PRATIK PRAMOD FEGADE

CONTACT INFORMATION

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EDUCATION

Indian Institute of Technology, Bombay, India
Bachelors of Technology in Computer Science and Engineering
Honours in Computer Science
Minor in Electrical Engineering
Current cumulative GPA of 9.5/10.0
Minor GPA of 9.4/10.0

Ratanbai Walbai Junior College of Science, Mumbai, India
Senior Secondary Education, 92.83%

New English School, Thane, India
Matriculation, 96.91%

INTERESTS

Program Analysis
I am interested mostly in the fields of program analysis and software verification. My two internships have spurred my interest in the field. The intersection of computer architecture and compiler technology also fascinates me.

Computer Systems
The courses I have completed and my undergraduate thesis project have also led me to be fascinated by the broad area of computer systems, especially that of operating systems and related technologies.

RESEARCH PROJECTS

Internals of Polyhedral based Tools for Parallelisation Aug, 2015 - Ongoing
Research and Development Project
Prof. Supratim Biswas
Studying the polyhedral model of parallelisation to explore possibilities of guiding it with the classical model to exploit more parallelism.
Studying the transformations applied by the polyhedral source to source parallelising compilers PPCG and PLuTo to the input program with the aim of characterising them, as appropriate.
Comparing the results of polyhedral parallelisation with the results of the classical model across various dimensions.
Aim to possibly guide the tools above with hints from classical model for better parallelisation.

Improvements in Container based Virtualisation Aug, 2015 - Ongoing
Undergraduate Thesis Project
Prof. Umesh Bellur and Prof. Purushottam Kulkarni
Exploring various ways to improve the current container based virtualisation. Currently working on Docker.
Identified various cgroups functionalities not exported to Docker users, for example an ability to throttle block IO rates of containers. Currently in the process of exporting these functionalities.
Cgroups do not support network IO throttling. Aim to further add support to Docker for this.
Aim to further identify and add functionalities to Docker for a more convenient and efficient operation of containers.

Load Generator Scalability Improvement Jan - April, 2015
Research and Development Project
Prof. Varsha Apte
Studied the operation and implementation of a load generator and suggested optimizations to improve its scalability and capacity.
Profiled and instrumented the load generator code to identify possible code to optimize.
Looked at various system parameters and their effects on the performance of the software.
Optimized the execution of individual worker threads to improve the load generation capacities of Autoperf.
Improved the ability of Autoperf to scale across CPU cores by reducing the amount of shared data and synchronization between the worker threads.

Research Internships

Static Resource Bounds Inference for Functional Programs May - Jul, 2015
École Polytechnique Fédérale De Lausanne
Prof. Viktor Kuncak
Extended previous work on inferring time bounds of functional Scala programs to add increased capabilities for inference of non linear bounds. Worked also on inferring bounds on stack usages.
Worked on Leon, an automated system for verification and synthesis of functional Scala programs built at EPFL.
Added support for inferring non linear time bounds of recursive functions by a using composition of bounds on number of recursive calls and time per recursion for recursive functions.
Developed an empirical model of stack usage of Scala programs through a survey of the generated bytecode for Scala programs. Evaluated the results of stack bounds inference by measuring the stack usage by actually executing the programs under consideration.

Concurrent Program Verification May - Jul, 2014
Institute of Science and Technology, Austria
Prof. Thomas Henzinger
Developed a system using ordering predicates on executions of statements of concurrent programs with the aim of verifying them.
Developed an extension to an existing framework based on the CEGAR (CounterExample-Guided Abstraction Refinement) approach to include ordering predicates.
Implemented a proof of concept in OCaml and proved Peterson's algorithm for mutual exclusion correct with it.

Industry Internship

Stock Market Simulation Dec, 2013
Edelweiss Financial Services Ltd.
Worked on the Feed Generator Algorithm used to simulate the price variations of a stock given a profile of buyers and sellers.
Explored possibilities of making the implementation multithreaded

Academic Honours and Achievements

Secured All India Rank 16 in IIT JEE out of 480,000 students and All India Rank 38 in AIEEE out of 1,300,000 students.

