Sparsh Mittal
Curriculum Vitae

Employment   Assistant professor at ECE department, IIT Roorkee from 12/2019 onwards. Also, a joint faculty at Mehta Family School of Data Science (DS) and Artificial Intelligence (AI) at IIT Roorkee. IEEE Senior member

Assistant professor at CSE department, IIT Hyderabad from 09/2016 to 12/2019.

Postdoctoral Research Associate at Future Technologies Group, ORNL from 09/2013 to 09/2016

Current research areas: artificial intelligence (AI) for computer-vision, applications of AI/ML/DL, accelerators for AI, computer architecture, VLSI, approximate computing.

Education and current research areas

Ph.D., Computer Engineering , 2008-2013, Iowa State University (ISU), USA.
    Thesis topic: *Dynamic Cache Reconfiguration Based Techniques for Improving Cache Energy Efficiency*

B.Tech., Electronics and Communications Engineering 2004-2008
Indian Institute of Technology (IIT) Roorkee, Uttarakhand, India. GPA: 9.58/10.0

Class XII from Maheshwari High Secondary School (MHS), Jaipur (Rajasthan Board), 2004, 90.77%.

Class X from MHS, Jaipur (Rajasthan Board), 2002, 90.67%.

Honors and Awards

"Best paper award honorable mention" at AIMLSystems Conference (Bengaluru) 2023

"Best student paper award" at VLSI Design Conference (Kolkata) 2024.

"Best paper award" at COMSNETS India Internet Governance Workshop (Bengaluru) 2024

In the Stanford's list of world's top researchers 2021, in the field of Computer Hardware and Architecture, without self-citation, I am ranked as number 71 (for whole career) and as number 3 (for year 2020 alone).

My research on mobile phone detection was praised by Education Minister of India (1, 2, 3). Also, it was covered by HinduBusinessLine, TimesOfIndia, AndhraJyothy, TelanganaToday, TheHansIndia, CollegeDunia and DailyHunt and Acqro

Yash Jain and Vishu Saxena, whom I advised for BTech project, won the best BTech project award in ECE Department, IIT Roorkee in 2023. They also won the "Best Innovation" award in the "Professional Development and Innovation Award" scheme at IIT Roorkee (This award was established by 1983 batch alumni of IITR).

Received *Distinguished Contribution* rating at ORNL based on 2013-2014 performance appraisal. This rating recognizes the top 10 percent of staff and is the topmost rating for research staff.

Received *Outstanding Contribution* rating at ORNL based on 2014-2015 performance appraisal. Also received a performance award and mid-year salary increment in both 2013-2014 and 2014-2015.

Received top-up salary at IIT Hyderabad, which is given to very few selected faculty members.

I was an associate editor of Elsevier's Journal of Systems Architecture for 2+ years.

My research has featured on NextPlatform, Phys.org, TheMemoryGuy, ScientificComputing, TechEnablement, InsideHPC (1, 2, 3, 4, 5, 6, 7,) Primeur Magazine, StorageSearch (1, 2, 3), HPCWire (1, 2,3, 4, 5), TechDecoded Data-Compression.info, and ReRAM Forum technical websites

Google Scholar Citations: 7749. h-index: 42. i10-index: 95.

Selected top conferences where I have published papers: SC (Supercomputing), IEEE Winter Conference on Applications of Computer Vision (WACV), ACM Symposium on High-Performance Parallel and Distributed Computing (HPDC), IEEE VLSID, IEEE ISVLSI, ACM GLSVLSI, Intl. Conf. on Supercomputing (ICS), Design Automation and Test in Europe (DATE), ISQED

Selected top journals where I have published papers: Computers in Industry, IEEE Trans. on Neural Networks and Learning Systems, Springer Neural computing and applications, IEEE Trans. on Electron Devices, IEEE Trans. on Computers, Elsevier Journal of Systems Architecture, ACM Transactions on Embedded Computing Systems (TECS), ACM Journal on Emerging Technologies in Computing Systems (JETC)

I have read 5500+ papers in the fields of computer architecture, operating system, high-performance computing, VLSI and deep learning.

Articles in popular media: Brain drain to Brain gain (Eduvoice), Importance of Coding (BusinessWorld).

Best student paper finalist in SC (Supercomputing) 2014, world's biggest HPC conference with 10,000+ attendees.

ECpE Fellowship of $2500 and Peer Research Award of $200 from ISU

Sumer Chand Jain Scholarship of INR 10,000 at IIT Roorkee.

Silver Medal for getting highest GPA in Electronics batch of year 2008 in ECE department, IIT Roorkee.

Silver Medal for best B.Tech project in Electronics batch of year 2008 in ECE department, IIT Roorkee.

Best Student Award from High School (named MHS, Jaipur) in 2004. Topper throughout school.

