27th IEEE International Symposium on High-Performance Computer Architecture, Feb 2021
Acceptance Rate: 24% (63/258)
- ASP-DAC 2021** “Dataflow-Architecture Co-Design for 2.5D DNN Accelerators using Wireless Network-on-Package”
Robert Guirado, Hyoukjun Kwon, Sergi Abadal, Eduard Alarcon and **Tushar Krishna**
In Proc of the 26th Asia and South Pacific Design Automation Conference, Jan 2021
- ASP-DAC 2021** “Bridging the Frequency Gap in Heterogeneous 3D SoCs through Technology-Specific NoC Router Architecture”
Best paper nominee
Jan Moritz Joseph, Lennart Bamberg, Geonhwa Jeong, Ruei-Ting Chien, Rainer Leupers, Alberto Garcia-Ortiz, **Tushar Krishna** and Thilo Pionteck
In Proc of the 26th Asia and South Pacific Design Automation Conference, Jan 2021
Acceptance Rate: 34% (111/327)
- ICCAD 2020** “GAMMA: Automating the HW Mapping of DNN Models on Accelerators via Genetic Algorithm”
Sheng-Chun Kao and **Tushar Krishna**
In Proc of the IEEE/ACM International Conference on Computer-Aided Design, Nov 2020
Acceptance Rate: 27% (127/470)
- MICRO 2020** “ConfuciuX: Autonomous Hardware Resource Assignment for DNN Accelerators using Reinforcement Learning”
Sheng-Chun Kao, Geonhwa Jeong and **Tushar Krishna**
In Proc of 53rd Annual IEEE/ACM International Symposium on Microarchitecture, Oct 2020
Acceptance Rate: 19% (82/424)
- VLSI-SoC 2020** “Breaking Barriers: Maximizing Array Utilization for Compute In-Memory Fabrics”
Best Paper Award
Brian Crafton, Samuel Spetalnick, Gauthaman Murali, **Tushar Krishna**, Sung-Kyu Lim, and Arijit Raychowdhury
In Proc of the 28th IFIP/IEEE Int.I Conference on Very Large Scale Integration, Oct 2020

- HotI 2020** “Scalable Distributed Training of Recommendation Models: An ASTRA-SIM + NS3 case-study with TCP/IP transport”
Saeed Rashidi, Pallavi Shurpali, Srinivas Sridharan, Naader Hassani, Dheevatsa Mudigere, Krishnakumar Nair, Misha Smelyanski, and **Tushar Krishna**
In Proc of the 16th International Symposium on High-Performance Interconnects, Aug 2020
- ISPASS 2020** “ASTRA-SIM: Enabling SW/HW Co-Design Exploration for Distributed DL Training Platforms”
Saeed Rashidi, Srinivas Sridharan, Sudarshan Srinivasan, and **Tushar Krishna**
In Proc of the IEEE International Symposium on Performance Analysis of Systems and Software, Aug 2020
- ISPASS 2020** “A Systematic Methodology for Characterizing Scalability of DNN Accelerators using SCALE-Sim”
Ananda Samajdar, Jan Moritz Joseph, Yuhao Zhu, Paul Whatmough, Matthew Mattina, and **Tushar Krishna**
In Proc of the IEEE International Symposium on Performance Analysis of Systems and Software, Aug 2020
- ISPASS 2020** “CLAN: Continuous Learning using Asynchronous NeuroEvolution on Commodity Edge Devices”
Parth Mannan, Ananda Samajdar, and **Tushar Krishna**
In Proc of the IEEE International Symposium on Performance Analysis of Systems and Software, Aug 2020
- DAC 2020** “Kite: A Family of Heterogeneous Interposer Topologies Enabled via Accurate Interconnect Modeling”
Srikant Bharadwaj, Jieming Yin, Bradford M. Beckmann, and **Tushar Krishna**
In Proc. of the 57th Annual Design Automation Conference, Jul 2020
Acceptance Rate: 23% (228/991)
- DAC 2020** “Co-Exploration of Neural Architectures and Heterogeneous ASIC Accelerator Designs Targeting Multiple Tasks”
Lei Yang, Zheyu Yan, Meng Li, Hyoukjun Kwon, Liangzhen Lai, **Tushar Krishna**, Vikas Chandra, Weiwen Jiang, Yiyu Shi
In Proc. of the 57th Annual Design Automation Conference, Jul 2020
Acceptance Rate: 23% (228/991)
- HPCA 2020** “SIGMA: A Sparse and Irregular GEMM Accelerator with Flexible Interconnects for DNN Training”
Best Paper Award
Eric Qin, Ananda Samajdar, Hyoukjun Kwon, Vineet Nadella, Sudarshan Srinivasan, Dipankar Das, Bharat Kaul, and **Tushar Krishna**
In Proc of the 26th IEEE International Symposium on High-Performance Computer Architecture, Feb 2019
Acceptance Rate: 19% (48/248)
- HPCA 2020** “DRAIN: Deadlock Removal for Arbitrary Irregular Networks”
Mayank Parasar, Hossein Farrokhbakht, Natalie Enright Jerger, Paul Gratz, **Tushar Krishna**, and Joshua San Miguel
In Proc of the 26th IEEE International Symposium on High-Performance Computer Architecture,

Feb 2019

Acceptance Rate: 19% (48/248)

HPCA 2020 “ALRESCHA: A Lightweight Reconfigurable Sparse-Computation Accelerator”
Bahar Asgari, Ramyad Hadidi, **Tushar Krishna**, Hyesoon Kim and Sudhakar Yalamanchili
In Proc of the 26th IEEE International Symposium on High-Performance Computer Architecture, Feb 2019

