Ashutosh Pattnaik

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RESEARCH INTERESTS

GPU Architectures, Computer Graphics, Near-Data Computing, Machine Learning Architectures

EDUCATION

Doctor of Philosophy in Computer Science and Engineering   Fall 2013 - Fall 2019
Pennsylvania State University, University Park, PA

Bachelor of Technology (Honors) in Electronics and Instrumentation Engineering   Fall 2009 - Spring 2013
National Institute of Technology, Rourkela, India

WORK EXPERIENCE

Senior GPU Architect, Arm   **September 2019 - Present**
Austin, TX
• Working on the architecture design and optimization of the Arm Mali GPU to improve performance, power and area.

Research Assistant, Pennsylvania State University   Fall 2013 - Fall 2019
University Park, PA
• Understanding research issues and opportunities involved in bringing near-data computing paradigm to GPUs and CPU-GPU systems and optimizing the compute placement for improved performance and energy efficiency.
• Improving the GPU datapath for improved execution of irregular applications and machine learning applications.

Co-Op Engineer, AMD Research   May 2016 - August 2016
Sunnyvale, CA
• Researched on efficient interconnect topologies and data placement techniques for a 3D-stacked processing-in-memory enabled, multi-chip module based architecture.

Co-Op Engineer, AMD Research   June 2015 - September 2015
Austin, TX
• Developed methodology and micro-benchmarks to perform detailed characterization of the energy usage of different ISA instructions and data movement in AMD GPUs.

PUBLICATIONS

[**ISCA 2020**] Sonali Singh, Anup Sarma, Nicholas Jao, **Ashutosh Pattnaik**, Sen Lu, Kezhou Yang, Abhronil Sengupta, Vijaykrishnan Narayanan, Chita Das, "**NEBULA: A Neuromorphic Spin-Based Ultra-Low Power Architecture for SNNs and ANNs**",In the Proceedings of the 47th International Symposium on Computer Architecture, Worldwide Event, June 2020.

[**MICRO 2019**] Haibo Zhang, Shulin Zhao, **Ashutosh Pattnaik**, Mahmut T. Kandemir, Anand Sivasubramaniam and Chita R. Das, "**Distilling the Essence of Raw Video to Reduce Memory Usage and Energy at Edge Devices**", In the Proceedings of the 52nd International Symposium on Microarchitecture, Columbus, Ohio, October 2019. *Acceptance Rate ≈ 23%*

[**ISCA 2019**] **Ashutosh Pattnaik**, Xulong Tang, Onur Kayiran, Adwait Jog, Asit Mishra, Mahmut T. Kandemir, Anand Sivasubramaniam and Chita R. Das, "**Opportunistic Computing in GPU Architecture**", In the Proceedings of the 46th International Symposium on Computer Architecture, Phoenix, Arizona, June 2019. *Acceptance Rate ≈ 17%*

[**MEMSYS 2019**] Anup Sarma, Huaipan Jiang, **Ashutosh Pattnaik**, Jagadish Kotra, Mahmut T. Kandemir, Chita R. Das, "**CASH: Improving DRAM Energy Efficiency in CPU-based Inference**", In the Proceedings of the 5th International Symposium on Memory Systems, Washington D.C., October 2019.

[**SIGMETRICS 2019**] Xulong Tang, <u>**Ashutosh Pattnaik**</u>, Onur Kayiran, Adwait Jog, Mahmut T. Kandemir and Chita R. Das, "**Quantifying Data Locality in Dynamic Parallelism in GPUs**", In the Proceedings of the ACM on Measurement and Analysis of Computing Systems, Phoenix, Arizona, June 2019. *Acceptance Rate ≈ 8%*

[**HPCA 2017**] Xulong Tang, <u>**Ashutosh Pattnaik**</u>, Huaipan Jiang, Onur Kayiran, Adwait Jog, Sreepathi Pai, Mohamed Ibrahim, Mahmut T. Kandemir and Chita R. Das, "**Controlled Kernel Launch for Dynamic Parallelism in GPUs**" In the Proceedings of the 23rd International Symposium on High Performance Computer Architecture, Austin, Texas, February 2017. *Acceptance Rate ≈ 22%*

[**PACT 2016**] <u>**Ashutosh Pattnaik**</u>, Xulong Tang, Adwait Jog, Onur Kayiran, Asit Mishra, Mahmut Kandemir, Onur Mutlu and Chita Das, "**Scheduling Techniques for GPU Architectures with Processing-In-Memory Capabilities**" In the Proceedings of the 25th Parallel Architecture and Compilation Techniques, Haifa, Israel, September 2016. *Acceptance Rate ≈ 22.3%*

[**PACT 2016**] Onur Kayiran, Adwait Jog, <u>**Ashutosh Pattnaik**</u>, Rachata Ausavarungnirun, Xulong Tang, Mahmut Kandemir, Gabriel Loh, Onur Mutlu and Chita Das, "**µC-States: Fine-grained GPU Datapath Power Management**" In the Proceedings of the 25th Parallel Architecture and Compilation Techniques, Haifa, Israel, September 2016. *Acceptance Rate ≈ 22.3%*

