

# Hashim Sharif

AMD Research and Development  
7171 Southwest Pkwy, Austin, TX 78735  
✉ hasharif@amd.com  
📧 hashimsharif.com

## Experience

- September 2022-Current **Member of Technical Staff**, *AMD Research*, Research Area: Compilers for ML Accelerators
- April 2021-August 2022 **Postdoctoral Researcher**, *University of Illinois at Urbana-Champaign*,  
Advisors: Vikram Adve and Sasa Misailovic
- 2016-2021 **Graduate Research Assistant**, *University of Illinois at Urbana-Champaign*, Urbana, IL,
- 2017 Summer **Summer Research Associate**, *Argonne National Lab*, Lemont, IL
- 2015 Summer **Summer Research Associate**, *SRI International*, Menlo Park, CA
- 2013-2014 **Research Assistant**, *Lahore University of Management Sciences*, Lahore, Pakistan

## Education

- 2014–2021 **University of Illinois at Urbana-Champaign**, *Urbana*, IL  
**PhD** in Computer Science  
**Advisor:** Vikram Adve
- 2009–2013 **National University of Computer and Emerging Sciences**, *Lahore*, Pakistan  
**Bachelor of Science** in Computer Science

## Research Areas

- Compilers
- Systems for Machine Learning
- Processing in memory (PIM) Accelerators
- Accuracy-aware Program Optimization
- Program Analysis
- Programming Languages

## Research Impact

- Collaborating with a robotics startup, Earthsense, I optimized the software stack of an in-production autonomous agriculture robot using *ApproxCaliper* - an **application-aware neural network optimization framework**. Our optimizations reduced the cost of deployed compute hardware by 3x.
- The ApproxHPVM deep learning compiler is being actively used at IBM Research for compiling neural network programs to a custom heterogeneous SoC developed for self-driving vehicles.
- I led two major open-source releases of the HPVM project; release v0.5 was presented at the open-source conference, FOSDEM 2020, and v1.0 is actively used by IBM Research and academic research groups.
- In terms of teaching and collaborating on various projects, I have mentored over 10 PhD and undergraduate students.

## Publications

### Selected Conference Papers

- [MLSys'23] Yifan Zhao\*, **Hashim Sharif\***, Peter Pao-Huang, Vatsin Ninad Shah, Arun Narenthiran, Mateus Valverde Gasparino, Nathan Zhao, Abdulrahman Mahmoud, Sarita Adve, Girish Chowdhary, Sasa Misailovic, Vikram Adve. *ApproxCaliper: Exploiting Application-level Error Resiliency for Optimizing Neural Networks*. (\* **equal contribution.**)
- [IEEE VR 2023] Rahul Singh, Muhammad Huzaifa, Jeffery Liu, Anjul Patney, **Hashim Sharif**, Yifan Zhao, Sarita Adve. *Power, Performance, and Image Quality Tradeoffs in Foveated Rendering*. In Proceedings of the 30th IEEE Conference on Virtual Reality and 3D User Interfaces.
- [PPoPP'21] **Hashim Sharif**, Yifan Zhao, Maria Kotsifakou, Akash Kothari, Ben Schreiber, Elizabeth Wang, Yasmin Sarita, Nathan Zhao, Keyur Joshi, Vikram Adve, Sasa Misailovic, and Sarita Adve. *ApproxTuner: a Compiler and Runtime System for Adaptive Approximations*. In *Proceedings of the 26th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP'21)*, 2021, February, Virtual.
- [OOPSLA'19] **Hashim Sharif**, Prakalp Srivastava, Muhammad Huzaifa, Maria Kotsifakou, Keyur Joshi, Yasmin Sarita, Nathan Zhao, Vikram Adve, Sasa Misailovic, and Sarita Adve. *ApproxHPVM: a Portable Compiler IR for Accuracy-aware Optimizations*. In *Proceedings of the ACM on Programming Languages (OOPSLA'19)*, 25 October 2019, Athens, Greece.

- [ASE'18] **Hashim Sharif**, Muhammad Abubakar, Ashish Gehani, and Fareed Zaffar. *TRIMMER: Application Specialization for Code Debloating*. In *Proceedings of the 33rd ACM/IEEE International Conference on Automated Software Engineering (ASE'18)*, September 7, 2018, Montpellier, France.