Acceptance Rate: 19% (48/248)

ICECS 2019 “Understanding the Impact of On-chip Communication on DNN Accelerator Performance”
Robert Guirado, Hyoukjun Kwon, Eduard Alarcon, Sergi Abadal and **Tushar Krishna**
In Proc of 26th IEEE International Conference on Electronics, Circuits and Systems, Nov 2019

IISWC 2019 “Characterizing the Deployment of Deep Neural Networks on Commercial Edge Devices”
Best paper nominee
Ramyad Hadidi, Jiashen Cao, Yilun Xie, Bahar Asgari, **Tushar Krishna**, and Hyesoon Kim
In Proc of IEEE International Symposium on Workload Characterization, Nov 2019

MICRO 2019 “Understanding Reuse, Performance, and Hardware Cost of DNN Dataflows: A Data-Centric Approach”
Selected for IEEE Micro Top Picks + Finalist at ACM Student Research Competition at MICRO 2018
Hyoukjun Kwon, Prasanth Chatarasi, Micheal Pellauer, Angshuman Parashar, Vivek Sarkar, and **Tushar Krishna**
In Proc of 52nd Annual IEEE/ACM International Symposium on Microarchitecture, Oct 2019
Acceptance Rate: 23% (79/344)

MICRO 2019 “SWAP: Synchronized Weaving of Adjacent Packets for Network Deadlock Resolution”
Mayank Parasar, Natalie Enright Jerger, Paul Gratz, Joshua San Miguel, and **Tushar Krishna**
In Proc of 52nd Annual IEEE/ACM International Symposium on Microarchitecture, Oct 2019
Acceptance Rate: 23% (79/344)

NOCS 2019 “BINDU: Deadlock-Freedom with One Bubble in the Network”
Mayank Parasar and **Tushar Krishna**
In Proc of 13th IEEE/ACM International Symposium on Networks-on-Chip, Oct 2019

FPL 2019 “Scaling the Cascades: Interconnect-aware mapping strategies for FPGA implementation of Machine Learning problems”
Ananda Samajdar, Tushar Garg, **Tushar Krishna** and Nachiket Kapre
In Proc of the Field-Programmable Logic and Applications, Sept 2019
Acceptance Rate: 18.5% (28/151)

DAC 2019 “Architecture, Chip, and Package Co-design Flow for 2.5D IC Design Enabling Heterogeneous IP Reuse”
Jinwoo Kim, Gauthaman Murali, Heechun Park, Eric Qin, Hyoukjun Kwon, Venkata Chaitanya Krishna Chekuri, Nihar Dasari, Arvind Singh, Minah Lee, Hakki Mert Torun, Kallol Roy, Madhavan Swaminathan, Saibal Mukhopadhyay, **Tushar Krishna**, and Sung Kyu Lim
In Proc of the 56th ACM/EDAC/IEEE Design Automation Conference, Jun 2019

ISPASS 2019 “mRNA: Enabling Efficient Mapping Space Exploration on a Reconfigurable Neural Accelerator”

Zhongyuan Zhao, Hyoukjun Kwon, Sachit Kuhar, Weiguang Sheng, Zhigang Mao, and **Tushar Krishna**

In Proc of the IEEE International Symposium on Performance Analysis of Systems and Software, Mar 2019

Acceptance Rate: 29.5% (26/88)

AISTECS 2019 “McMahon: Minimum-cycle Maximum-hop network”

Gokul Subramanian Ravi, **Tushar Krishna**, and Mikko Lipasti

In Proc of 4th International Workshop on Advanced Interconnect Solutions and Technologies for Emerging Computing Systems, Jan 2019

[Held in conjunction with the 14th HiPEAC Conference on High-Performance Embedded Architectures and Compilers]

ICRC 2018 “Merge Network for a Non-von Neumann Accumulate Accelerator in a 3D Chip”

Anirudh Jain, Sriseshan Srikanth, Erik Debenedictis, and **Tushar Krishna**

In Proc of 3rd IEEE International Conference on Rebooting Computing, Nov 2018

MICRO 2018 “GeneSys: Enabling Continuous Learning through Neural Network Evolution in Hardware”

Finalist at ACM Student Research Competition at ASPLOS 2018

Ananda Samajdar, Parth Mannan, Kartikay Garg, and **Tushar Krishna**

In Proc of 51st Annual IEEE/ACM International Symposium on Microarchitecture, Oct 2018

Acceptance Rate: 21% (74/351)

MICRO 2018 “Scalable Distributed Last-Level TLBs Using Low-Latency Interconnects”

Srikant Bharadwaj, Guilherme Cox, **Tushar Krishna**, and Abhishek Bhattacharjee

In Proc of 51st Annual IEEE/ACM International Symposium on Microarchitecture, Oct 2018

Acceptance Rate: 21% (74/351)

NOCS 2018 “Brownian Bubble Router: Enabling Deadlock Freedom via Guaranteed Forward Progress”

Mayank Parasar, Ankit Sinha, and **Tushar Krishna**

In Proc of 11th International Symposium on Networks-on-Chip, Oct 2018

ISCA 2018 “Synchronized Progress in Interconnection Networks (SPIN) : A New Theory for Deadlock Freedom”

Selected for IEEE Micro Top Picks

Aniruddh Ramrakhiani, Paul Gratz, and **Tushar Krishna**

In Proc of 45th International Symposium on Computer Architecture, Jun 2018

Acceptance Rate: 16.9% (64/378)

ISCA 2018 “FastTrack: Leveraging Heterogeneous FPGA Wires to Design Low-cost High-performance Soft NoCs”

