Sridhar Gopinath

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Education

University of Texas at Austin, USA — **GPA: 3.3 / 4.0**

M.S. in Computer Science — *Aug. 2019 - May 2021 (expected)*

- **Courses**: Program synthesis | Advanced operating systems | Machine learning
- Teaching assistant for Advanced topics in compilers (CS 380C)

Indian Institute of Science (IISc), India — **GPA: 7.0 / 8.0**

Master by Research in Computer Science — *Aug. 2015 - May 2017*

- **Courses**: Advanced software engineering | Program analysis and verification | Operating systems | Algorithm design
- **Thesis**: Efficient whole program path tracing

Sri Jayachamarajendra College of Engineering (SJCE), India — **GPA: 9.0 / 10.0**

B.E. in Computer Science and Engineering — *Sep. 2011 - May 2015*

- **Courses**: Design and analysis of algorithms | Data structures | Compilers | Computer networks
- **Thesis**: Loop fusion in LLVM compiler

Experience

GPU Compiler Intern — **Apple Inc., USA** — **C++, LLVM, Alive2**

Project: Verifying the GPU instruction selector — *Jun. 2020 - Aug. 2020*

- Developed a tool to automatically find defects in GlobalISel (Apple's GPU instruction selector) using the Alive formal verifier.
- Implemented type inference, SSA representation, and register aliasing for the machine IR in LLVM.
- Found **3 critical defects** in GlobalISel that is deployed in the latest release of iOS and macOS.

Research Fellow — **Microsoft Research, India** — **Python, MATLAB, C++, C#**

Project: Machine learning on edge devices *Microsoft/EdgeML* — *Oct. 2017 - Jul. 2019*

- Developed a framework called SeeDot that compiles ML models to high-performant C code to run on embedded IoT devices.
- Implemented novel techniques like replacing all floating-points with integers and optimizing expensive functions like e^x and *SpMV*.
- SeeDot outperforms hand-optimized code by up to 12× and MATLAB-generated code by up to 82×. Paper published at **PLDI 2019**.

Research Intern — **Microsoft Research, India** — **Java, C#, Boogie**

Project: Finding bugs in Windows 10 device drivers *Boogie/Corral* — *Jun 2017 - Sep. 2017*

- Implemented a bug finder to detect Interrupt Request Level (IRQL) violations, which is a major cause for crashes on Windows.
- Tool generates assertions in drivers to model IRQL violations and uses a formal verifier to find executions that violate the assertions.
- Tool found **26 unknown defects** in Windows 10 and is deployed in the Windows Driver Kit. Paper published at **FMCAD 2020**.

Software Engineer Intern — **Compiler Tree Technologies, India** — **C++, LLVM**

Project: Loop fusion in LLVM compiler — *Jan. 2015 - May 2015*

- Designed a function pass in LLVM that fuses adjacent loops to improve cache locality.
- Implemented feasibility and data dependency analyses to identify candidate loops for fusion.
- Verified the correctness of fusion and observed up to 20% performance improvement on micro-benchmarks.

Projects

Efficient whole program path tracing — **Java, Ant, SOOT, DaCapo**

- Designed a program analysis to minimize the overhead to derive the control-flow trace (whole program path) of an execution.
- Proved that the problem is NP-hard using control-flow graph properties and designed approximations to scale for large programs.
- Tool outperforms state-of-the-art by up to 5.4× on the DaCapo benchmark suite for Java programs.

Null pointer dereference analysis — **Java, Ant, WALA, JGraphT**

- Implemented a data-flow analysis to identify potential null pointer dereferences in Java programs.
- Designed transfer functions to perform pointer analysis that handle object creation, conditionals, loops, and exceptions.
- Tool performs inter-procedural analysis to improve precision and scales for complex Java programs with ∼100 LOC.

Kernel implementation using PintOS — **C++, Qemu**

- Implemented the following key functionalities on top of base OS. Threads: Priority scheduling, mlfqs scheduling.
- Virtual memory: Demand paging, stack growth, swapping, memory-mapped files.
- File systems: Indexed and extensible files, sub-directories, caching file blocks.

Results analytics website - SJCEResults.com — **AWS, EC2, PHP, MySQL, HTML**

- Developed a website that provides deep analytics on the examination results data of around 6000 students over 3 academic years.
- Implemented a name-wise search for students, outcome analysis for courses, and performance analysis for departments.
- Website currently has more than **2.1 Million** page views.

Miscellaneous

- Executive member of Linux Campus Club, Mysuru, where I organized workshops and promoted open-source software.
- Won 7 competitive coding contests including the national level coding contest, *C-Fi*, during 8th Mile 2014, RVCE, Bengaluru.