

# Ashutosh Pattnaik

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## RESEARCH INTERESTS

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GPU Architectures, CPU-GPU Architectures, Near-Data Computing, Machine Learning Architectures

## EDUCATION

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**Pennsylvania State University, University Park, PA**

*Ph.D. Candidate* in Computer Science and Engineering,

Advisor: Dr. Chita R. Das

Current GPA: 3.82/4.0

Fall 2013 - Present  
Expected Graduation: August 2019

**National Institute of Technology, Rourkela, India**

*Bachelor of Technology (Honors)* in Electronics and Instrumentation Engineering,

GPA: 9.24/10.0 (Junior and Senior GPA: 9.77/10.0)

Fall 2009 - Spring 2013

## WORK EXPERIENCE

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**Pennsylvania State University, Research Assistant**

*High Performance Computing Lab (HPCL)*

Fall 2013 - Present

- 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.

**AMD Research, Co-Op Engineer**

*Mentors: Nuwan Jayasena, Yasuko Eckert      Manager: John Keaty*

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.

**AMD Research, Co-Op Engineer**

*Mentor: Joseph Greathouse      Manager: John Keaty*

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

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[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  $\approx 23\%$*

[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  $\approx 17\%$*

[SIGMETRICS 2019] Xulong Tang, Ashutosh Pattnaik, 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  $\approx 8\%$*

[HPCA 2017] Xulong Tang, Ashutosh Pattnaik, 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  $\approx 22\%$*

[PACT 2016] Ashutosh Pattnaik, 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  $\approx 22.3\%$*

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

[IISWC 2016] Vignesh Adhinarayanan, Indrani Paul, Joseph Greathouse, Wei N. Huang, Ashutosh Pattnaik and Wuchun 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  $\approx 30.4\%$*

[SIGMETRICS 2016] Adwait Jog, Onur Kayiran, Ashutosh Pattnaik, 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  $\approx 13.4\%$*

[MEMSYS 2015] Adwait Jog, Onur Kayiran, Tuba Kesten, Ashutosh Pattnaik, 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] Ashutosh Pattnaik, 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

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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

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

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### 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

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**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
- Microprocessors and Microsystems: Embedded Hardware Design, Elsevier
- ETRI Journal, Wiley

### On-Behalf Reviewer:

- 2019: HPCA, ISCA, MICRO
- 2018: ASPLOS, HPCA, CF, TC
- 2017: MICRO, ASPLOS, TACO, IPDPS, NPC,
- 2016: ISCA, MICRO, ICCD
- 2015: PPOPP, HPCA, IGSC

### Student Member:

- ACM, IEEE, SIGARCH, SIGMETRICS, IEEE Computer Society

## REFERENCES

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Chita R. Das  
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Department of Computer Science & Engineering  
Penn State University  
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Mahmut T. Kandemir  
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