Invited for and attended the ITCSC-INC Winter School held at the Chinese University of Hong Kong, Hong Kong in January 2014.

Among the top 1% students in India to attend the orientation-cum-selection camps for the International Physics and Chemistry Olympiads.

Offered KVPY, NTSE and INSPIRE fellowships.

Academic Projects

An Interprocess Communication System for Guests in KVM Oct, 2015 - Ongoing
Prof. Purushottam Kulkarni
Building a system for inter process communication across guest VMs using the shared memory device provided by IVSHMEM.
Aim to compare the performance with traditional network based inter process communication.

Compiler for a C-Subset Mar - Apr, 2015
Prof. Amitabha Sanyal
Implemented a compiler for a subset of C to generate x86 like pseudo-assembly running on a emulated machine.
Extended the Sethi-Ullman code generation algorithm for other language constructs.

File System Implementation for GeekOS Mar - Apr, 2015
Designed and implemented a byte stream file system for GeekOS by emulating the disk by a file in the underlying file system.
Optimized file system operations by implementing a hash-based page cache.

Web Office Organiser **Oct - Nov, 2014**
Designed and implemented a web application for use in formal work places.
Features included appointment scheduling, messaging, personal cloud storage and personal calendar management.
Made use of technologies like JSP, PostgreSQL and Javascript.

Proposal for Multi-Coloured LEDs Mar - Apr, 2014
A proposal was given for a multi-coloured LED using multiple wells and quantum dots.
Considered the fabrication of these LEDs and suggested suitable materials for the same.

Hardware Simulation of Pong Oct - Nov, 2014
Prof. Dipankar Saha
Simulated the game of Pong at the gate level using the software Logisim.

Simulation of a Microorganism Culture Mar - Apr, 2013
Prof. Amitabha Sanyal
Modelled a culture of sexually reproducing microorganisms demonstrating Mendel's Laws of Genetics through random genetic mutations leading to new species.

Talks and Seminars

Loop Fusion Oct, 2015
Presented Kennedy and McKinley's algorithm to solve the loop fusion problem and discussed applications of the same.

Inferring Resource Bounds Jul, 2015
Gave a talk to my research group (LARA, EPFL) on the using compositions of various program counters to infer non linear time bounds and presented stack usage results obtained by using an empirical stack usage model of Scala programs.

Reach for A*: Efficient Point-to-Point Shortest Path Algorithms Jan, 2015
A presentation of the paper Reach for A*: Efficient Point-to-Point Shortest Path Algorithms by A.V. Goldberg, Haim Kaplan, and Renato F. Werneck.

Concurrent Program Verification Jul, 2014
Presented my work on using ordering predicates in concurrent program verification to the Henzinger group at IST Aastria

Positions Held

Software Systems Laboratory, Teaching Assistant Aug - Nov, 2015
Part of an 8 member team responsible for designing weekly laboratory exercises for sophomore students and evaluating their final project submissions.

Signals and Systems MOOC, Teaching Assistant Dec - Jun, 2015
Responsible for writing lecture notes, framing weekly quizzes and answering doubts and leading discussions on the public forum for the MOOC hosted on edX and IITBombayX.

Department Academic Mentor Aug, 2014 - Apr, 2015
Mentored a group of sophomores in academic and general matters.

Technical Skills

Working knowledge of Scala, C, C++, Java
Familiar with Golang, OCaml, Docker, CUDA, Python, SQL, Lisp

Relevant Coursework

Computer Systems: Topics in Virtualisation, Cloud Computing and Storage Systems, Advanced Computer Architecture, Cryptography and Network Security

Compiler Technology: Parallelizing Compilers

Electrical Engineering: Special Semiconductor Devices, Signals and Systems, Control and Communications

References

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