Curriculum Vitae

Shoaib Akram
Australian National University
Shoaib.Akram@anu.edu.au
https://shbakram.github.io

Education

Ph.D. Computer Science Engineering, Ghent University, 2019.
Advisor: Lieven Eeckhout (ACM Fellow)
Thesis Topic: Exploiting Managed Language Semantics to Optimize for Hardware Heterogeneity

M.S. Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, 2009.
Advisor: Deming Chen (IEEE Fellow)
Thesis Topic: Workload Adaptive Shared Memory Multicore Processors with Reconfigurable Interconnects

B.Sc. Electrical Engineering, University of Engineering & Technology, Lahore, Pakistan, 2006.
Advisor: Shahid H. Bokhari (ACM Fellow)
Thesis Topic: Implementation of Suffix Trees on FPGAs

Research Interests

Computer architecture; Memory and storage systems; Performance analysis

Employment

January 2020 - Current
Lecturer at The Australian National University

July 2019 - December 2019
Post-doctoral Researcher at PerfLab - Ghent University

July 2012 - June 2019
Ph.D. student at PerfLab - Ghent University
Research Focus: Computer architecture, runtime systems, memory management

March 2010 - June 2012
Junior Researcher at FORTH-ICS, Greece (with Angelos Bilas)
Research Focus: Storage systems

March 2006 - May 2007
Research Associate, Al-Khwarizmi Institute of Computer Science (KICS), Lahore

Memberships

- Professional Member, Association for Computing Machinery (ACM)

Refereed Publications

Journals

1. A. Hasnat, **S. Akram**, "SPIRIT: Scalable and Persistent In-Memory Indices for Real-Time Search," ACM Transactions on Architecture and Code Optimization (TACO), 2025.

2. I. Kolokasis, G. Evdorou, **S. Akram**, A. Papagiannis, F. Zakkak, C. Kozanitis, P. Pratikakis, A. Bilas, "TeraHeap: Exploiting Flash Storage for Mitigating DRAM Pressure in Managed Big Data Frameworks," ACM Transactions on Programming Languages and Systems (TOPLAS), 2025.

3. W. Liu, W. Heirman, S. Eyerman, **S. Akram**, and L. Eeckhout, "Scale-Model Simulation," IEEE Computer Architecture Letters (CAL), 2021.

4. **S. Akram**, "Performance Evaluation of Intel Optane Memory for Managed Workloads," ACM Transactions on Architecture and Code Optimization (TACO), 2021.

5. W. Liu, **S. Akram**, and L. Eeckhout, "Reliability-Aware Garbage Collection for Hybrid DRAM-HBM Memories," ACM Transactions on Architecture and Code Optimization (TACO), 2021.

6. S. Pestel, S. Steen, **S. Akram**, and L. Eeckhout, "RPPM: Rapid Performance Prediction of Multithreaded Applications on Multicore Hardware," IEEE Computer Architecture Letters (CAL), 2018.

7. **S. Akram**, J. Sartor, and L. Eeckhout, "DEP+BURST: Online DVFS Performance Prediction for Energy-Efficient Managed Language Execution," IEEE Transactions on Computers (TC), 2017.

8. **S. Akram**, J. Sartor, K. Van Craeynest, W. Heirman, and L. Eeckhout, "Boosting the Priority of Garbage: Scheduling Collection on Heterogeneous Multicore Processors," ACM Transactions on Architecture and Code Optimization (TACO), 2016.

9. **S. Akram**, A. Papakonstantinou, R. Kumar, D. Chen, "S. Akram, A. Papakonstantinou, R. Kumar, D. Chen, "A Workload-adaptive and Reconfigurable Bus Architecture for Multicore Processors," International Journal of Reconfigurable Computing (IJRC), 2010.