Funded projects (all as sole-PI)

"Designing Efficient Hardware Accelerators for Autonomous Driving Vehicles", Semiconductor Research Consortium, USA $36,000, 2018-2021. [Completed]

"Secure & Reliable Non-volatile Memories for Ultra-low Power Applications", SERB (DST), 2017-2020, 4.5M INR. [Completed]

Intel PhD fellowship for a PhD student, 2.25M INR, 2018-2022 [Completed]

Startup grant: IITR (2M INR), IITH (0.5M INR). 2 masters students supported by Redpine Signals.

Consultancy project "Architecture for Accelerating Al workloads" from TCS Research from Apr-22 to Mar-23. Funding of 11.3 Lakh (including GST). [Completed]

Consultancy project "Architecture for Accelerating Al workloads" from TCS Research from Apr-23 to Mar-24. Funding of 11.3 Lakh (including GST). [Ongoing]

"Designing Secure and Robust Artificial Intelligence (AI) Algorithms and Accelerators", SERB Core research grant, 2023-2026, 25.1 Lakh [Ongoing]

Invited talks/panel-discussions

Panel discussion: 'HPC and AI: two sides of same coin' by ACM India and TCS Research 2023.

Conferences: 1. ISC Conference (Germany) 2016. ISC is the biggest HPC conference in Europe with nearly 3000 attendees. 2. PARCOMPTECH (Bengaluru) Organized by C-DAC and MeitY 2017.

Companies: Xilinx (Hyderabad) 2019, Intel (Bangalore) 2017.

Universities: New York University, University of Michigan, VelTech University (Chennai), MSRIT (Bengaluru), NIT Jalandhar, Anurag Group of Institutions (Hyderabad).

Patents

Maruthi S. Inukonda, Jessy Bondla, Arjun Reddy, and Sparsh Mittal. Method and system for privacy-preserving continuous internet forensics, 2022. Indian Patent 202,241,035,158 (filed on 20 June 2022).

Maruthi S. Inukonda, Jessy Bondla, Arjun Reddy, and Sparsh Mittal. Methods and systems for privacy-preserving federated continuous internet forensics, 2023. Indian Patent 202,341,041,491 (filed on 19 June 2023).

Aaditi Kapre, Shruti Kunde, Sparsh Mittal, and Rekha Singhal. System and methods for hyperspectral image processing in remote sensing using reflexivity based approximate computing, 2023. Indian Patent 202,321,078,005 (filed on 16 November 2023).

Publications

[Ji] and [Ci] refer to journal and conference paper numbering. Impact factor of a journal may be different in different years. Papers with ⋆mark are where I am corresponding author. Q1/Q2 rankings have been taken from https://wos-journal.info/.

AI/ML for Computer Vision and NLP

Vandan Gorade, Sparsh Mittal, Debesh Jha, and Ulas Bagchi. SynergyNet: Bridging the Gap between Discrete and Continuous Representations for Precise Medical Image Segmentation. In *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (Core A rank conference)*, USA, 2024. [C1]⋆.

Vandan Gorade, Sparsh Mittal, Debesh Jha, and Ulas Bagchi. Rethinking Intermediate Layers design in Knowledge Distillation for Kidney and Liver Tumor Segmentation. In *IEEE International Symposium on Biomedical Imaging (ISBI)*, Greece, 2024. [C2].

Gayatri Deshmukh, Onkar Susladkar, Dhruv Makwana, Sparsh Mittal, and R Sai Chandra Teja. Textual Alchemy: CoFormer for Scene Text Understanding. In *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (Core A rank conference)*, USA, 2024. [C3]⋆Code One of the 53 papers (out of 847 accepted papers) that was selected for oral presentation.

Dhruv Makwana, Gayatri Deshmukh, Onkar Susladkar, Sparsh Mittal, and R Sai Chandra Teja. LIVENet: A novel network for real-world low-light image denoising and enhancement. In *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (Core A rank conference)*, USA, 2024. [C4]⋆Code.

Dhruv Makwana, R Sai Chandra Teja, and Sparsh Mittal. PCBSegClassNet - A Light-weight Network for Segmentation and Classification of PCB Component. *Expert Systems With Applications (Q1 journal)*, 2023. (Impact Factor 8.665) PDF Code [J1]⋆.

Vandan Gorade, Sparsh Mittal, and Rekha Singhal. PaCL: Patient-aware Contrastive Learning Through Metadata Refinement for Generalized Early Disease Diagnosis. *Computers in Biology and Medicine (Q1 journal)*, 2023. (Impact Factor 7.7), PDF [J2]⋆.

Ananya Mantravadi, Siddharth Saini, R Sai Chandra Teja, Sparsh Mittal, Shrimay Shah, R Sri Devi, and Rekha Singhal. CLINet: A Novel Deep Learning Network for ECG Signal Classification. *Journal of Electrocardiology*, 2024. (Impact Factor 1.3) PDF [J3].