Nachiket Kapre and **Tushar Krishna**

In Proc of 45th International Symposium on Computer Architecture, Jun 2018

ISCA 2018 “SEESAW: Using Superpages to Improve VIPT Caches”

Mayank Parasar, Abhishek Bhattacharjee, and **Tushar Krishna**

In Proc of 45th International Symposium on Computer Architecture, Jun 2018

Acceptance Rate: 16.9% (64/378)

- ISPASS 2018** “Performance Implications of NoCs on 3D-Stacked Memories: Insights from the Hybrid Memory Cube”
Ramyad Hadidi, Bahar Asgari, Jeffrey Young, Burhan Ahmad Mudassar, Kartikay Garg, **Tushar Krishna**, and Hyesoon Kim
In Proc of the IEEE Int. Symp. on Performance Analysis of Systems and Software, Apr 2018
Acceptance Rate: 31.3% (21/67)
- ASPLOS 2018** “MAERI: Enabling Flexible Dataflow Mapping over DNN Accelerators via Reconfigurable Interconnects”
Honorable Mention in IEEE Micro Top Picks
Hyoukjun Kwon, Ananda Samajdar, and **Tushar Krishna**
In Proc of the 23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Mar 2018
Acceptance Rate: 17.5% (56/319)
- ASPLOS 2018** “LATR: Lazy Translation Coherence”
Mohan Kumar, Steffen Maass, Sanidhya Kashyap, Jan Vesely, Zi Yan, Taesoo Kim, Abhishek Bhattacharjee, and **Tushar Krishna**
In Proc of the 23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Mar 2018
Acceptance Rate: 17.5% (56/319)
- SysML 2018** “MAERI: Enabling Flexible Dataflow Mapping over DNN Accelerators via Programmable Interconnects”
Hyoukjun Kwon, Ananda Samajdar, and **Tushar Krishna**
In Inaugural SysML Conference, Feb 2018
- AISTECS 2018** “Spoofing Prevention via RF Power Profiling in Wireless Network-on-Chip”
Brian Lebednik, Sergi Abadal, Hyouk Jun Kwon and **Tushar Krishna**
Proc of 3rd International Workshop on Advanced Interconnect Solutions and Technologies for Emerging Computing Systems, Jan 2018
[Held in conjunction with the 13th HiPEAC Conference on High Performance Embedded Architectures and Compilers]
- ICCAD 2017** “A Case for Low Frequency Single Cycle Multi Hop NoCs for Energy Efficiency and High Performance”
Monodeep Kar and **Tushar Krishna**
Proc of the IEEE/ACM International Conference on Computer-Aided Design, Nov 2017
Acceptance Rate: 26% (105/399)
- NocArc 2017** “Lightweight Emulation of Virtual Channels using Swaps”
Mayank Parasar and **Tushar Krishna**
Proc of 10th International Workshop on Networks-on-Chip Architectures, Oct 2017
[Held in conjunction with the 50th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-50)]

- NOCS 2017** “Rethinking NoCs for Spatial Neural Network Accelerators”
 Hyoukjun Kwon, Ananda Samajdar, and **Tushar Krishna**
Proc of 11th International Symposium on Networks-on-Chip, Oct 2017
Acceptance Rate: 32% (14/44)
- NOCS 2017** “Adaptive Manycore Architectures for Big Data Computing”
 Janardhan Rao Doppa, Ryan Gary Kim, Mihailo Isakov, Michel A. Kinsky, Hyoukjun Kwon, and
 Tushar Krishna
Proc of 11th International Symposium on Networks-on-Chip, Oct 2017 (Special Session Paper)
- ISPASS 2017** “OpenSMART: Single-Cycle Multi-hop NoC Generator in BSV and Chisel”
 Hyoukjun Kwon and **Tushar Krishna**
*Proc of the IEEE International Symp. on Performance Analysis of Systems and Software, Apr
 2017*
Acceptance Rate: 29% (24/81)
- DATE 2017** “Automatic Place-and-Route of emerging LED-driven wires within a monolithically-integrated
Best Paper CMOS+III-V process”
Award **Tushar Krishna**, Arya Balachandran, Siau Ben Chiah, Li Zhang, Bing Wang, Cong Wang, Kenneth
 Lee Eng Kian, Jurgen Michel and Li-Shiuan Peh
Proc of Design Automation and Test in Europe, Mar 2017
Acceptance Rate: 24% (194/794)
- HPCA 2017** “Static Bubble: A Framework for Deadlock-free Irregular On-chip Topologies”
 Aniruddh Ramrakhiani and **Tushar Krishna**
Proc of the 23rd IEEE International Symp. on High-Performance Computer Architecture, Feb 2017
Acceptance Rate: 22% (50/224)
- ISSCC 2016** “Eyeriss: An Energy-Efficient Reconfigurable Accelerator for Deep Convolutional Neural
Media Coverage: Networks”
[IEEE Spectrum](#), Yu-Hsin Chen, **Tushar Krishna**, Joel Emer, and Vivienne Sze
[Daily Mail](#), [The](#)
[Verge](#), [phys.org](#), *Proc. of the IEEE International Solid-State Circuits Conference, Feb 2016*
[MIT News](#)
- NOCS 2014** “Single-Cycle Collective Communication Over A Shared Network Fabric”
Best Paper **Tushar Krishna** and Li-Shiuan Peh
Award *Proc. of the 8th International Symposium on Networks-on-Chip, Sep 2014*
Acceptance Rate: 25% (21/83)
- Hot Chips 2014** “SCORPIO: A 36-Core Research Chip Demonstrating Snoopy Coherence on a Scalable Mesh NoC
 with In-Network Ordering”
 Chia-Hsin Owen Chen, Sunghyun Park, Suvinay Subramanian, **Tushar Krishna**, Bhavya K. Daya,
 Woo-Cheol Kwon, Brett Wilkerson, John Arends, Anantha P. Chandrakasan, and Li-Shiuan Peh
Proc. of Hot Chips 26: A Symposium on High Performance Chips, Aug 2014
- ISCA 2014** “SCORPIO: A 36-Core Research Chip Demonstrating Snoopy Coherence on a Scalable Mesh NoC
Media Coverage: with In-Network Ordering”
[Wired](#), [PC World](#), Bhavya K. Daya, Chia-Hsin Owen Chen, Suvinay Subramanian, Woo-Cheol Kwon, Sunghyun Park,
[Geek](#), [Phys](#), [Tech](#), **Tushar Krishna**, Jim Holt, Anantha P. Chandrakasan, and Li-Shiuan Peh
[The Registrar](#), *Proc. of the 41st International Symposium on Computer Architecture, Jun 2014*
etc. *Acceptance Rate: 18% (46/258)*