Conferences

1. Aditya Chilukuri and **Shoaib Akram**, "Analyzing and Improving the Scalability of In-Memory Indices for Managed Search Engines," ACM SIGPLAN International Symposium on Memory Management (ISMM), 2023. Acceptance Rate: 13/25
   $\longrightarrow$ ***Best Paper Candidate***

2. I. Kolokasis, G. Evdorou, **S. Akram**, A. Papagiannis, F. Zakkak, C. Kozanitis, P. Pratikakis, A. Bilas, "TeraHeap: Reducing Memory Pressure in Managed Big Data Frameworks," Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2023. Acceptance Rate: 128/598

3. W. Liu, W. Heirman, S. Eyerman, **S. Akram**, and L. Eeckhout, "Scale-Model Architectural Simulation," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), 2022. Acceptance Rate: 24/83

4. **S. Akram**, “Exploiting Intel Optane Persistent Memory for Full Text Search," ACM SIGPLAN International Symposium on Memory Management (ISMM), 2021. Acceptance Rate: 8/14

5. S. Pestel, S. Steen, **S. Akram**, and L. Eeckhout, “RPPM: Rapid Performance Prediction of Multithreaded Workloads on Multicore Processors," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), 2019. Acceptance Rate: 26/88

6. **S. Akram**, J. Sartor, K. McKinley and L. Eeckhout, “Emulating and Evaluating Hybrid Memory for Managed Languages on NUMA Hardware," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), 2019. Acceptance Rate: 26/88

7. **S. Akram**, J. Sartor, K. McKinley and L. Eeckhout, “Crystal Gazer: A Profile-Driven Garbage Collector to Manage Hybrid Memories," ACM International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS), 2019. Acceptance Rate: 50/317

8. **S. Akram**, J. Sartor, K. McKinley and L. Eeckhout, “Write-Rationing Garbage Collection for Hybrid Memories," ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2018. Acceptance Rate: 55/245
   $\longrightarrow$ ***NVMW Memorable Paper Award***

9. **S. Akram**, J. Sartor, and L. Eeckhout, “DVFS Performance Prediction for Managed Multi-Threaded Applications," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), 2016. Acceptance Rate: 27/77
   $\longrightarrow$ ***Best Paper Candidate***

10. K. Van Craeynest, **S. Akram**, W. Heirman, A. Jaleel, and L. Eeckhout, “Fairness-aware Scheduling on Single-ISA Heterogeneous Multicores," International Conference on Parallel Architectures and Compilation Techniques (PACT), 2013. Acceptance Rate: 36/208

11. **S. Akram**, M. Marazakis, and A. Bilas, “Understanding Scalability and Performance Requirements of I/O-intensive Applications on Future Multicore Servers," IEEE International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS), 2012. Acceptance Rate: 49/134

12. **S. Akram**, M. Marazakis, and A. Bilas, “Understanding and Improving the Cost of Scaling Distributed Event Processing," ACM International Conference on Distributed Event-Based Systems (DEBS), 2012. Acceptance Rate: 17/103

13. **S. Akram**, R. Kumar, D. Chen, “Workload Adaptive Shared Memory Multicore Processors with Reconfigurable Interconnects," IEEE Symposium on Application Specific Processors (SASP), 2009.

Poster/Workshop

1. Iacovos G. Kolokasis, **Shoaib Akram**, Foivos Zakkak, Polyvios Pratikakis, and Angelos Bilas, “DynaHeap: Dynamic Division of DRAM between Heterogeneous Managed Heaps," Symposium on Operating System Principles (SOSP), 2023.

2. **S. Akram** and A. Bilas, “Energy Implications of Contention in Multicore Processors for the Data-Centre," EuroSys, 2012.

3. **S. Akram** and A. Bilas, “A Sleep-based Communication Mechanism to Save Processor Utilization in Distributed Streaming Systems," Computer Architecture and Operating System Co-design (CAOS), held alongside HiPEAC, 2011.

4. **S. Akram** and A. Bilas, “A Sleep-based Communication Mechanism to Save Processor Utilization in Distributed Streaming Systems," Computer Architecture and Operating System Co-design (CAOS), held alongside HiPEAC, 2011.

5. **S. Akram**, M. Marazakis, and A. Bilas, “NUMA Implications for Storage I/O Throughput in Modern Servers," Computer Architecture and Operating System Co-design (CAOS), held alongside HiPEAC, 2012.

6. **S. Akram**, M. Marazakis, and A. Bilas, “Energy Inefficiency of Operating System Layers for Data-centric Infrastructures," Systems for Future Multi-core Architectures (SFMA), held alongside EuroSys, 2012.

7. **S. Akram**, K. McKinley, J. Sartor, and L. Eeckhout, “Managing Hybrid Memories by Predicting Object Write Intensity," Programming Across the System Stack (PASS), held alongside <programming>, 2018.