Onkar Susladkar, Gayatri Deshmukh, Dhruv Makwana, Sparsh Mittal, R Sai Chandra Teja, and Rekha Singhal. GAFNet: A Global Fourier Self Attention Based Novel Network for multi-modal downstream tasks. In *Proceedings of IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (Core A rank conference)*, Hawaii, USA, 2023. Code [C5].

Onkar Susladkar, Gayatri Deshmukh, R Sai Chandra Teja, Sparsh Mittal, and Rekha Singhal. LiBERTy: A Novel Model for Natural Language Understanding. In *International Conference on AI-ML Systems (AIMLSystems)*, Bengaluru, India, 2023. ACM. [C6]⋆(Best paper award honorable mention).

Maruthi S Inukonda, Krishna Prashanth Thummanapelly, Bheemarjuna Reddy Tamma, and Sparsh Mittal. TEFAR: An Efficient Transparent Finer-grained Encryption of Internet Access Artifacts. In *COMSNETS India Internet Governance Workshop (IIGW)*, 2024. [C7]Best paper award.

Subhrajit Nag, Dhruv Makwana, R Sai Chandra Teja, Sparsh Mittal, and C Krishna Mohan. WaferSeg-ClassNet - A Light-weight Network for Classification and Segmentation of Semiconductor Wafer Defects. *Computers in industry (Q1 journal)*, 2022. (impact factor 11.245) pdf, Code [J4].

Ananya Mantravadi, Dhruv Makwana, R Sai Chandra Teja, Sparsh Mittal, and Rekha Singhal. Dilated Involutional Pyramid Network (DInPNet): A Novel Model for Printed Circuit Board (PCB) Components Classification. In *Proceedings of 24th International Symposium on Quality Electronic Design (ISQED)*, California, USA, 2023. [C8]⋆.

Onkar Susladkar, Dhruv Makwana, Gayatri Deshmukh, Sparsh Mittal, R Sai Chandra Teja, and Rekha Singhal. TPFNet: A Novel Text In-painting Transformer for Text Removal. In *IEEE International Conference on Document Analysis and Recognition (ICDAR) (Core A rank conference)*, California, USA, 2023. [C9]⋆.

Gayatri Deshmukh, Onkar Susladkar, Dhruv Makwana, R Sai Chandra Teja, S Nagesh Kumar, and Sparsh Mittal. FEEDNet: A Feature Enhanced Encoder-Decoder LSTM Network for Nuclei Segmentation for Histopathological Diagnosis. *Physics in Medicine and Biology (Q2 journal)*, 67(19):195011, 2022. (impact factor 4.174) pdf, Code [J5]⋆.

Onkar Susladkar, Gayatri Deshmukh, Subhrajit Nag, Ananya Mantravadi, Dhruv Makwana, Sujitha Ravichandran, R Sai Chandra Teja, Gajanan H Chavhan, C Krishna Mohan, and Sparsh Mittal. ClarifyNet: A High-Pass and Low-Pass Filtering Based CNN for Single Image Dehazing. *Journal of Systems Architecture (Q1 journal)*, 2023. (impact factor 5.836) pdf, Code [J6]⋆.

Dhruv Makwana, Subhrajit Nag, Onkar Susladkar, Gayatri Deshmukh, R Sai Chandra Teja, Sparsh Mittal, and C Krishna Mohan. ACLNet: An Attention and Clustering-based Light-weight Cloud Segmentation Network. *Remote Sensing Letters (Q3 journal)*, 2022. (impact factor 2.583) pdf, Code [J7].

Yash Jain, Vishu Saxena, and Sparsh Mittal. Ensembling Deep Learning And CIELAB Color Space Model for Fire Detection from UAV images. In *Proceedings of International Conference on AI-ML Systems (AIML-Systems)*, India, 2022. [C10]Code, PDF.

R. Saini, N. Jha, B. Das, Sparsh Mittal, and C. Mohan. ULSAM: Ultra-Lightweight Subspace Attention Module for Compact Convolutional Neural Networks. *Proceedings of Winter Conference on Applications of Computer Vision (WACV) (Core A rank conference), USA*, pages 1616–1625, 2020. [C11]pdf, Code ⋆.

Poonam Rajput, Subhrajit Nag, and Sparsh Mittal. Detecting Usage of Mobile Phones using Deep Learning Technique. In *Proceedings of 6th EAI International Conference on Smart Objects and Technologies for Social Good (GOODTECHS), Belgium*, pages 96–101, 2020. [C12]pdf, Dataset and trained models ⋆.

Poonam Rajput, Sparsh Mittal, and Sarthak Narayan. Improving Accuracy and Efficiency of Object Detection Algorithms using Multiscale Feature Aggregation Plugins. In *Proceedings of IAPR TC3 Workshop*

on Artificial Neural Networks in Pattern Recognition (ANNPR), pages 65–76, Winterthur, Switzerland, 2020. Springer. [C13]pdf ⋆.