- ASPLOS 2014** “Locality-Oblivious Cache Organization leveraging Single-Cycle Multi-Hop NoCs”
Woo-Cheol Kwon, **Tushar Krishna**, and Li-Shiuan Peh
Proc. of the 19th International Conference on Architectural Support for Programming Languages and Operating Systems, Mar 2014
Acceptance Rate: 22% (49/217)
- DATE 2013** SMART: A Single-Cycle Reconfigurable NoC for SoC Applications”
Chia-Hsin Owen Chen, Sunghyun Park, **Tushar Krishna**, Suvinay Subramanian, Anantha P. Chandrakasan, and Li-Shiuan Peh
Proc. of Design Automation and Test in Europe, Mar 2013
Acceptance Rate: 25% (206/829)
- HPCA 2013** “Breaking the On-Chip Latency Barrier Using SMART”
Tushar Krishna, Chia-Hsin Owen Chen, Woo Cheol Kwon and Li-Shiuan Peh
Proc. of the 19th IEEE International Symp. on High-Performance Computer Architecture, Feb 2013
Acceptance Rate: 20% (51/249)
Selected for IEEE Micro Top Picks
- DAC 2012** “Approaching the Theoretical Limits of a Mesh NoC with a 16-Node Chip Prototype in 45nm SOI”
Tushar Krishna, Sunghyun Park, Chia-Hsin Chen, Bhavya K. Daya, Anantha Chandrakasan, and Li-Shiuan Peh
Proc. of the 49th Design Automation Conference, Jun 2012
Acceptance Rate: 22% (164/741)
Media Coverage: EE Times, Slashdot, ACM, IT World, etc.
- MICRO 2011** “Towards the Ideal On-chip Fabric for 1-to-Many and Many-to-1 Communication”
Tushar Krishna, Li-Shiuan Peh, Bradford M. Beckmann, and Steven K. Reinhardt
Proc. of the 44th IEEE/ACM International Symposium on Microarchitecture, Dec 2011
Acceptance Rate: 21% (44/208)
- ICCAD 2011** “A Low-Swing Crossbar and Link Generator for Low-Power Networks-on-Chip”
Chia-Hsin Owen Chen, Sunghyun Park, **Tushar Krishna** and Li-Shiuan Peh
Proc. of the IEEE/ACM International Conference on Computer-Aided Design, Nov 2011
Acceptance Rate: 30% (106/349)
- ICCD 2010** “SWIFT: A SWing-reduced Interconnect For a Token-based Network-on-Chip in 90 nm CMOS”
Tushar Krishna, Jacob Postman, Christopher Edmonds, Li-Shiuan Peh and Patrick Chiang,
Proc. of the 28th IEEE International Conference on Computer Design, Oct 2010
Acceptance Rate: 29% (79/267)
- NOCS 2010** “Physical vs Virtual Express Topologies with Low-Swing Links for Future Many-core NoCs”
Chia-Hsin Owen Chen, Niket Agarwal, **Tushar Krishna**, Kyung-Hoae Koo, Li-Shiuan Peh and Krishna Saraswat
Proc. of the 4th International Symposium on Networks-on-Chip, May 2010
Acceptance Rate: 27% (32/118)
- ISPASS 2009** “GARNET: A Detailed On-Chip Network Model inside a Full-System Simulator”
Niket Agarwal, **Tushar Krishna**, Li-Shiuan Peh and Niraj K. Jha
Proc. of the International Symp. on Performance Analysis of Systems and Software, April 2009
Acceptance Rate: 28% (24/86)
751 citations
- ICCAD 2008** “Texture Filter Memory – A Power-efficient and Scalable Texture Memory Architecture for Mobile Graphics Processors”
Silpa BVN, Anjul Patney, **Tushar Krishna**, Preeti R. Panda and G.S. Visweswaran
Proc. of the International Conference on Computer-Aided Design, Nov. 2008.