[**IISWC 2016**] Vignesh Adhinarayanan, Indrani Paul, Joseph Greathouse, Wei N. Huang, <u>**Ashutosh Pattnaik**</u> and Wu-chun Feng, "**Measuring and Modeling On-Chip Interconnect Power on Real Hardware**", In the Proceedings of IEEE International Symposium on Workload Characterization, Providence, Rhode Island, 2016. **(Best Paper Award)** . *Acceptance Rate ≈ 30.4%*

[**SIGMETRICS 2016**] Adwait Jog, Onur Kayiran, <u>**Ashutosh Pattnaik**</u>, Mahmut Kandemir, Onur Mutlu, Ravi Iyer and Chita Das, "**Exploiting Core-Criticality for Enhanced Performance in GPUs**", In the Proceedings of the 42nd ACM International Conference on Measurement and Modeling of Computer Systems, Antibes Juan-les-Pins, France, June 2016. *Acceptance Rate ≈ 13.4%*

[**MEMSYS 2015**] Adwait Jog, Onur Kayiran, Tuba Kesten, <u>**Ashutosh Pattnaik**</u>, Evgeny Bolotin, Nilardish Chatterjee, Steve Keckler, Mahmut Kandemir and Chita Das, "**Anatomy of GPU Memory System for Multi-Application Execution**", In the Proceedings of the 1st International Symposium on Memory Systems, Washington D.C., October 2015.

[**ICCCS 2012**] <u>**Ashutosh Pattnaik**</u>, Sharad Agarwal, Subhasis Chand, "**A New and Efficient Method for Removal of High Density Salt and Pepper Noise Through Cascade Decision based Filtering Algorithm**", In the Proceedings of the 2nd International Conference on Communication, Computing & Security, India, 2012.

TEACHING EXPERIENCE

Teaching Assistant, Penn State Spring 2014
CMPEN 431, Introduction to Computer Architecture

Teaching Assistant, Penn State Fall 2013
CMPEN 270, Digital Design: Theory and Practice

Guest Lecturer, Penn State
CSE 597: Advances and Applications in Deep Learning (Spring 2017)
CSE 532: Multiprocessor Architecture (Spring 2015)
CMPEN 431: Introduction to Computer Architecture (Fall 2017, Spring 2018)
CMPEN 331: Computer Organization And Design (Spring 2015)

TALKS

- Be(-A)ware of Data Movement: Optimizing Throughput Processors for Efficient Computations
  Qualcomm, San Diego, CA, USA, July 2019

- Opportunistic Computing in GPU Architecture
  ISCA 2019, Phoenix, AZ, USA, June 2019

- Quantifying Data Locality in Dynamic Parallelism in GPUs
  SIGMETRICS 2019, Phoenix, AZ, USA, June 2019

- Be(-A)ware of Data Movement: Optimizing Throughput Processors for Efficient Computations
  Advanced Micro Devices (AMD) Research, Austin, TX, USA, March 2019

- Scheduling Techniques for GPU Architectures with Processing-In-Memory Capabilities
  PACT 2016, Haifa, Israel, September 2016

- μC-States: Fine-grained GPU Datapath Power Management
  PACT 2016, Haifa, Israel, September 2016

- Exploiting Core-Criticality for Enhanced Performance in GPUs
  SIGMETRICS 2016, Antibes Juan-les-Pins, France, June 2016

- A New and Efficient Method for Removal of High Density Salt and Pepper Noise Through Cascade Decision based Filtering Algorithm
  ICCCS 2012, India, October 2012

HONORS AND AWARDS

Best Paper Award:
- Measuring and Modeling On-Chip Interconnect Power on Real Hardware, IISWC 2016

Student Travel Grant:
- 2019: IEEE Travel Grant for ISCA, NSF Travel Grant for SIGMETRICS
- 2017: IEEE Travel Grant for HPCA, ACM SIGARCH Travel Grant for ISCA
- 2016: ACM SIGMETRICS Travel Grant, NSF Travel Grant for PACT
- 2015: ACM SIGARCH Travel Grant for ISCA

SERVICE AND MEMBERSHIPS

Session Chair: GPUs, IEEE International Symposium on High-Performance Computer Architecture (HPCA), San Diego, CA, Feb, 2020
External Review Committee Member, IEEE International Symposium on High-Performance Computer Architecture (HPCA), San Diego, CA, Feb, 2020
General Co-Chair, Workshop on General Purpose Processing Using GPU (GPGPU), San Diego, CA, Feb, 2020
Submission/Web Chair, Workshop on General Purpose Processing Using GPU (GPGPU), Providence, RI, April 2019
Submission Chair, International Conference on Supercomputing (ICS), Turkey, June 2016
Reviewer:
- Transactions on Cloud Computing, IEEE
- Transactions on Parallel and Distributed Systems, IEEE
- IEEE Transactions on Architecture and Code Optimization (TACO)
- IEEE Transactions on Computers (TC)
- IEEE Micro
- Microprocessors and Microsystems: Embedded Hardware Design, Elsevier
- ETRI Journal, Wiley

Memberships:
- ACM Professional, IEEE Young Professional, SIGARCH, IEEE Computer Society

REFERENCES

References are available on request.