## Journal Publications

- [TSE'22] Aatira Anum Ahmad, Abdul Rafae Noor, **Hashim Sharif**, Usama Hameed, Shoaib Asif, Mubashir Anwar, Ashish Gehani, Fareed Zaffar, and Junaid Haroon Siddiqui. *TRIMMER: An Automated System for Configuration-based Software Debloating*. *IEEE Transactions on Software Engineering (TSE'22)*.
- [IEEE Micro Journal 2022] Adel Ejje, Aaron Councilman, Akash Kothari, Maria Kotsifakou, Leon Medvinsky, Abdul Rafae Noor, **Hashim Sharif**, Yifan Zhao, Sarita Adve, Sasa Misailovic, Vikram Adve. *HPVM: Hardware-Agnostic Programming for Heterogeneous Parallel Systems*. *IEEE Micro Journal 2022*

## Workshop Papers and Presentations

- [ASE'22 Tool Track] Aatira Anum, Mubashir Anwar, **Hashim Sharif**, Ashish Gehani, and Fareed Zaffar. *Trimmer: Context-Specific Code Reduction*. In *Proceedings of the 37th IEEE/ACM International Conference on Automated Software Engineering (Tool track)*.
- [LLVMDev'20] **Hashim Sharif**, Maria Kotsifakou, Yifan Zhao, Akash Kothari, Ben Schreiber, Elizabeth Wang, Yasmin Sarita, Nathan Zhao, Keyur Joshi, Vikram Adve, Sasa Misailovic, and Sarita Adve. *ApproxTuner: a Compiler and Runtime System for Adaptive Approximations*. *2020 LLVM Virtual Developers Meeting*, October 8, 2020 (**Oral**).
- [LLVM-HPC 2017] **Hashim Sharif**, Vikram Adve, and Hal Finkel. *Developing an OpenMP Offloading Runtime for UVM-Capable GPUs*. *The Fourth Workshop on the LLVM Compiler Infrastructure in HPC*, November 13, 2017, Denver, CO (**Oral**).
- [OpenMPCon 2017] **Hashim Sharif**, Vikram Adve, Hal Finkel, and Lingda Li. *Developing an OpenMP Offloading Runtime for UVM-Capable GPUs*. *2017 OpenMP Developers Meeting*, September 19, 2017, Stony Brook University, NY (**Oral**).
- [IPAW'16] Manolis Stamatogiannakis, Hasanat Kazmi, **Hashim Sharif**, Remco Vermeulen, Ashish Gehani, Herbert Bos, Paul Groth. *Trade-Offs in Automatic Provenance Capture*. *6th International Provenance and Annotation Workshop*, Maclean, VA, June 8, 2016.

## Undergraduate Research

- [PACIS'15] **Hashim Sharif**, Saad Ismail, Shehroze Farooqi, Mohammad Taha Khan, Mohammad Ali Gulzar, Hasnain Lakhani, Fareed Zaffar, and Ahmed Abbasi. A Classification Based Framework to Predict Viral Threads *Pacific Asia Conference on Information Systems (PACIS'15)*.
- [SocialCom'14] **Hashim Sharif**, Fareed Zaffar, Ahmed Abbasi, and David Zimbira. Detecting Adverse Drug Reactions Using a Sentiment Classification Framework. *Proceedings of the 2014 International Conference on Social Computing (SocialCom'14)*.

