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 (IEEE & 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 (IEEE & 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, W. Heirman, **S. Akram**, "Analyzing and Exploiting Memory Hierarchy Parallelism with MLP Stacks," IEEE Computer Architecture Letters (CAL), 2025.
2. A. Hasnat, **S. Akram**, "SPIRIT: Scalable and Persistent In-Memory Indices for Real-Time Search," ACM Transactions on Architecture and Code Optimization (TACO), 2025.
3. 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.
4. W. Liu, W. Heirman, S. Eyerman, **S. Akram**, and L. Eeckhout, "Scale-Model Simulation," IEEE Computer Architecture Letters (CAL), 2021.
5. **S. Akram**, "Performance Evaluation of Intel Optane Memory for Managed Workloads," ACM Transactions on Architecture and Code Optimization (TACO), 2021.
6. 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.
7. 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.
8. **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.
9. **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.
10. **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. I. Kolokasis, K. Delis, **S. Akram**, F. Zakkak, P. Pratikakis, A. Bilas, "SmartSweep: Efficient Space Reclamation in Tiered Managed Heaps," International Conference on Managed Programming Languages and Runtimes (MPLR), 2025. Acceptance Rate: 11/18
2. 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***
3. 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

4. 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

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

6. 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

7. **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

8. **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

9. **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***

10. **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***

11. 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

12. **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

13. **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

14. **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

- HiPEAC Paper Award for ASPLOS 2023
- Nominated for Best Paper Award at ISMM 2023
- 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)
- Graduated from the University of Engineering and Technology with Honors (2006)
- First position in college, Crescent Model Higher Secondary School, Lahore, Pakistan (2001)

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: Expanding JVM Heaps with Tiering
Awards: Meta (Facebook) Research PhD Fellowship (2022)

Australian National University, School of Computing, 2024
Jackson Kilrain-Mottram (Primary Adviser)
Thesis Topic: Scheduling in Distributed Storage Systems

Honours Students (ANU)

- Aditya Chilukuri (Graduation: semester 1, 2022) Bachelor of Advanced Computing
- Hou (Harris) Loi (Graduation: semester 2, 2022) Bachelor of Advanced Computing
- Jack Kilrain (Graduation: semester 2, 2022) Bachelor of Software Engineering
- Junming Zhao (Graduation: semester 1, 2023) Bachelor of Engineering and Advanced Computing
- Anson Thai (Graduation: semester 1, 2024) Bachelor of Advanced Computing
- Adnan Hasnat (Graduation: semester 2, 2025) Bachelor of Advanced Computing
- Kshama Patel (Graduation: semester 2, 2025) Bachelor of Advanced Computing
- Itay Yarom (Graduation: semester 2, 2026) Bachelor of Advanced Computing

B.S. and M.S. Project Students

- Arjun Sharma (2024, ANU, PhB Advanced Studies Course, 6 units)
- Nicholas Arvanitellis (2024, ANU, PhB Advanced Studies Course, 6 units)
- Yuki Misumi (2024, ANU, COMP8755, 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

- Sponsorship Chair, ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), 2026
- Program Committee, International Symposium on High-Performance Computer Architecture (HPCA), 2026
- Program Committee, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2026
- Program Committee, Hardware Architecture track, IEEE International Conference on Computer Design (ICCD), 2025
- Program Committee, IEEE/ACM International Symposium on Microarchitecture (MICRO), 2025
- Program Committee, Scalable Optimization for Efficient and Adaptive Foundation Models (SCOPE), 2025 (workshop collocated with ICLR)
- Program *Co-Chair*, Virtual Machines and Language Implementations (VMIL), 2025 (workshop collocated with SPLASH)
- Program Committee, International Symposium on Memory Management (ISMM), 2025
- Invited Reviewer (multiple papers, 2024-2025), ACM Transactions on Architecture and Code Optimization (TACO)
- Program Committee, International Symposium on High-Performance Computer Architecture (HPCA), 2025
- Program Committee, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2025
- Program Committee, Hardware Architecture track, IEEE International Conference on Computer Design (ICCD), 2024

