Siddharth Jayashankar

Research Fellow at Microsoft Research
B.Tech, Computer Science & Engineering, IIT Kanpur 2021

sidjay64 [at] gmail.com
t-siddharthj [at] microsoft.com
linkedin.com/in/sidjay10
github.com/sidjay10
sidjay10.github.io

Education

2021 | **Indian Institute of Technology, Kanpur**
Bachelor of Technology in Computer Science and Engineering | Grade: **9.8**/10

Work Experience

Jul 2021 - Present | **Microsoft Research**
Research Fellow

- I work on designing protocols that use trusted execution environments to allow untrusted services to process user data while protecting the privacy of user data.

Sept 2020 - May 2021 | **IIT Kanpur -**
Computer Architecture for Reliable, Secure, and Scalable Systems (CAR3S) Research Group
Undergraduate Researcher | Advisor: Prof. Biswabandan Panda

- I Ported Valgrind to Android and built tracing tool- cstracer to collect program execution traces of android apks. Traced mobile benchmarks - geekbench5 and Antutu to collect instruction and memory access patterns
- I Studied performance difference between the big and little cores in ARM's big.LITTLE architecture and potential for cache block compression on a custom modification of champSim using the traces collected
- **cstracer**, Report, Presentation

Mar 2020 - Jul 2020 | **EPFL - Parallel Systems Architecture Lab (PARSA)**
External Student Researcher | Mentor: Yunho Oh

- I studied the performance of container-level horizontal and vertical scaling of Cloudsuite benchmark workloads on server CPUs.
- I analysed performance bottlenecks caused by front end pipeline stalls in server CPUs and bottlenecks due to lock contention and thread scheduling overheads.

Dec 2019 - Feb 2020 | **Intel - Processor Architecture Research Lab (PARL)**
Architecture Research Intern | Mentors: Sreenivas Subramoney, Anant V Nori

- I worked on designing a new prefetcher to mitigate the performance reduction caused by downsizing the L2 cache to extend the CATCH Microarchitecture proposed by Nori et al [ISCA'18]

May 2019 - Jul 2019 | **IISc Bangalore - Algorithms, Complexity and Optimisations Group**
Summer Research Intern | Advisor: Prof. Arindam Khan

- Worked on devising a polynomial time approximation algorithm for 2D strip packing to improve the absolute approximation ratio of Steinberg's algorithm

Projects

Empirical Evaluation of State-of-the-art cache replacement policies *Nov 2021*

- A Study to compare the performance of state-of-the-art LLC replacement policies like SHiP, DIP, Hawk-Eye on SPEC CPU benchmarks using the ChampSim simulator
- **Project Report**

Cache Simulator to study effects of architecture and replacement policies *Aug 2019*

- Built a cache simulator to study the effect of replacment policy, and associativity and type (Inclusive, Exclusive, NINE) on hit and miss rates
- **Repository** | **Project Report**

C to MIPS32 compiler *May 2021*

- A C source to MIPS32 target compiler written in **C++** | Source Code
- Compiler supports language features like **variables, control statements, recursion, custom data types, multi level pointers, multi dimensional arrays**. It can perform code optimisations like **constant folding** and **basic dead code elimination** and also provide detailed error reports.

Cache miss analysis on loop nests *Sep 2020*

- A program that takes as input loop nests and cache sizes, parses the loop nest and then reports the number of cache misses for the loop ordering | Source Code

Mozart Oz Interpreter *Oct 2020*

- A minimal interpreter for the Oz programming language that implements the kernel language | Source Code

Programming Operating System syscall and exception handlers *Oct 2019*

- Implemented syscalls like **mmap, munmap, mprotect, page fault exception handling, fork, copy on write fork, file and pipe reads, writes, open, close** on gemOS - a teaching OS | Source Code 1, Source Code 2

FPGA synthesis of a basic processor *Apr 2019*

- Synthesised a simple processor that can perform instructions like add, sub, compare, branch and load on an FPGA. This processor can execute simple programs like loops and report results. | Source Code

Coursework

Advanced Computer Architecture	Operating Systems	Software Security
Advanced Algorithms	Machine Learning	Theory of Computation
Linear Algebra	Programming for Performance	Data Structures and Algorithms
Formal Logic	Probability	Database Systems
Learning Theory	Multivariable Calculus	Compiler Design
Discrete Mathematics	Principles of Programming Languages	Computer Networks
Introductory Economics	Macroeconomics	

Skills

Programming & Scripting	C | C++ | Python | GoLang | Rust | Bash | PowerShell
Assembly	x86-64 | MIPS | aarch64
Operating System	Linux | Android | Windows
Containers	Docker | Kubernetes | runc | Microsoft hcsshim
Software	Envoy Proxy | Istio | Valgrind | OpenSSL
Misc	Latex | Git | Markdown | Jekyll

Awards & Achievements

- Academic Excellence Award, IIT Kanpur for the years 2020, 2019, 2018 and 2017
- A* grade for outstanding performance in 8 courses
- Perfect GPA (10/10) in five semesters
- Ranked 1348 in JEE(Advanced), 2017 and 2481 in JEE(Main), 2017
- Selected for the KVPY Fellowship Award 2016 by IISc Bangalore

Extra-Curricular Achievements

- Novice Runner Up, WBNUJS Parliamentary Debate 2019
- Novice Finalist, IIT Bombay Parliamentary Debate 2018
- Secretary, Debating Society IIT Kanpur 2017-19
- Core group member, Vox Populi, Student Journalism Body of IIT Kanpur, 2017-19
- Runner Up, NLS Debate Junior, 2015