## Talks

- **Accuracy-aware Compilers for Energy-efficient Machine Learning**
  - AMD Research, 12/2022
  - Virginia Tech University, 05/2022, Virtual
  - VMware Research, 05/2022, Virtual
  - NYU Abu Dhabi, 04/2022, Virtual
  - Amazon AWS, 04/2022, Virtual
  - Nvidia Research, 03/2022, Virtual
  - IBM Research, 03/2022, Virtual
- **ApproxCaliper: Exploiting Application-level Error Resiliency for Optimizing Neural Networks**
  - Harvard University, 02/18/2022, Virtual
  - SRI International, 02/14/2022, Virtual
  - UIUC Compiler Seminar, 02/07/2022, University of Illinois
  - Illinois Autonomous Farm Workshop, 7/7/2021, University of Illinois
- **ApproxTuner: a Compiler and Runtime System for Adaptive Approximations**
  - PPOPP'21, 3/2/2021, Virtual
  - Google Compiler Seminar, 3/12/2021
  - DePaul University, Chicago, 2/19/2021
  - Qualcomm Compiler Group, 12/13/2020
  - LLVM Developers conference, 10/8/2020
  - Amazon Compiler Team, 6/2/2020
- **ApproxHPVM: a Portable Compiler IR for Accuracy-aware Optimizations**
  - UIUC Compiler Seminar, 10/16/2019, University of Illinois
  - IBM Research Computer Architecture Team, 9/6/2019, Yorktown Heights, NY
- **TRIMMER: Application Specialization for Code Debloating**
  - LUMS ISPL Seminar Series, 11/5/2020, Virtual
  - UIUC Compiler Seminar, 08/28/2018, University of Illinois

- **Developing an OpenMP Offloading Runtime for UVM-Capable GPUs**
  - OpenMP Developers Meeting, September 19, 2017, Stony Brook University, NY
  - LLVM-HPC Workshop at Supercomputing 2017, November 13, 2017, Denver, CO

## --- **Services**

- Fall 2021 Empirical Software Engineering Journal 2021 - *Reviewer*
- Fall 2021 Principles and Practice of Parallel Programming 2022 (PPoPP'22) - *External Reviewer*
- Spring 2021 Transactions on Design Automation of Electronic Systems 2021 - *Reviewer*
- Spring 2018 UIUC Compiler Seminar - *Student Organizer*

## --- **Teaching and Mentoring**

### **Teaching Assistant**

- Fall 2015 UIUC CS 498 Digital Forensics (with Roy Campbell)

### **Guest Lectures**

- Spring 2021 UIUC CS 526 Advanced Compiler Construction
- Fall 2020 UIUC CS 598 Approximate and Probabilistic Computing
- Spring 2020 UIUC CS 526 Advanced Compiler Construction
- Fall 2013 LUMS CS Topics in Network Security
- Spring 2014 LUMS CS Network Security

### **Research Mentoring**

- 2019-present UIUC PhD student, Yifan Zhao  
Worked jointly on the ApproxCaliper and ApproxTuner projects.
- 2019-present UIUC PhD student, Akash Kothari  
Worked together on the ApproxTuner project and the HPVM release.
- 2019-present UIUC PhD student, Abdul Rafae Noor  
Worked together on TRIMMER and HPVM release.
- 2020-present UIUC PhD student, Mubashir Anwar  
Collaborated on TRIMMER Journal version and TRIMMER release.
- 2019-present UIUC undergraduate student, Nathan Zhao  
Worked together on ApproxHPVM, ApproxTuner, and ApproxCaliper.
- 2020-present UIUC undergraduate student, Peter Pao-Huang  
Worked together on ApproxTuner and ApproxCaliper.
- 2021-present UIUC undergraduate student, Vatsin Ninad Shah  
Collaborated on the ApproxCaliper project.

- 2019-2020 UIUC undergraduate student, Elizabeth Wang  
Collaborated on the ApproxTuner project.
- 2019-2020 Cornell undergraduate student, Yasmin Sarita  
Worked on ApproxHPVM, while Yasmin was a summer intern at UIUC.
- 2018-2019 LUMS undergraduate student, Usama Hameed  
Worked together on TRIMMER. Usama is pursuing his PhD at UCLA.
- 2019-2020 LUMS undergraduate student, Shoaib Asif  
Collaborated on TRIMMER. Shoaib is pursuing his PhD at UT Austin.

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## References

### **Vikram Adve**

Donald B. Gillies Professor  
Department of Computer Science  
University of Illinois at Urbana-Champaign  
vadve@illinois.edu

### **Sasa Misailovic**

Assistant Professor  
Department of Computer Science  
University of Illinois at Urbana-Champaign  
misailo@illinois.edu

### **Sarita Adve**

Richard T. Cheng Professor  
Department of Computer Science  
University of Illinois at Urbana-Champaign  
sadve@illinois.edu

### **Ashish Gehani**

Principal Computer Scientist  
Computer Science Laboratory  
SRI International  
Menlo Park, CA  
ashish.gehani@sri.com