Acceptance Rate: 26% (122/458)

Hot1 2008
Selected for IEEE
Micro Top Picks

“NoC with Near-Ideal Express Virtual Channels Using Global-Line Communication”
Tushar Krishna, Amit Kumar, Patrick Chiang, Mattan Erez, and Li-Shuan Peh
Proc. of the 16th International Symposium on High-Performance Interconnects, Aug. 2008.
Acceptance Rate: 30% (19/63)

“Modeling Electron Transport Mechanism in a Molecular Diode through *ab initio* Molecular Energy Calculations”

Tushar Krishna, C Kiran, Dilip K. Maity and Swapan K Ghosh
Proc. of the DAE-BRNS Theme Meeting on Materials Modeling at Different Length Scales, BARC, Mumbai, India, 2006

PATENTS

“Message Broadcast with Router Bypassing”
Tushar Krishna, Bradford M. Beckmann, Steven K. Reinhardt.
US Patent 2011/0314255 A1, Issued: Dec 22, 2011

OPEN-SOURCE SOFTWARE RELEASES

- August 2020 ASTRA-sim: Distributed Deep Learning Training simulator
<https://github.com/astra-sim/astra-sim>
- Oct 2018 SCALE-Sim: Systolic CNN Accelerator Simulator
<https://github.com/ARM-software/SCALE-Sim>
- June 2018 MAESTRO: An Analytic Model for Cost-Benefit Analysis of Dataflows in DNN Accelerators
<http://maestro.ece.gatech.edu>
- June 2018 MAERI: An Open Source Framework for Generating Modular DNN Accelerators supporting Flexible Dataflow
<http://synergy.ece.gatech.edu/tools/maeri/>
- May 2017 OpenSMART: A Tool for Automated Integration of Heterogeneous IPs
<http://synergy.ece.gatech.edu/tools/opensmart>
- Oct 2016 Garnet2.0: An On-Chip Network Model for Heterogeneous SoCs
<http://synergy.ece.gatech.edu/tools/garnet>

INVITED TALKS

- Oct 2020 “Teaching AI the Game of AI Accelerator Design”
At Facebook AI Research, Cambridge, MA, USA. (virtual due to COVID-19)
- Oct 2020 “Teaching AI the Game of AI Accelerator Design”
At Google Brain, Sunnyvale, CA, USA. (virtual due to COVID-19)
- Oct 2020 “A Communication-centric Approach for Designing Flexible DNN Accelerators”
At 3rd China Symposium on Cognitive Computing and Hybrid Intelligence (CCHI’2020) (virtual due to COVID-19)
- Sep 2020 “Communication-centric Design of Distributed Deep Learning Training Platforms”
at Computer Engineering and Systems Group, Texas A& M University (virtual due to COVID-19)

- Aug 2020** “Benchmarking DNN Models on Future Inference and Training Platforms”
at *Workshop on Benchmarking Machine Learning Workloads, co-located with IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS) (virtual due to COVID-19)*
- May 2020** “A Communication-centric Approach for Designing Flexible DNN Accelerators”
at *2nd Workshop on Accelerated Machine Learning (AccML), Co-located with International Symposium on Computer Architecture (ISCA) (virtual due to COVID-19)*
- May 2020** “A Systematic Methodology for Characterizing Scalability of DNN Accelerators using SCALE-Sim”
Guest Lecture in MIT 6.888 (Hardware Architecture for Deep Learning) (virtual due to COVID-19)
- May 2020** “Designing Efficient DL Training Platforms by optimizing Communication within and across Accelerators”
at *Facebook Research, Menlo Park, CA USA, (virtual due to COVID-19)*
- Mar 2020** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CS, Harvard University, Cambridge, MA, USA (virtual due to COVID-19)*
- Feb 2020** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CSE, University of California, San Diego, CA, USA*
- Feb 2020** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of ECE, Cornell University, Ithaca, NY, USA*
- Jan 2020** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CSE, University of Michigan, Ann Arbor, MI, USA*
- Dec 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CS, University of Illinois, Urbana Champaign, IL, USA*
- Nov 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of ECE, University of Toronto, Toronto, Canada*
- Nov 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of Electrical Engineering and Computer Science, MIT, Cambridge, MA, USA*
- Nov 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CS, Columbia University, New York City, NY, USA*
- Nov 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of CS, Princeton University, Princeton, NJ, USA*
- Nov 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *School of Computer and Communication Sciences, EPFL, Austin, Lausanne, Switzerland*
- Sept 2019** “Communication-Aware HW-SW Co-Design for Scalable Deep Learning”
at *Facebook AI Systems Faculty Summit, Menlo Park, CA, USA*
- Sept 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
at *Department of ECE, University of Texas, Austin, TX, USA*

- Sept 2019** “Enabling Continuous Learning through Neural Network Evolution in Hardware”
 at *ARM Research Summit, Austin, TX, USA*
Winner of Best Presentation Award
- July 2019** “Enabling Efficient Dataflow Exploration for Reconfigurable Neural Accelerators”
 at *International Conference on Neuromorphic Systems (ICONS), Knoxville, TN, USA*
- June 2019** “Using ML to Design ML Accelerators”
 at *Google Brain, Sunnyvale, CA, USA*
- June 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
 at *4th Workshop on Energy Efficient Machine Learning and Cognitive Computing for Embedded Applications (EMC2), Co-Located with ISCA, Phoenix, AZ, USA*
- June 2019** “Enabling Pervasive AI through Dataflow-Hardware Co-Design”
 at *Mythic AI, Redwood City, CA, USA*
- June 2019** “Dataflow and Communication-Aware Deep Learning Accelerator Design”
 at *Google Edge TPU Team, Mountain View, CA USA*
- March 2019** “Enabling Continuous Learning through Synaptic Plasticity in Hardware”
 at *University of Wisconsin, Madison, WI, USA*
- March 2019** “From Dataflows to Communication Flows in Spatial DNN Accelerators”
 at *FastPath Workshop, Co-located with ISPASS, Madison, WI, USA*
- February 2019** “Dataflow and Communication-Aware Deep Learning Accelerator Design”
 at *Xilinx Research, San Jose, CA USA*
- February 2019** “DNN-Dataflow-Hardware Co-Design for Enabling Pervasive General-Purpose AI”
 at *Facebook Research, Menlo Park, CA USA*
- November 2018** “DNN-Dataflow-Hardware Co-Design for Enabling Pervasive General-Purpose AI”
 at *Annual CRNCH Summit, Georgia Institute of Technology, Atlanta, GA, USA*
- October 2018** “Enabling Pervasive General-Purpose AI”
 at *Oakridge National Laboratory (ORNL), Oak Ridge, TN, USA*
- August 2018** “MAESTRO: An Analytic Model for Cost-Benefit Analysis of Dataflows in DNN Accelerators”
 at *Workshop on Modeling and Simulation on Systems and Applications, Seattle, WA, USA*
- June 2018** “A Quest to Enable Pervasive General-Purpose AI”
 at *IBM T. J. Watson Research Center, Yorktown Heights, NY, USA*
- June 2018** “Enabling Rapid Design Space Exploration and Prototyping of DNN Accelerators”
 at *CMU/GT Symposium on Machine Learning in Science and Engineering, Pittsburgh, PA, USA*
- May 2018** “Enabling Irregular Dataflow Mapping via Reconfigurable Single-Cycle On-Chip Interconnects”
 at *Lawrence Berkeley National Laboratory, Berkeley, CA, USA*
- May 2018** “A Communication-centric Approach to Designing Flexible DNN Accelerators”
 at *TPU Design Team, Google, Sunnyvale, CA, USA*