- External Program Committee, IEEE/ACM International Symposium on Microarchitecture (MICRO), 2024
- Program Committee, ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes (MPLR), 2024
- Program Committee, International Symposium on Computer Architecture (ISCA), 2024
- Program Committee, International Symposium on Performance Analysis of Systems and Software (ISPASS), 2024
- ACM Student Research Competition (SRC) Selection Committee, International Conference on Parallel Architectures and Compilation Techniques (PACT), 2023
- Program Committee, IEEE/ACM International Symposium on Microarchitecture (MICRO), 2023
- Program Committee, High Performance Computational Biology (HiCOMB), 2023 (workshop collocated with IPDPS)
- Program Committee, Modern Language Runtimes, Ecosystems, and VMs (MoreVMs), 2023 (workshop collocated with <Programming>)
- Program Committee, International Symposium on Memory Management (ISMM), 2023
- ACM Student Research Competition (SRC) Selection Committee, International Conference on Parallel Architectures and Compilation Techniques (PACT), 2022
- External Expert Reviewer, ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA), 2022
- Program Committee, IEEE/ACM International Symposium on Microarchitecture (MICRO), 2022
- Program Committee, International Symposium on High-Performance Computer Architecture (HPCA), 2023
- Program Committee, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2023
- Program Committee, International Symposium on Memory Management (ISMM), 2022
- Program Committee, International Symposium on Performance Analysis of Systems and Software (ISPASS), 2022
- External Review Committee, International Symposium on Computer Architecture (ISCA), 2022
- External Review Committee, IEEE/ACM International Symposium on Microarchitecture (MICRO), 2021
- Program Committee, International Symposium on Memory Management (ISMM), 2021
- External Review Committee, International Symposium on Computer Architecture (ISCA), 2021
- External Review Committee, International Symposium on High-Performance Computer Architecture (HPCA), 2021

- External Review Committee, ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA), 2020
- Shadow Program Committee, European Conference on Computer Systems (EuroSys), 2020
- External Review Committee, International Symposium on Computer Architecture (ISCA), 2020
- External Review Committee, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2020
- Program Committee, Virtual Machines and Language Implementations (VMIL), 2019 (workshop collocated with SPLASH)
- Student Volunteer Co-Chair, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2019
- Program Committee, International Symposium on Memory Management (ISMM), 2019
- Program Committee, Programming Across the System Stack (PASS), 2019 (workshop collocated with <Programming>)
- Program Committee, Programming Across the System Stack (PASS), 2018 (workshop collocated with <Programming>)
- Artifact Evaluation Committee, ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA), 2017
- Artifact Evaluation Committee, ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA), 2016
- Artifact Evaluation Committee, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2018
- Reviewer, J. Parallel Distrib. Comput. 72 (2012)

Research Funding

- ASD-ANU Co-Lab Honours grant for undergraduate student, 8K AUD (Kshama Patel, 2025)
- ASD-ANU Co-Lab Honours grant for undergraduate student, 8K AUD (Anson Thai, 2024)
- SIGPLAN SIGPLAN Professional Activities Committee (PAC) student travel grant, 2.5K AUD (Aditya Chilukuri, 2023)
- ANU Start-Up Grant (2020), 200K AUD

Teaching

- Convener, ANU, 2021, Computer Architecture and Simulation (ENGN2219)
- Convener, ANU, 2021, Computer Microarchitecture (COMP3710)
- Convener, ANU, 2022, Computer Systems and Organisation (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 Architecture (ENGN2219)
- Convener, ANU, 2025, Computer Architecture (COMP2300)
- Convener, ANU, 2026, Computer Architecture (ENGN2219)
- Convener, ANU, 2026, Computer Architecture (COMP2300)
- Convener, ANU, 2026, Operating Systems Implementation (COMP3300)