Sparsh Mittal, Srishti Srivastava, and J Phani Jayanth. A survey of deep learning techniques for underwater image classification. *IEEE Transactions on Neural Networks and Learning Systems (Q1 journal)*, 2022. (impact factor 14.255) pdf [J8]⋆.

Subhrajit Nag, Yash Khandelwal, Sparsh Mittal, C Krishna Mohan, and Alex Kai Qin. ARCN: A Real-time Attention-based Network for Crowd Counting from Drone Images. In *Proceedings of IEEE 18th India Council International Conference (INDICON)*, Guwahati, India, 2021. [C14]pdf, Pretrained model ⋆.

Srishti Srivastava, Sarthak Narayan, and Sparsh Mittal. A Survey of Deep Learning Techniques for Vehicle Detection from UAV Images. *Journal of Systems Architecture (Q1 journal)*, 117:102152, 2021. (impact factor 3.77) pdf [J9].

AI/ML intersection with Systems and Security

Aabid Amin Fida, Farooq A Khanday, and Sparsh Mittal. An active memristor based rate-coded spiking neural network. *Neurocomputing (Q2 journal)*, 2023. (Impact Factor 5.779) [J10].

Vishu Saxena, Yash Jain, and Sparsh Mittal. Machine learning and polynomial chaos models for accurate prediction of set pulse current. In *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Brazil, 2023. [C15]⋆.

Vibhu, Vivek Kumar, and Sparsh Mittal. Machine Learning-based model for Single Event Upset Current Prediction in 14nm FinFETs. In *Proceedings of IEEE International VLSI Design and Embedded Systems conference*, Hyderabad, India, 2023. [C16]Code.

Yash Khare, Kumud Lakara, Maruthi S Inukonda, Sparsh Mittal, Mahesh Chandra, and Arvind Kaushik. Design and Analysis of Novel Bit-flip Attacks and Defense Strategies for DNNs. In *Proceedings of 5th IEEE Conference on Dependable and Secure Computing (DSC)*, Edinburgh, UK, 2022. (acceptance rate 28 percent) pdf, Code [C17]⋆.

Yash Khare, Kumud Lakara, Sparsh Mittal, Arvind Kaushik, and Rekha Singhal. SpotOn: A Gradient-based Targeted Data Poisoning Attack on Deep Neural Networks. In *Proceedings of 24th International Symposium on Quality Electronic Design (ISQED)*, California, USA, 2023. Code [C18]⋆.

Sudhir Rai, Ashish Mittal, and Sparsh Mittal. A node-embedding features based machine-learning technique for dynamic malware detection. In *Proceedings of 5th IEEE Conference on Dependable and Secure Computing (DSC)*, Edinburgh, UK, 2022. (acceptance rate 28 percent) pdf [C19]⋆.

Maruthi S Inukonda, Atharva R Karpate, Vaibhav S Chauhan, Bheemarjuna Reddy Tamma, Sparsh Mittal, and Praveen Tammana. NASCENT: A Non-invasive Solution for Detecting Utilization of Servers in Bare-metal Cloud. *IEEE Access (Q2 journal)*, 2022. (impact factor 3.367) pdf, Code [J11].

Santanu Pattanayak, Subhrajit Nag, and Sparsh Mittal. CURATING: A Multi-Objective based Pruning Technique for CNNs. *Journal of Systems Architecture (Q1 journal)*, 116:102031, 2021. (impact factor 3.77) pdf [J12]⋆.

Nandan Kumar Jha and Sparsh Mittal. Modeling data reuse in deep neural networks by taking datatypes into cognizance. In *IEEE Transactions on Computers (Q2 journal)*, 2020. (impact factor 2.1) pdf [J13].

Nandan Kumar Jha, Sparsh Mittal, Binod Kumar, and G. Mattela. DeepPeep: Exploiting Design Ramifications to Decipher the Architecture of Compact DNNs. In *ACM Journal on Emerging Technologies in Computing Systems (Q3 journal)*, volume 17, pages 5:1–5:25, 2020. (impact factor 1.65) pdf [J14].

Nandan Kumar Jha, Shreyas Ravishankar, Sparsh Mittal, Arvind Kaushik, Dipan Mandal, and Mahesh Chandra. DRACO: Co-Optimizing Hardware Utilization, and Performance of DNNs on Systolic Accelerator. In *Proceedings of IEEE Computer Society Annual Symposium on VLSI (ISVLSI), Cyprus*, pages 574–579, 2020. [C20]pdf ⋆.

N. Jha, R. Saini, S. Nag, and S. Mittal. E2GC: Energy-efficient Group Convolution in Deep Neural Networks. *Proceedings of IEEE International Conference on VLSI Design (VLSID)*, pages 155–160, 2020. [C21]pdf, Trained model ⋆.