- May 2018** “Communication-centric Computing for Deep Learning”
at *GT Institute for Electronics and Nanotechnology (IEN) Technical Conference, Atlanta, GA, USA*
- Sept 2017** “Garnet2.0: A Detailed On-Chip Network Model inside a Full-System Simulator”
at *gem5 workshop, ARM Research Summit, Cambridge, U.K.*
- Sept 2017** “Breaking the On-Chip Latency Barrier Using Single-cycle Multi-hop Networks”
at *ARM Research, Cambridge, U.K.*
- May 2017** “Scalable and Low-Cost Heterogeneous Design in the Post-Moore’s Law Era using Efficient Communication”
at *Georgia Tech ECE Advisory Board Meeting, Cupertino, CA, USA*
- Apr 2017** “Breaking the On-Chip Latency Barrier Using Single-cycle Multi-hop Networks”
at *Computer Engineering and Systems Group Seminar, Texas A&M University, TX, USA*
- Feb 2017** “Breaking the On-Chip Latency Barrier Using Single-cycle Multi-hop Networks”
at *Baidu Research, Sunnyvale, CA*
- Oct 2016** “Breaking the On-Chip Latency Barrier Using Single-cycle Multi-hop Networks”
at *Department of ECE, CALCM Seminar Series, Carnegie Mellon University, PA, USA*
- Mar 2016** “Breaking the On-Chip Latency Barrier Using SMART”
at *NVIDIA, Westford, MA, USA*
- Mar 2015** “Breaking the On-Chip Latency Barrier Using SMART”
at *Department of CS, University of California at Los Angeles, CA, USA*
- Feb 2015** “Breaking the On-Chip Latency Barrier Using SMART”
at *Department of CS, University of Illinois Urbana-Champaign, IL, USA*
- Feb 2015** “Breaking the On-Chip Latency Barrier Using SMART”
at *Department of ECE, Georgia Tech, Atlanta, GA, USA*
- Jan 2015** “Enabling dedicated single-cycle connections over a shared multi-hop network”
at *Department of ECE, Northeastern University, Boston, MA, USA*
- Nov 2014** “Enabling dedicated single-cycle connections over a shared Network-on-Chip”
at *Department of CSE, University of Michigan, Ann Arbor, MI, USA*
- Sep 2014** “Single-Cycle Collective Communication Over A Shared Network Fabric”
at *IEEE Intl. Symp. on Networks-on-Chip (NOCS-8), Ferrara, Italy*
- Feb 2013** “Breaking the On-Chip Latency Barrier Using SMART”
at *IEEE Intl. Symp. on High-Performance Computer Architecture (HPCA-19), Shenzhen, China*
- Jul 2012** “Breaking the On-Chip Latency Barrier Using SMART”
at *VSSAD, Intel Corporation, Hudson, MA, USA*
- May 2012** “Reconfigurable on-chip network topologies using SMART links”
at *Industry Affiliates Program, CSAIL, MIT, Cambridge, MA, USA*
- Dec 2011** “Towards the Ideal On-chip Fabric for 1-to-Many and Many-to-1 Communication”
at *IEEE/ACM Intl. Symp. on Microarchitecture (MICRO-44), Porte Alegre, Brazil*

- Oct 2010 “SWIFT: A SWing-reduced Interconnect For a Token-based Network-on-Chip in 90 nm CMOS”
at *IEEE Intl. Conf. on Computer Design (ICCD-28), Amsterdam, Netherlands*
- Feb 2010 “SWing-reduced Interconnect For a Token-based (SWIFT) Network-on-Chip”
at *Student Research Preview, Intl. Solid-State Circuits Conference (ISSCC), San Francisco, CA*
- Oct 2008 “NoC with Near-Ideal Express Virtual Channels Using Global-Line Communication”
at *Interconnect Focus Center (IFC) Annual Review, Atlanta, GA*