8. **S. Akram**, “To Expose, or Not to Expose, Hardware Heterogeneity to Runtimes!" Modern Language Runtimes, Ecosystems, and VMs (MoreVMs), held alongside <programming>, 2019.

Invited Publications

1. **S. Akram**, J. Sartor, K. McKinley and L. Eeckhout, “Kingsguard: Write-Rationing Garbage Collection for Hybrid Memories," Annual Non-Volatile Memories Workshop (NVMW), 2019.

2. **S. Akram**, S. Cromar, G. Lucas, A. Papakonstantinou, and D. Chen, “VEBoC: Variation and Error-Aware Design for Billions of Devices on a Chip," IEEE/ACM Asia and South Pacific Design Automation Conference (ASPDAC), 2008.

Invited Talks

1. “Exploiting Managed Language Semantics to Mitigate Wear-Out in Persistent Memory," Flash Memory Summit, 2019, Santa Clara.

2. “Exploiting Managed Language Semantics to Optimize for Heterogeneous Hardware," Australian National University, 2019, Canberra.

3. “Kingsguard: Write-Rationing Garbage Collection for Hybrid Memories," Annual Non-Volatile Memories Workshop (NVMW), 2019, San Diego.

4. “Profile-Driven Write-Rationing Garbage Collection for Hybrid Memories," The 5th Virtual Machine Meetup (VMM), 2018, Linz.

5. “Write-Rationing Garbage Collection for Hybrid Memories," Swiss Federal Institute of Technology, 2018, Lausanne.

6. “Write-Rationing Garbage Collection for Hybrid Memories," The 4th Virtual Machine Meetup, 2017, Prague.

7. “Managed Language Runtimes on Heterogeneous Hardware: Optimizations for Performance, Efficiency and Lifetime Improvement," Workshop on Programming Across the System Stack (PASS), 2017, Brussels.
8. “DVFS Performance Prediction for Managed Multithreaded Applications," VSSAD seminar, Sep. 15, 2017, Intel, Portland.
9. “Energy-Efficient Managed Language Execution on Modern Hardware," The 3rd Virtual Machine Meetup (VMM), 2016, Lugano.

Achievements and Honors

- NVMW Memorable Paper Award 2019
- HiPEAC Paper Award for PLDI 2018
- Nominated for Best Paper Award at ISPASS 2016
- Marie Curie Initial Training Networks Fellowship (2010-2012)
- Fulbright Scholarship (2007-2009)

Service (ANU)

- Ph.D. Scholarship Ranking Committee (Research School of Computer Science, August 2020)
- HDR Convener (ANU School of Computing, Foundations cluster, 2021)

Ph.D. Supervisory Panel (ANU)

- Wenyu Zhao (Advisor: Steve Blackburn)

Ph.D. Advisees

University of Crete, Department of Computer Science, 2020
Iacovos G. Kolokasis (Co-Advisor and Ph.D. committee)
Advisor: Angelos Bilas
Thesis Topic: Efficient Caching for Big Data Analytics
Awards: Meta (Facebook) Research PhD Fellowship (2022)

Australian National University, School of Computing, 2024
Jackson Kilrain-Mottram
Thesis Topic: Storage Engines for Managed Data-Intensive Frameworks

Honours Students (ANU)

- Aditya Chilukuri (2022) Bachelor of Advanced Computing
- Hou Loi (2022) Bachelor of Advanced Computing
- Jack Kilrain (2022) Bachelor of Software Engineering

- Junming Zhao (2023) Bachelor of Engineering and Advanced Computing
- Anson Thai (2024) Bachelor of Advanced Computing

