Keyur Parag Joshi

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Education

- **University of Illinois at Urbana-Champaign (UIUC), USA**
  Ph.D in Computer Science advised by Sasa Misailovic
  August 2017 – May 2023 (Expected)
- **Indian Institute of Technology, Hyderabad (IITH), India**
  Bachelor of Technology (Honours) in Computer Science and Engineering
  Valedictorian
  August 2013 – May 2017

Research Interests

- Testing and analysis of approximate and/or unreliable programs and systems
- Effective and safe application of approximations in emerging domains
- Programming languages and software engineering

Current Research

I am currently a Research Assistant at UIUC advised by Sasa Misailovic. My current projects include:

- **State uncertainty estimation for autonomous robots:** Modern autonomous robots use neural networks to perceive their state and/or to make control decisions. Consequently, such robots operate on approximate data and may make unsafe decisions. We adapt techniques such as polynomial chaos to estimate the uncertainty in the robot state over time. We use these uncertainty estimates to provide useful safety guarantees.
- **Static analysis of accuracy of programs with recovery mechanisms:** Silent Data Corruptions alter program data in an insidious manner. Critical programs often employ recovery mechanisms to handle such errors. We extend Chisel, a static analysis of quantitative accuracy of programs, with analysis for programs with (possibly imperfect) error checks and recovery mechanisms. We also extend Chisel by integrating the analysis of gem5-Approxilizer, a tool for analysis of programs in the presence of single-bit errors.

Publications

Publications are also listed at Google Scholar: scholar.google.com/citations?user=ewi6R3UAAAAJ

- **Diamont: Dynamic Monitoring of Uncertainty for Distributed Asynchronous Programs**
  Vimuth Fernando, **Keyur Joshi**, Jacob Laurel, Sasa Misailovic
  International Conference on Runtime Verification (RV 2021)
- **ApproxTuner: A Compiler and Runtime System for Adaptive Approximations**
  Hashim Sharif, Maria Kotsifakou, Yifan Zhao, Akash Kothari, Ben Schreiber, Elizabeth Wang, Yasmin Sarita, Nathan Zhao, **Keyur Joshi**, Vikram Adve, Sasa Misailovic, Sarita Adve
  ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPOPP 2021)
- **Aloe: Verifying Reliability of Approximate Programs in the Presence of Recovery Mechanisms**
  Keyur Joshi, Vimuth Fernando, Sasa Misailovic
  IEEE/ACM International Symposium on Code Generation and Optimization (CGO 2020)
- **Statistical Algorithmic Profiling for Randomized Approximate Programs**
  Keyur Joshi, Vimuth Fernando, Sasa Misailovic
  41st ACM/IEEE International Conference on Software Engineering (ICSE 2019)

- **Verifying Safety and Accuracy of Approximate Parallel Programs via Canonical Sequentialization**
  Vimuth Fernando, **Keyur Joshi**, Sasa Misailovic
  34th ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA/SPLASH 2019)
- **ApproxHPVM: A Portable Compiler IR for Accuracy-Aware Optimizations**
  Hashim Sharif, Prakalp Srivastava, Muhammad Huzaifa, Maria Kotsifakou, **Keyur Joshi**, Yasmin Sarita, Nathan Zhao, Vikram S. Adve, Sasa Misailovic, Sarita Adve
  34th ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA/SPLASH 2019)
- **Identifying Optimal Parameters for Randomized Approximate Algorithms**
  Vimuth Fernando, **Keyur Joshi**, Darko Marinov, Sasa Misailovic
  Workshop on Approximate Computing Across the Stack (WAX 2019) (Co-located with PLDI 2019)

Professional Experiences

- Summer 2021 – Member of the OOPSLA 2021 Artifact Evaluation Committee
- Fall 2020 – Teaching Assistant for CS 427 Software Engineering I at UIUC; responsibilities including office hours, class logistics, homework, and projects
- Spring 2018 – Co-organized the Brett Daniel Software Engineering Seminar at UIUC

Talks and Presentations

- **Conference Talk:** Aloe: Verifying Reliability of Approximate Programs in the Presence of Recovery Mechanisms *(CGO 2020)*
- **Conference Talk:** Statistical Algorithmic Profiling for Randomized Approximate Programs *(ICSE 2019)*
- **Seminar Talk:** Monitor-Based Statistical Model Checking for Weighted Metric Temporal Logic *(Brett Daniel Software Engineering Seminar, UIUC)*
- **Lightning Talk:** Implementation of a Cache Miss Calculator in LLVM/Polly *(LLVM in HPC Workshop, SC 2017)*
- **Seminar Talk:** Triangular inequality for compiler-based strength reduction *(Brett Daniel Software Engineering Seminar, UIUC)*

Tools

- **Parallely:** Verifying Safety and Accuracy of Approximate Parallel Programs via Canonical Sequentialization: tool and instructions available at `github.com/uiuc-arc/parallely`
- **AxProf:** Statistical Algorithmic Profiling for Randomized Approximate Programs: tool, examples, and tutorial available at `axprof.org`

Skills

- **Languages:** Extensive experience with Python, `C++`, `git`, and LaTeX. Moderate experience with Java and LLVM.
- **OS:** Experience in programming for GNU/Linux and Windows environments.
- **Teamwork:** Experience working on research and engineering projects in teams of 2-5 individuals.