TEACHING EXPERIENCE

- Spring 2021 **Georgia Tech ECE 3058 (Architecture, Systems, Concurrency and Energy in Computation)**
Undergraduate-level class of 78 students. *Teaching Score: 4.7/5*
- Spring 2021 **Georgia Tech ECE 6115 / CS 8803 – ICN (Interconnection Networks)**
Graduate-level class of 32 students. *Teaching Score: 4.9/5*
- Spring 2020 **Georgia Tech ECE 3057 (Architecture, Systems, Concurrency and Energy in Computation)**
Undergraduate-level class of 59 students. *No teaching score due to COVID-19*
- Spring 2020 **Georgia Tech ECE 6115 / CS 8803 – ICN (Interconnection Networks)**
Graduate-level class of 35 students. *No teaching score due to COVID-19*
- Fall 2019 **Georgia Tech ECE4100/ECE6100/CS4290/CS6290 (Advanced Computer Architecture)**
Graduate-level class of 54 students. *Teaching Score: 4.85/5*
- Spring 2019 **Georgia Tech ECE 8893 B (Hardware Accelerators for Machine Learning)**
NEW Graduate-level class of 60 students. *Teaching Score: 4.5/5*
- Spring 2019 **Georgia Tech ECE 8823 A / CS 8803 – ICN (Interconnection Networks)**
Graduate-level class of 48 students. *Teaching Score: 4.9/5*
- Fall 2018 **Georgia Tech ECE 3056 (Architecture, Concurrency and Energy in Computation)**
Undergraduate-level class of 86 students. *Teaching Score: 4.2/5*
- Spring 2018 **Georgia Tech ECE 3056 (Architecture, Concurrency and Energy in Computation)**
Undergraduate-level class of 90 students. *Teaching Score: 4.3/5*
- Spring 2018 **Georgia Tech ECE 8823 A / CS 8803 – ICN (Interconnection Networks)**
Graduate-level class of 26 students. *Teaching Score: 5/5*
+ Won the “Class of 1940 Course Survey Teaching Effectiveness Award”
- Summer 2017 **Invited Lecturer for Network-on-Chip course at ACACES Summer School, Fuiggi, Italy**
Graduate-level class with 50+ students
The ACACES Summer School is a one-week summer school for computer architects and tool builders working in the field of high performance computer architecture and compilation for computing systems. It is organized by the High Performance and Embedded Architecture and Compilation (HiPEAC) consortium. The school aims at the dissemination of advanced scientific knowledge and the promotion of international contacts among scientists from academia and industry. It attracts PhD-students, faculty, and industry researchers.
- Spring 2017 **Georgia Tech ECE 8823 A / CS 8803 – ICN (Interconnection Networks)**
Graduate-level class of 11 students. *Teaching Score: 4.85/5*
- Fall 2016 **Georgia Tech ECE4100/ECE6100/CS4290/CS6290 (Advanced Computer Architecture)**

Graduate-level class of 62 students. *Teaching Score: 4.85/5*

Spring 2016 **Georgia Tech ECE 8823 A / CS 8803 – ICN (Interconnection Networks)**
NEW Graduate-level class of 21 students. *Teaching Score: 4.9/5*

Fall 2015 **Georgia Tech ECE4100/ECE6100/CS4290/CS6290 (Advanced Computer Architecture)**
Graduate-level class of 39 students. *Teaching Score: 4.7/5*

STUDENT ADVISING

PhD Students (Graduated)

Hyoukjun Kwon (PhD, SCS, July 2020)

- **Thesis:** *Data- and Communication-centric Approaches to Model and Design Flexible Deep Neural Network Accelerators*
- **First Employment:** Facebook Reality Labs
- **Select Honors during PhD**
 - Honorable Mention at ACM SIGARCH / IEEE CS TCCA Outstanding Dissertation Award “*For developing mechanisms to quantify the relationship between deep neural network mappings, data reuse and communication flows for system design of flexible deep learning accelerators*”
 - Best Paper at HPCA 2020
 - IEEE Micro Top Picks 2020
 - Qualcomm Innovation Fellowship Finalist 2019
 - Honorable Mention in IEEE Micro Top Picks 2019
 - Finalist at ACM Student Research Competition MICRO 2018

Mayank Parasar (PhD, ECE, July 2020)

- **Thesis:** *Subactive Techniques for Guaranteeing Routing and Protocol Deadlock Freedom in Interconnection Networks*
- **First Employment:** Samsung Austin Research Center
- **Select Honors during PhD**
 - Best Paper candidate at SC 2021

PhD Students (In Progress)

Ananda Samajdar
Eric Qin
Sheng-Chun (Felix) Kao
Saeed Rashidi
Matthew Denton
Geonhwa Jeong
William (Jonghoon) Won
Raveesh Garg
Jianming Tong

MS Students (Graduated)

Yehowshua Immanuel (MS, ECE, 2020)

- **Thesis:** *Plug-and-Play FOSS ML Accelerator: From Concept to Conception*
- **First Employment:** Founder of ChipEleven (Startup)

Vineet Nadella (MS, ECE, 2020)

- **Thesis:** *Investigating Opportunities and Challenges in Modeling and Designing Scale-Out DNN Accelerators*
- **First Employment:** Amazon

Parth Mannan (MS, ECE, 2018)

- **Thesis:** *Exploring Opportunities and Challenges in Enabling Neuro-Evolutionary Algorithms in Hardware*
- **First Employment:** NVIDIA

Srikant Bharadwaj (MS, ECE, 2017)

Thesis: *Scaling Address Translation in Multi-core Architectures using Low-Latency Interconnects*
First Employment: AMD Research (GPU Micro-architecture)

Aniruddh Ramrakhyani (MS, ECE, 2017)

Thesis: *Deadlock Recovery in On-Chip Interconnection Networks*
First Employment: Apple. Now at Google