Sparsh Mittal, Poonam Rajput, and Sreenivas Subramoney. A Survey of Deep Learning on CPUs: Opportunities and Co-optimizations. *IEEE Transactions on Neural Networks and Learning Systems (Q1 journal)*, 2021. (impact factor 14.2) pdf [J15]⋆.

N. Jha, S. Mittal, and G. Mattela. The ramifications of making deep neural networks compact. In *Proceedings of IEEE International Conference on VLSI Design*, 2019. [C22]pdf ⋆.

Saksham Sharma, Vanshika V Bhargava, Aditya Singh, Kshitij Bhardwaj, and Sparsh Mittal. Leveraging Prediction Confidence For Versatile Optimizations to CNNs. In *Proceedings of International Conference on AI-ML Systems (AIMLSystems)*, Bengaluru, India, 2021. [C23]pdf ⋆.

Krishna Teja Chitty-Venkata, Sparsh Mittal, Murali Emani, Venkatram Vishwanath, and Arun K Somani. A survey of techniques for optimizing transformer inference. *Journal of Systems Architecture (Q1 journal)*, 2023. (impact factor 4.5) pdf [J16]⋆.

Dandpati Kumar Bhargav Achary, R Sai Chandra Teja, Sparsh Mittal, Biswabandan Panda, and C Krishna Mohan. Reverse Engineering Layer-profile of Deep Neural Networks using Hardware Performance Counters. In *Proceedings of International Conference on AI-ML Systems (AIMLSystems), India*, 2021. [C24]pdf, PMC traces ⋆.

Computer Architecture, VLSI, Electronics, Approximate Computing

Aaditi Kapre, Shruti Kunde, Sparsh Mittal, and Rekha Singhal. RAxC: Reflexivity-based Approximate Computing techniques for efficient remote sensing. In *IEEE International Conference on Big Data*, Sorrento, Italy, 2023. [C25].

Vishesh Mishra, Sparsh Mittal, Neelofar Hassan, Rekha Singhal, and Urbi Chatterjee. VADF: Versatile Approximate Data Formats for Energy-Efficient Computing. *ACM Transactions on Embedded Computing Systems (TECS) (Q3 journal)*, 2023. (Impact Factor 1.89) [J17]⋆.

Jens Domke, Emil Vatai, Balazs Gerofi, Yuetsu Kodama, Mohamed Wahib, Artur Podobas, Sparsh Mittal, Miquel Pericas, Lingqi Zhang, Peng Chen, Aleksandr Drozd, and Satoshi Matsuoka. At the Locus of Performance: A Case Study in Enhancing CPUs with Copious 3D-Stacked Cache. *ACM Transactions on Architecture and Code Optimization (TACO)*, 2023. (Impact Factor 1.6) PDF [J18].

Vishesh Mishra, Sparsh Mittal, Nirbhay Mishra, and Rekha Singhal. Security Implications of Approximation: A Study of Trojan Attacks on Approximate Adders and Multipliers. In *International Conference on VLSI Design (VLSID)*, 2024. [C26]⋆Best student paper award.

Vishesh Mishra, Sparsh Mittal, Rekha Singhal, and Manoj Nambiar. Novel, configurable approximate floating-point multipliers for error-resilient applications. In *Proceedings of 24th International Symposium on Quality Electronic Design (ISQED)*, California, USA, 2023. [C27]⋆.

Maruthi S Inukonda, Jatin S Tarachandani, Imtiaz Ahmed, Bheemarjuna Reddy Tamma, and Sparsh Mittal. ZETA: A Zero-Trust Security based Forensic-Ready Solution for Perimeter-less Enterprise Networks. In *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2023. [C28].

Vishesh Mishra, Sparsh Mittal, Saurabh Singh, Divy Pandey, and Rekha Singhal. MEGA-MAC: A Merged Accumulation based Approximate MAC Unit for Error Resilient Applications. In *Proceedings of 32nd ACM Great Lakes Symposium on VLSI (GLSVLSI)*, California, USA, 2022. [C29]pdf, Code ⋆.

Mubashir A Kharadi, Gul Faroz A Malik, and Sparsh Mittal. Electric field tunable spin polarization in functionalized silicene. *Physics Letters A (Q2 journal)*, 2022. (impact factor 2.654) pdf [J19]⋆.

Mubashir A Kharadi, Sparsh Mittal, and Jhuma Saha. Structural, electronic and optical properties of fluorinated bilayer silicene. *Optical Materials (Q2 journal)*, 136:113418, February 2023. (impact factor 3.754) [J20].

Mubashir Kharadi, Gul Faroz Ahmed Malik, and Sparsh Mittal. Temperature-dependent high magnetoresistance in zigzag silicene nanoribbon heterostructure. *IEEE Transactions on Electron Devices (Q2 journal)*, 2022. (impact factor 2.91) pdf [J21].

