Akash Banerjee

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Contact

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Languages

English, Hindi, Bengali

Programming Languages

C
C++, JAVA
C#, JavaScript
Python
Flex/Bison
LLVM, GOTO
Git, GDB, LaTeX

Qualifications

2022–Pres	**Sr Compiler Engineer** at AMD	Milton Keynes, UK
2021–2022	**Graphics Compiler Engineer** at Imagination Technologies	Kings Langley, UK
2018–2021	**M.Tech.** in Computer Science and Engineering - 9.50/10 CGPA	IIT Hyderabad
2013–2017	**B.Tech.** in Computer Science and Engineering - 8.37/10 CGPA	RERF, Kolkata

Interests

Compiler Optimizations
Using novel techniques and engineering principles for optimizing software systems.

Software Verification
Exploring techniques for formal verification of programs like Symbolic Execution, Abstract Interpretation, etc.

SAT Solvers
Studying and exploring techniques and encoding to make SAT/MaxSAT solvers more efficient

Skills

Programming Ability
Skilled in C, C++ and able to adapt quickly to new languages

Frameworks
LLVM Compiler Infrastructure, CPRover Verification Framework

Tools
Git, LaTeX, GDB, LLDB, Eclipse

Projects

Jun. - 2021 **Proteus: Polymorphic Compilation**
Proteus is a compiler tool which uses polymorphic compilation and execution techniques to mitigate a class of side channel attacks with minimal performance overhead, compared to the other state-of-the-art solutions available. This work was done as part of my master's thesis project. This work is currently in submission awaiting reviews at a peer reviewed conference.

Apr. - 2020 **BPI Enhancements** GitHub Repo
Proposed and implemented improvements to the Branch Probability Information pass in LLVM to allow better static profiling leading to speed-up of up to 1.07x, as part of the course project for Advanced Compiler Optimizations - CS6240.
Accepted as a poster in EuroLLVM-20 held at Paris, France.

Oct. - 2019 **Loop Acceleration** GitHub Repo
Added a loop acceleration module to the Pinaka verifier for quick detection of counterexamples in loops simulating polynomial functions. Pinaka is developed by IITH Software Verification Group which won the third-fastest verifier position in SV-COMP'20 Floats sub-category, amongst other positions and was the only entry from Indian academia.
Appreciated by the Dept. of CSE for this work here.

Sep. - 2019 **LLVM2GOTO** GitHub Repo
Created a tool to translate LLVM IR to CBMC-GOTO. LLVM supports multiple front-ends like C, C++, FORTRAN, Swift, etc., which get converted to LLVM-IR. CBMC is a tool to verify programs which has its own GOTO IR, this tool translates LLVM-IR to GOTO IR, allowing us to potentially verify all the languages that are supported by LLVM's front-end.

Aug. - 2019 **COOL Compiler**
Designed and implemented a compiler for the COOL language to generate LLVM IR as part of the course project for Advanced Compiler Design - CS CS6240.

Mar. - 2019 **SAT Solvers** GitHub Repo
Implemented DPLL SAT Solver with MOMS heuristics, CDCL SAT Solver with Lazy data structure and Watch Literals, MaxSAT with Totalizer encoding and an Incomplete SAT Solver based on Break-only-poly algorithm and WalkSAT. As part of the course project for Constraint Programming - CS6483.

Nov. - 2018 **Hybrid Mutual Exclusion in Distributed Systems** GitHub Repo
An efficient implementation of a hybrid mutual exclusion algorithm for distributed systems by combining Raymond's and Maekawa's algorithms by multiplexing between them when communicating within clusters and across clusters, based on load, latency and throughput. As part of the course project for Distributed Computing - CS5320.

Oct. - 2018 **Bitcoin Wallet** GitHub Repo
Created a BTC wallet application which can create and manage BTC addresses, and also execute transactions with support for both single and multisig authoirisations.This was done as part of the course project for Blockchain- Theory and Practice - CS5543.

Co-Curricular

Jan. - 2020 **Teaching Assistant** IIT Hyderabad
Helped in grading and evaluating assignments for the CS6483-Constraint Programming course

Aug. - 2019 **Webpage Moderation** sat-smt.in
Maintainer for the Indian SAT+SMT School website :https://sat-smt.in

Jul. - 2019 **FMUpdate-India 2019** fmindia.cmi.ac.in
Organizing team member at the Formal Methods Update Meeting 2019

Jun. - 2019 **System Security** COEP Pune
Attended ACM India Summer School on Detection and Analysis of Malware

Hobbies

Gaming
Competitively play MMO games, and also design games

Photography
In the top 10% of contributors at Unsplash

Aquascaping
Enjoy creating and maintaining nature Aquascapes

Astrophysics
Curious about the Cosmos and the pale blue dot we live in

References

Dr. Saurabh Joshi - sbjoshi@cse.iith.ac.in

Dr. Ramakrishna Upadrasta - ramakrishna@cse.iith.ac.in