B.S. and M.S. Project Students

- Yuki Misumi (2024, ANU, COMP3770, 12 units)
- Adnan Hasnat (2024, ANU, COMP3770, 12 units)
- Itay Yarom (2024, ANU, COMP3770, 12 units)
- Rosalita Rosenberg (2023, ANU, PhB Advanced Studies Course, 6 units)
- Zack Noyes (2023, ANU, PhB Advanced Studies Course, 6 units)
- Peter Oslington (2023, S2, ANU, PhB Advanced Studies Course, 6 units)
- Peter Oslington (2023, S1, ANU, PhB Advanced Studies Course, 6 units)
- Chethin Weerakkody (2023, ANU, COMP3770, 12 units)
- Angus Atkinson (2022, ANU, COMP3740, 6 units)
- Anson Thai (2022, ANU, COMP3770, 6 units)
- Anson Thai (2021, ANU, COMP2560, 6 units)
- Aditya Chilukuri (2021, ANU, COMP3770, 6 units)
- Peixiao Zhao, Master of Computing (2021, ANU, COMP8755, 12 units)
- Hengjia Zhang, Master of Computing (2020, ANU, COMP8755, 12 units)
- Ruben Peter Vervaeke, Master of Science (2017, Free University Brussels, Thesis)

Summer Scholars (ANU)

- Itay Yarom (summer 2023)
- Junming Zhao (summer 2022)
- Qianhui Wang (summer 2022)
- Xuechao Wang (summer 2022)
- Anson Thai (summer 2021)
- Angus Atkinson (summer 2021)

Research Assistants (Casual)

- Cassandra Chun-Crogan, BSc, 2021 (December 2021 - May 2022)
- Kshama Patel, BAC (R&D), 2021 (December 2022 - Feb 2023)

Peer Reviewing and Program Committees

- Program Co-Chair, VMIL 2025 (workshop co-located with SPLASH)
- Program Committee, ASPLOS 2026
- Program Committee, ISMM 2025
- Invited Reviewer (multiple papers, 2024-2025), ACM TACO
- Program Committee, HPCA 2025
- Program Committee, ASPLOS 2025
- External Program Committee, MICRO 2024
- Program Committee, MPLR 2024
- Program Committee, ISCA 2024
- Program Committee, ISPASS 2024
- ACM Student Research Competition (SRC) Selection Committee, PACT 2023
- Program Committee, MICRO 2023
- Program Committee, 22nd IEEE International Workshop on High Performance Computational Biology, HiCOMB 2023
- Program Committee, MoreVMs 2023 (held alongside <Programming>)
- Program Committee, ISMM 2023
- ACM Student Research Competition (SRC) Selection Committee, PACT 2022
- External Expert Reviewer, OOPSLA 2022
- Program Committee, MICRO 2022
- Program Committee, HPCA 2023
- Program Committee, ASPLOS 2023
- Program Committee, ISMM 2022
- Program Committee, ISPASS 2022
- External Review Committee, ISCA 2022
- External Review Committee, MICRO 2021
- Program Committee, ISMM 2021
- External Review Committee, ISCA 2021
- External Review Committee, HPCA 2021
- External Review Committee, OOPSLA 2020
- Shadow Program Committee, EuroSys 2020

- External Review Committee, ISCA 2020
- External Review Committee, ASPLOS 2020
- Program Committee, VMIL 2019
- Student Volunteer Co-Chair, PLDI 2019
- Program Committee, ISMM 2019
- Program Committee, PASS 2018, 2019 (held alongside <Programming>)
- Artifact Evaluation Committee, OOPSLA 2016, 2017
- Artifact Evaluation Committee, PLDI 2018
- Reviewer, J. Parallel Distrib. Comput. 72 (2012)

Teaching

- Convener, ANU, 2021, Computer Architecture and Simulation (ENGN2219)
- Convener, ANU, 2021, Computer Microarchitecture (COMP3710)
- Convener, ANU, 2022, Computer Systems and Organisation (Revamped ENGN2219)
- Convener, ANU, 2022, Computer Microarchitecture (COMP3710)
- Convener, ANU, 2022, Systems, Networks, and Concurrency (COMP2310)
- Convener, ANU, 2023, Computer Systems and Organisation (ENGN2219)
- Convener, ANU, 2023, Computer Organization and Program Execution (COMP2300)
- Convener, ANU, 2023, Systems, Networks, and Concurrency (COMP2310)
- Convener, ANU, 2024, Computer Systems and Organisation (ENGN2219)
- Convener, ANU, 2024, Computer Organization and Program Execution (COMP2300)
- Convener, ANU, 2025, Computer Systems and Organisation (ENGN2219)
- Convener, ANU, 2025, Computer Organization and Program Execution (COMP2300)
- Convener, ANU, 2025, Parallel Computer Architecture (COMP4045)