

Snehasish Kumar

Research Interests

- Scalable compiler directed workload analysis
- Hardware software co-design for specialized architectures
- Core micro-architecture with a focus on the cache memory hierarchy

Academic

05/13 – 11/16 **PhD in Computing Science**, *Simon Fraser University*, British Columbia, Canada, 4.0/4.0.

Supervisor: Dr. Arrvindh Shriraman

- Adapted program analysis techniques to understand what to specialize in a workload.
- Designed an abstraction for partial specialization of workloads.
- Implemented automated, scalable characterization and program transformation tools in LLVM.
- Designed and evaluated a hybrid coherence protocol for accelerator rich architectures.
- Designed and evaluated a hardware accelerator for software data structures.

Publications: **HPCA'17, IISWC'16, MICRO'16, ICS'16, ISCA'15, ICS'15**

01/11 – 04/13 **MSc in Computing Science**, *Simon Fraser University*, British Columbia, Canada, 3.8/4.0.

Supervisor: Dr. Arrvindh Shriraman

- Designed and evaluated a variable granularity cache memory system.
- Evaluated a variable granularity coherence protocol for multiprocessor systems.

Publications: **ISCA'13, MICRO'12**

08/06 – 04/10 **B. Tech in Computer Engineering**, *Biju Patnaik University of Technology*, Orissa, India, 8.3/10.0.

Supervisor: Dr. Satyananda Champati Rai

Publications

- 2017 – **Needle: Leveraging program analysis to extract accelerators from whole programs**, Snehasish Kumar, Nick Sumner, Vijayalakshmi Srinivasan, Steve Margerm, and Arrvindh Shriraman, *23rd ACM International Conference on High Performance Computer Architecture*, HPCA '17. Acceptance Rate $\approx 22\%$.
- 2016 – **ChainSaw: Creating Von-Neumann Accelerators with Fused Instruction Chains**, Amirali Sharifian, Snehasish Kumar, Apala Guha, and Arrvindh Shriraman, *49th Annual IEEE/ACM International Symposium on Microarchitecture*, MICRO '16. Acceptance Rate $\approx 22\%$.
- **SPEC-AX: Extracting Accelerator Benchmarks from Microprocessor Benchmarks**, Snehasish Kumar, Nick Sumner, and Arrvindh Shriraman, *2016 IEEE International Symposium on Workload Characterization*, IISWC '16. Acceptance Rate $\approx 30\%$.
- **Peruse and Profit: Estimating the Accelerability of Loops**, Snehasish Kumar, Vijayalakshmi Srinivasan, Amirali Sharifian, Nick Sumner, and Arrvindh Shriraman, *30th ACM International Conference on Supercomputing*, ICS '16. Acceptance Rate $\approx 24\%$.
- 2015 – **Fusion: Design Tradeoffs in Coherent Cache Hierarchies for Accelerators**, Snehasish Kumar, Arrvindh Shriraman, and Naveen Vedula, *42nd Annual International Symposium on Computer Architecture*, ISCA '15. Acceptance Rate $\approx 19\%$.

– **DASX: Hardware Accelerator for Software Data Structures**,
Snehasish Kumar, Naveen Vedula, Arrvindh Shriraman, and Vijayalakshmi Srinivasan,
29th ACM International Conference on Supercomputing, ICS '15.
Acceptance Rate \approx 25%.

2013 – **Protozoa: Adaptive Granularity Cache Coherence**,
Hongzhou Zhao, Arrvindh Shriraman, Snehasish Kumar, and Sandhya Dwarkadas,
40th Annual International Symposium on Computer Architecture, ISCA '13.
Acceptance Rate \approx 19%.

2012 – **Amoeba-Cache: Adaptive Blocks for Eliminating Waste in the Memory Hierarchy**,
Snehasish Kumar, Hongzhou Zhao, Arrvindh Shriraman, E. Matthews, S. Dwarkadas, and L. Shannon,
45th Annual IEEE/ACM International Symposium on Microarchitecture, MICRO '12.
Acceptance Rate \approx 18%.

Workshops

- 03/16 GCASR'16 – Statistical program analysis assisted cost-effective sampling in large scale scientific simulations
- 06/15 SFU-ZU workshop on Big Data – Data Structure Accelerators
- 12/13, 08/14 WoNDP'13, PACT'14 – SQRL: Hardware Accelerator for Collecting Software Data Structures

Invited Talks

- 06/16 IBM Research – Needle [HPCA '17]
- 01/16 SRC India Design Review – Caches [MICRO '12, ISCA '15]
- 01/16 Intel Bangalore – Fusion [ISCA '15]

Professional and Academic Experience

- 01/17 – Postdoctoral Researcher: Simon Fraser University
- 06/13 – 12/13 Research Intern: Systems Technology and Architecture
IBM, T.J. Watson Research Centre
- '11 – '16 Research Assistant: Simon Fraser University
- '11, '13 Teaching Assistant: Parallel Computer Architecture (Graduate), Operating Systems

Awards

- 08/16 President's PhD Scholarship, Simon Fraser University
- '16, '14, '12 Graduate Fellowship, Simon Fraser University
- 01/14 Special Graduate Entrance Scholarship, Simon Fraser University

Projects

- 01/15 Networks: Parallel implementation of Kou, Markowsky and Berman (1981) algorithm
- 04/14 Natural Language Processing: Optimizing the Bitpar CKY parser
- 12/11 Computational Geometry: Interactive demo for the Linear Cell Complex (CGAL)
- 04/11 Machine Learning: Non-Negative Matrix Factorisation for large datasets

References

- Dr. Arrvindh Shriraman, Simon Fraser University – (ashriram@cs.sfu.ca)
- Dr. William N. Sumner, Simon Fraser University – (wsumner@cs.sfu.ca)
- Dr. Viji Srinivasan, IBM Research – (viji@us.ibm.com)