PROFESSIONAL SERVICE**Conference Organization:**

- TPC Track Chair for “*Design Methodologies for Machine Learning Architectures*” for DATE 2022
 - *DATE has one TPC chair and several tracks, each with a chair and a co-chair*
 - *Role as track co-chair: pick the TPC for the track (~12 members), assign double-blind reviewers, run the TPC meeting for the track, create session for the track.*
- General Co-Chair NOCS 2021
- Workshops and Tutorials Chair ISPASS 2021
- TPC Track Co-Chair for “*Design Methodologies for Machine Learning Architectures*” for DATE 2021
 - *DATE has one TPC chair and several tracks, each with a chair and a co-chair*
 - *Role as track co-chair: pick the TPC for the track (~12 members), assign double-blind reviewers, run the TPC meeting for the track, create session for the track.*
- Technical Program Committee Co-Chair NOCS 2020
 - *Role: select TPC (~40 members), select organizing committee, assign reviews, create and manage overall technical program, invite and coordinate keynotes.*
- Tutorials and Special Sessions Co-Chair NOCS 2019
- TPC Track Chair for track on On-Chip and On-Package Interconnects, DAC 2019
 - *DAC has one overall TPC chair and several tracks, each with one chair*
 - *Role as track chair: pick the TPC for the track, assign double-blind reviewers, run the TPC meeting for the track, create session for the track.*
- Publicity Co-Chair NOCS 2018
- Travel Grants Co-Chair PACT 2018
- Travel Grants Co-Chair ISCA 2017
- Workshops and Tutorials Chair ASPLOS 2016

Workshop Organization:

- Co-organizing a new workshop “*Inaugural Workshop on Architecture, Compiler, and System Support for Multi-model DNN Workloads*” at MICRO 2021
- Co-organized a new workshop “*Systems for Machine Learning for Health (SysML4H)*” at MLSys 2021
- Co-organized a new workshop “*Unlocking the power of Edge Computing*” at ASPLOS 2019
- Started a new workshop “*Rising Stars in Computer Architecture*” in 2018 for final-year PhD students across USA interested in academia.
 - Co-Chaired the first (2018) and second iteration (2019) of the workshop. Solicited nominations and invited a select set of candidates to visit and present

at Georgia Tech

Tutorial Organization:

- Started a new tutorial “*ASTRA-sim: Enabling SW/HW Co-Design Exploration for Distributed Deep Learning Training Platforms*” at ASPLOS 2021
- Started a new Tutorial series “*Enabling Rapid Design Space Exploration and Prototyping of DNN Accelerators*” to aid researchers designing DNN accelerator Hardware-Software using the MAESTRO, MAERI and SCALE-sim frameworks
 - First offering at ISCA 2018
 - Second offering at HPCA 2019
 - Third offering at MICRO 2020
 - Fourth offerings at ISCA 2021 and ASPLOS 2021

Program Committee Member:

- ACM/SIGARCH International Conference on Supercomputing (ICS)
 - 2015
- IEEE/ACM International Symposium on Microarchitecture (MICRO)
 - 2016, 2019, 2020, 2021
- International Symposium on Computer Architecture (ISCA)
 - 2019, 2020, 2021, 2022
- IEEE International Symposium on High-Performance Computer Architecture (HPCA)
 - 2020, 2021, 2022
- Design Automation Conference (DAC)
 - 2017, 2018, 2019
- Design Automation and Test in Europe (DATE)
 - 2017, 2018, 2019, 2020
- IEEE International Symposium on High-Performance Interconnects (HOTI)
 - 2016, 2017, 2019
- IEEE International Symp. on Performance Analysis of Systems and Software (ISPASS)
 - 2018
- IEEE International Parallel and Distributed Processing (IPDPS)
 - 2018
- International Conference on Parallel Architectures and Compilation Techniques (PACT)
 - 2019
- IEEE Micro Top Picks in Computer Architecture
 - 2020

Conference External Review Committee (ERC) Member:

- IEEE/ACM International Symposium on Microarchitecture (MICRO)
 - 2015
- International Conference on Parallel Architectures and Compilation Techniques (PACT)
 - 2016
- IEEE International Symposium on Computer Architecture (ISCA)
 - 2017
- IEEE/ACM International Symposium on Microarchitecture (MICRO)
 - 2017

Journal Reviewer:

- IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)
 - 2010
- IEEE Computer
 - 2013
- IEEE Micro
 - 2020

- IEEE Computer Architecture Letters (CAL)
 - 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
- IEEE Transactions on Very Large Scale Integration Systems (TVLSI)
 - 2014, 2016, 2019
- IEEE Transactions on Parallel and Distributed Systems (TPDS)
 - 2015
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
 - 2016, 2017, 2020
- IEEE Transactions on Computers
 - 2016, 2018
- IEEE Transactions on Multi-Scale Computing Systems (TMCS)
 - 2017
- ACM Transactions on Architecture and Code Optimization (TACO)
 - 2012, 2014, 2015, 2016, 2017, 2018, 2020
- ACM Transactions on Embedded Computing Systems (TECS)
 - 2017

Panels: NSF (2016), DoE (2020)

INTERNAL SERVICE AT GEORGIA TECH

- 2021** Search Committee for **Steve. W. Chaddick Chair** for the School of ECE
 - 2019-22** Faculty Recruitment Committee for School of ECE
 - 2017 – 18** Search Committee for **Steve. W. Chaddick Chair** for the School of ECE
 - 2017 and 2018** Graduate Student Recruitment Committee for the School of ECE
 - 2017-present** Faculty Coordinator for **CS 8001: Computer Architecture Seminar**
(a weekly seminar series for students and faculty across School of ECE and College of Computing working in Computer Architecture featuring student talks and guest lectures)
-