Gul Faroz A Malik, Mubashir A Kharadi, Farooq A Khanday, Khurshed A Shah, Sparsh Mittal, and Brajesh Kumar Kaushik. Dilute magnetic semiconductor electrode based magnetic tunnel junction for high temperature applications. *Physica B: Physics of Condensed Matter (Q3 journal)*, 2021. (impact factor 2.4) pdf [J22].

Mubashir A Kharadi, Gul Faroz A Malik, Farooq A Khanday, and Sparsh Mittal. Silicene based spin filter with high spin-polarization. *IEEE Transactions on Electron Devices (Q2 journal)*, 2021. (impact factor 2.91) pdf [J23]⋆.

Mubashir A Kharadi, Gul Faroz A Malik, Feroz A Najar, Farooq A Khanday, Khurshed A Shah, and Sparsh Mittal. First Principle Study of Fluorine Functionalized Germanene based Two Probe Device. *Physica B: Physics of Condensed Matter (Q3 journal)*, 620:413249, 2021. (impact factor 2.4) pdf [J24].

Arshid Nisar, Seema Dhull, Sparsh Mittal, and Brajesh Kumar Kaushik. SOT and STT Based 4-bit MRAM Cell for High-Density Memory Applications. *IEEE Transactions on Electron Devices (Q2 journal)*, 68(9):4384–4390, 2021. (impact factor 2.91) pdf [J25].

Sheel Sindhu Manohar, Sparsh Mittal, and Hemangee K Kapoor. CORIDOR: exploiting Coherence and temporal Read Intensity to mitigate read disurb error in STT-RAM based LLCs. *ACM Transactions on Embedded Computing Systems (TECS) (Special issue on Memory and Storage Systems for Embedded and IoT Applications) (Q3 journal)*, 2021. (impact factor 1.19) pdf [J26].

Arshid Nisar Laway, Seema Dhull, Brajesh K Kaushik, and Sparsh Mittal. High-Performance Voltage Controlled Multilevel MRAM Cell. *IOP Semiconductor Science and Technology (Q3 journal)*, 36(12):125013, 2021. (impact factor 2.35) pdf [J27].

Haonan Wang, Mohamed Ibrahim, Sparsh Mittal, and Adwait Jog. Address-Stride Assisted Approximate Load Value Prediction in GPUs. In *Proceedings of ACM International Conference on Supercomputing (ICS) (Core A rank conference)*, Phoenix, Arizona, USA, 2019. (acceptance rate = 23.3 percent) pdf [C30].

Sparsh Mittal et al. Architecting SOT-RAM Based GPU Register File. In *Proceedings of IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Germany, 2017. pdf [C31].

Rujia Wang, Sparsh Mittal, Youtao Zhang, and Jun Yang. Decongest: Accelerating Super-Dense PCM under Write Disturbance by Hot Page Remapping. *IEEE Computer Architecture Letters (Q3 journal)*, 2017. Mittal and Wang are co first-authors. (Impact Factor: 1.14) pdf [J28].

Lei Jiang, Sparsh Mittal, and Wujie Wen. Building a Fast and Power Efficient Inductive Charge Pump System for 3D Stacked Phase Change Memories. In *Proceedings of ACM Great Lakes Symposium on VLSI (GLSVLSI), Canada*, Canada, 2017. pdf [C32].

Sparsh Mittal, J. Vetter, and L. Jiang. Addressing Read-disturbance Issue in STT-RAM by Data Compression and Selective Duplication. *IEEE Computer Architecture Letters (Q3 journal)*, 2017. (Impact Factor: 1.14) pdf [J29].

Sparsh Mittal and J. Vetter. EqualWrites: Reducing Intra-set Write Variations for Enhancing Lifetime of Non-volatile Caches . *IEEE Transactions on VLSI Systems (Q2 journal)*, 24(1):103–114, 2016. (impact factor 1.14) pdf [J30].

Sparsh Mittal and Jeffrey Vetter. Reducing Soft-error Vulnerability of Caches using Data Compression. In *Proceedings of ACM Great Lakes Symposium on VLSI (GLSVLSI), USA*, pages 197–202, 2016. (acceptance rate 25 percent) pdf [C33].

Panruo Wu, Dong Li, Zizhong Chen, Jeffrey Vetter, and Sparsh Mittal. Algorithm-directed data placement in hybrid memory. In *Proceedings of ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC), (Core A rank conference)Japan*, 2016. (acceptance rate 15 percent) pdf [C34].

M. Poremba, Sparsh Mittal, Dong Li, J. Vetter, and Yuan Xie. DESTINY: A Tool for Modeling Emerging 3D NVM and eDRAM caches. In *Proceedings of Design Automation and Test in Europe (DATE)*, 2015. (M. Poremba and S. Mittal are co first-authors. Selected as interactive presentation.), pdf [C35].

Li Yu, Dong Li, Sparsh Mittal, and J. Vetter. Quantitatively modeling application resiliency with the data vulnerability factor. In *Proceedings of ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) (Core A rank conference)*, pages 695–706, 2014. (Acceptance rate 21 percent), **best student paper finalist** pdf [C36].

