Sandeepa Bhuyan

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Research Interests

SoC Architecture, Accelerators, Energy-efficient Mobile/XR/IoT platforms

Education

The Pennsylvania State University — University Park, PA, USA
Ph.D. in Computer Science and Engineering. — *Fall 2019 - Present*
Advisors: Dr. Chita R. Das & Dr. Mahmut T. Kandemir

The Pennsylvania State University — University Park, PA, USA
M.S. in Computer Science and Engineering. (Converted to Ph.D.) — *Fall 2016 - Fall 2019*

National Institute of Technology Rourkela — Rourkela, India
B.Tech. in Electronics and Instrumentation Engineering. — *Fall 2009 - Spring 2013*

Work Experience

Research Assistant — August 2018 – Present
The Pennsylvania State University — *University Park, PA*
Working on the architectural and application-level optimizations for improving the execution times as well as addressing energy-efficiency concerns in the mobile/handheld systems.

- GemDroid Simulator: Adding accurate IP models to the existing GemDroid Framework (trace-driven cycle accurate SoC simulator), upgrading the GemDroid front-end QEMU emulator for IP, memory and system interactions' trace collection and modifying the gem5-based backend for the trace execution.
- 5G Applications: Identifying and optimizing the performance and energy bottlenecks of the emerging 5G applications such as Game Streaming, 4K UHD Video Streaming on mobile devices.
- VR/AR Applications: Reducing the energy consumption of the 360° VR video streaming application pipeline by exploiting spatial and temporal opportunities to reduce GPU computations.
- IoT Applications: Improving the energy-efficiency of the IoT hubs through dynamic task partitioning, batch sensing and kernel bypassing schemes.

Co-op Engineer — Feb 2022 – May 2022
AMD Research — *Remote*
Identified bottleneck in AOCC (AMD Optimized C/C++ Compiler) generated code (for multi-dimensional tensor multiplication) and proposed a solution for significant speedup.

Deployment and Integration Engineer — September 2013 – June 2016
Ericsson India Global Services Pvt. Ltd. — *Kolkata, India*

- Responsibilities included remote setup & activation of the LTE base stations, software releases implementation on LTE network core backend, network performance audits and feature planning.
- Received several appreciation awards from AT&T and Sprint for 2 consecutive years.

Publications

[Under Preparation]"Enabling Neural-augmented Game Streaming on Mobile Platforms."

[Under Submission]"EdgePC: Efficient Deep Learning Analytics for Point Clouds on Edge Devices."

[MICRO 2022] Ziyu Ying, Shulin Zhao, **Sandeepa Bhuyan**, Cyan S. Mishra, Mahmut Kandemir, Chita R. Das. "**Pushing Point Cloud Compression to the Edge.**", In Proceedings of the 55th Annual International Symposium on Microarchitecture.

[ICDCS 2022] Ziyu Ying, Shulin Zhao, Haibo Zhang, Cyan S. Mishra, **Sandeepa Bhuyan**, Mahmut Kandemir, Anand Sivasubramaniam, Chita R. Das. "**Exploiting Frame Similarity for Efficient Inference on Edge Devices**", In Proceedings of the 42nd International Conference on Distributed Computing Systems.

[SIGMETRICS 2022] **Sandeepa Bhuyan**, Shulin Zhao, Ziyu Ying, Mahmut Kandemir, Chita R. Das. "**End-to-end Characterization of Game Streaming Applications on Mobile Platforms.**", In Proceedings of the 2022 ACM SIGMETRICS/International Conference on Measurement and Modeling of Computer Systems.

[MICRO 2021] Shulin Zhao, Haibo Zhang, Cyan S. Mishra, **Sandeepa Bhuyan**, Ziyu Ying, Mahmut Kandemir, Anand Sivasubramaniam, Chita R. Das. "**HoloAR: On-the-fly Optimization of 3D Holographic Processing for Augmented Reality**", In Proceedings of the 54th Annual International Symposium on Microarchitecture.

[ISCA 2020] Shulin Zhao, Haibo Zhang, **Sandeepa Bhuyan**, Cyan S. Mishra, Ziyu Ying, Mahmut Kandemir, Anand Sivasubramaniam, Chita R. Das. "**Deja View: Spatio-Temporal Compute Reuse for Energy-Efficient 360-degree VR Video Streaming**", In Proceedings of the 47th International Symposium on Computer Architecture.

[ICDCS 2019] Shulin Zhao, Prasanna V. Rengasamy, Haibo Zhang, **Sandeepa Bhuyan**, Nachiappan C. Nachiappan, Anand Sivasubramaniam, Mahmut Kandemir, Chita R. Das. "**Understanding Energy Efficiency in IoT App Executions**", In Proceedings of the 39th International Conference on Distributed Computing Systems.

Technical Skills

Languages: Python, C/C++, Java, Bash, MATLAB, Verilog, LaTEX
Developer Tools: Git, Docker, VS Code, Android Studio, VIM, TensorFlow, PyTorch
Platforms: Linux, Windows, Android, NVIDIA Jetson, Raspberry Pi

Teaching Experience

Teaching Assistant

The Pennsylvania State University — *University Park, PA, USA*

CMPEN 270, Digital Design: Theory and Practice	*Spring 2018*
CMPEN 472, Microprocessors & Embedded Systems	*Fall 2017*
CMPSC 200, Programming for Engineers with MATLAB	*Spring 2017*

Academic Experience

Course Work

- Operating Systems, Computer Architecture, Compiler Construction, Computer Vision, Wireless and IoT Mobile Sensing

Course Projects

- **Memory Allocator**: Designed & implemented buddy and slab policies based memory allocation schemes.
- **Virtual Memory Paging**: Designed & implemented FIFO and Third Chance page replacement algorithms.
- **Parallel File System**: Designed & implemented sequentially consistent parallel file system with server-client RPC mechanism as well as LRU client cache replacement policy.
- **Multi-threaded synchronization**: Designed & implemented thread-level synchronization mechanisms for the Readers-Writers, Bounded buffer and Child Care problems using path expression.
- **Multi-thread scheduler**: Designed & implemented FCFS, SRTF and PBS multi-thread schedulers.
- **Object Tracking**: Implemented CFNet (Siamese-based CNN) for object tracking on embedded platforms.

Honors and Awards

Awards and Achievements

- Awarded Star Performer, ACE, PAT awards for outstanding performance in the team in 2014 and 2015 at Ericsson.
- Ranked 3^{rd} in my undergraduate major at NIT Rourkela in 2013.
- Selected as a Research Fellow by Indian Academy of Sciences (IAS) under the Summer Research Fellowship Program (SRFP) in 2012.

Student Travel Grant

- ACM Travel Grant for MICRO 2022, NSF Travel Grant for NAS 2021, IEEE Travel Grant for ICDCS 2019

Services and Memberships

- On-behalf Reviewer for ICCD, HPCA, MICRO
- IEEE Student Member