Guoliang Zhu, Kai Lu, P. Zhang, X. Wang, and Sparsh Mittal. Architecting NVM in Virtualized Memory Systems. In *Design Automation Conference (DAC) (work-in-progress)*, Texas, USA, 2017. [C37].

Sparsh Mittal, Haonan Wang, Adwait Jog, and Jeffrey Vetter. Design and Analysis of Soft-Error Resilience Mechanisms for GPU Register File. In *IEEE International Conference on VLSI Design (VLSID)*, 2017. (Acceptance Rate 24 percent) [C38].

Sparsh Mittal, R. Wang, and J. Vetter. DESTINY: A Comprehensive Tool with 3D and Multi-Level Cell Memory Modeling Capability. In *Journal of Low Power Electronics and Applications (JLPEA)*, 2017. pdf Code [J31]⋆.

Guoliang Zhu, Kai Lu, Xiaoping Wang, Yiming Zhang, Pengfei Zhang, and Sparsh Mittal. SwapX: An NVM-based hierarchical swapping framework. In *IEEE Access (Q2 journal)*, 2017. (Impact Factor: 3.244) pdf [J32].

Sparsh Mittal. A Survey of Techniques for Cache Partitioning in Multicore Processors. *ACM Computing Surveys*, 50(2), 2017. (impact factor 6.13) pdf [J33].

Sparsh Mittal and Jeffrey Vetter. A Survey of CPU-GPU Heterogeneous Computing Techniques. *ACM Computing Surveys*, 47(4):69:1–69:35, 2015. (impact factor 6.13) pdf [J34].

Sparsh Mittal and Jeffrey Vetter. AYUSH: Extending Lifetime of SRAM-NVM Way-based Hybrid Caches Using Wear-leveling. In *Proceedings of IEEE International Symposium on Modeling, Analysis, and Simulation On Computer and Telecommunication Systems (MASCOTS)*, 2015. (acceptance rate 24 percent) pdf [C39].

Sparsh Mittal and J. Vetter. AYUSH: A Technique for Extending Lifetime of SRAM-NVM Hybrid Caches. *IEEE Computer Architecture Letters (CAL)*, 2015. (impact factor 1.14) pdf [J35].

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Initiatives taken and contributions at IITR

My most unique contribution at IITR has been coming up with the idea of starting a center for offering degree programs on AI and DS. I did the early discussion work for this with multiple HODs and director (Prof Chaturvedi).

Due to above, I was made the convener of committee formed for initiating artificial intelligence (AI) and Data Science (DS) degree programs. This committee set the ground for creation of center for AI/DS and MTech programs in AI/DS.

Later, I was also involved in getting the financial support of Mehta Family for this center and then, this center was renamed to Mehta Family School of DS and AI (MFSDSAI).

I was involved in developing the curriculum of BTech in DS/AI degree offered by MFSDSAI. Right in its first year, this program has attracted top JEE rankers (500). Also, among the DS/AI BTech degrees offered by 8 IITs, our BTech program has attracted the topmost JEE rankers.

I played a major role in developing the proposal for "Sponsored, MTech in VLSI for working professionals" in ECE department, which has been approved by senate in Feb 2021. **This is the first-of-its-kind program in IIT Roorkee.**

Proposed the idea of making department-level profiles on Linkedin for publicity/announcements. This idea was shared with all the departments by the director.

Initiated development of online room-booking system for ECE building

Administrative responsibilities at IITR

TA allocation incharge, where I implemented director's idea of doing TA allocation at department level. This involves personally negotiating with all faculty and students to find a satisfactory mapping. This has helped especially new faculty, and this is done probably first time in IIT Roorkee.

Acted as judge in the startup expo 2022 and Smart Indian Hackathon 2022.

Member of ECE DAPC and institute ethics committee.

Member of computer center faculty-advisory committee and purchase committee

Convener of ECE department faculty-search committee

I am in-charge for converting a room in ECE building to the department server room

At IITH: CSE website incharge. Faculty adviser for MDS students batch. Accompanied students on a 10-day cultural tour to Japan as a faculty-supervisor.

Open-source datasets released

Medical datasets: COVID/pneumonia chest X-ray image dataset and Breast mammography images.

Students who have done SPARK internship under me at IIT Roorkee

Kumud Lakara, Manipal Academy of Higher Education, 2021

Sarvasv Arora, McGill Univ, Canada, May'21-July'21 (International student)

Yuval Kansal, UNSW, Australia, 2021 (International student)

Sarthak Narayan, NIT Trichy, 2020

Gaurav Jyakhwa, Pulchowk Campus (Nepal), 2022 (International student)

Student-guiding and awards/honors to my students

PhD students at IITR: Priyanshu Tyagi, Md Sarvar Ali, Cheena Singhal, Aabid Amin Fida, Sonali Gangwar, Hina Khan

MTech students: Prahlad, Rajkumar Das, Aditi Dalakoti, Dhayan Dhananjaya Senanayake, Vipul Agrawal, Vivek Kumar Kharya

PhD Alumni: Subhrajit Nag (viva-voce completed, thesis submitted on Aug'22), Maruthi S. Inukonda (Pre-synopsis done. Viva-voce on 7th March 2024)

MTech Alumni: Dinesh Buswala, Rajat Saini, Poonam Rajput, Nandan Jha, Satanu Pattanayak, Srinivas Reddy, Pankaj Berule, Vibhu, Priyansh Singh, Krishna Chaitanya.

Graduate interns guided: Matt Poremba (Penn State University), Rujia Wang (University of Pittsburgh) and Seonglyong Gong (University of Texas, Austin).

Undergraduate interns (with whom I have published at least one paper): Phani Jayanth (IIT Madras), SB Abhinaya (NIT Trichy), Shreyas (BITS, Hyd), Sumanth (IIT Jodhpur), Shraiysh V. (IITH), Sarthak Narayan (NIT Trichy), Himanshi (NIT Trichy), Sai Harsh (IITH), Kakul (AMU), Srishti (IIT Dharwad), Yash Khandelwal (BITS), Saksham Sharma (IITR), Vishu Saxena (IITR), Yash Khare (Amrita Vishwavidyapeetham), Kumud Lakara (Manipal Inst of Tech), Atharva (SRCOEM), Gayatri and Onkar (VIIT, Pune), Dhruv Makwana (GTU), Ananya Mantravadi (IIIT Raichur).

Awards/internships to my students: Kumud Lakara (UG intern in our lab) was selected as one among the 9 interns selected as the best by the SPARK committee (IIT Roorkee) in year 2021. Maruthi received Best Cloud Innovator of the Year 2021 in Cloud Management from Cloud Computing Innovation Council of India. Subhrajit selected for IITH-Swinburne joint PhD program, Nandan got VLSID fellowship 2019. Irfan and Chander Shekhar: summer internship in Japan under Sakura Science Plan 2018 and 2019, respectively. Poonam: internship at Fujitsu, Japan (2019). Shraiysh: internship at NTT-AT, Japan (2019).

Courses Taught

Executive Courses: Accelerators for Deep Learning (Cloudx), Accelerators for AI (Coursera), Computer Architecture for AI (short-term course to Qualcomm), RISC-V Assembly Language Programming (short-term course to Qualcomm), etc.

Computer architecture (2016 to 2022) (largest class strength: 121)

Hardware architectures for deep learning 2019, 2021, 2022 (class strength: 70)

Advanced Computer Architecture (2017-2018) (largest class strength: 55)

Advanced memory system architecture (2016) (class strength: 12)

Computer vision (2022) [jointly with other faculty]

Scaling to Big Data (2018) [jointly with other faculty]

Operating system (2017-2019) [jointly with other faculty]

Computers and network security (2018-2019) [jointly with other faculty]

Professional Activity and Outreach

IEEE Senior member

Reviewed proposals for three European research-funding agencies (France, Switzerland and Austria).

TPC member of: VLSID 2020, IPDPS 2022, ICPP 2022, NAS 2022, SC 2023, WACV 2024, CCGrid 2024.

Reviewed MS or PhD thesis of students from IIT Kanpur, IIT Madras and IIIT Hyderabad.

Acted as judge in the startup expo 2022, Smart Indian Hackathon 2022, Defence India Startup Challenges Disc X 2024.

Reviwer for ACM: Computing Surveys (3 times), TACO (2 times), JETC. Reviwer for IEEE: Trans. on AI, CAL (3 times), Trans. on VLSI, Intelligent Systems, ISVLSI, JETCAS, Trans. on Computers (TC), TCAD, HiPC student research symposium. Reviewer for Elsevier: SUSCOM. Reviwer for Springer: Cluster Computing, J. of Supercomputing, Springer book High Performance Computing in Power and Energy Systems. Reviwer for IET CDT, MDPI Sustainability, Concurrency and computation (2 times)

I have given many lectures in the workshops held by TEQIP and TLC (teaching learning center) at IIT Hyderabad. More than 300 faculty members from various colleges of India have attended and benefitted from these workshops.

My talks on research-paper writing and presentations have been attended by 1000+ people (including IITR/IITH/IITM students and govt college faculty members)

Taught in computer architecture winter school organized by National Supercomputing mission.

Taught in NCERT-IITR Nurturance Programme for National Talent Search (NTS) Awardees 2022

Taught in PG Certificate program in VLSI at Coursera platform.

Taught a short-term course on RISC-V Assembly Language Programming 2023.

I have given an 8-hour training session to Qualcomm employees three times.

Guidance and mentoring of the students during their visit to IIT Hyderabad under Ishan Vikas Programme initiated by Ministry of Human Resource Development, Govt. of India