

## Pratik Pramod Fegade

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### CONTACT INFORMATION

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### RESEARCH INTERESTS

My research interests lie in the areas of static and dynamic program analyses for the purposes of program optimization. I envision building compiler techniques to understand programs at a semantically higher level than is possible now, thus enabling optimizations and transformations on a much larger scale.

### EDUCATION

**Carnegie Mellon University**, Pittsburgh, PA  
PhD Candidate in the Computer Science Department

Aug, 2016 - Present

**Indian Institute of Technology, Bombay**, India  
Bachelors of Technology in Computer Science and Engineering  
Honours in Computer Science  
Minor in Electrical Engineering  
GPA: 9.53/10.0

Jul, 2012 - May, 2016

### RESEARCH PROJECTS

**Data Structure Aware Heap Partitioning on NUMA Architectures** May, 2018 - Ongoing  
Graduate Research Assistant, Carnegie Mellon University  
Advisors: Prof. Todd Mowry, Prof. Phillip Gibbons  
*Building static and dynamic analyses to understand a program's data and computation to enable data and computation partitioning with applications to NUMA architectures.*

We build an understanding of a program's use of irregular and/or linked data structures like trees, graphs, hashtable, etc. that are prevalent in modern code.  
Leveraging this understanding, we are working to come up with intelligent partitioning of these data structures, other associated data and the computation for better locality on NUMA, or even distributed architectures.

**Daedalus: Data Structure Aware Distinctness Analysis**

Aug, 2016 - Aug, 2017

Graduate Research Assistant, Carnegie Mellon University  
Advisors: Prof. Todd Mowry, Prof. Phillip Gibbons  
*Assisted Chris Fallin with his work on an innovative data structure aware static analysis with applications to parallelization and other optimizations.*  
Assembled a benchmark suite of irregular, CPU intensive java programs for evaluating Daedalus.  
Generally helped with infrastructure development.

**Static Resource Bounds Inference for Functional Programs**

May - Jul, 2015

Research Intern, École Polytechnique Fédérale De Lausanne  
Advisor: 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.

	<b>Concurrent Program Verification</b> Research Intern, Institute of Science and Technology, Austria Advisor: Prof. Thomas Henzinger <i>Developed a system using ordering predicates on executions of statements of concurrent programs with the aim of verifying them.</i> Developed an extension to an existing framework based on the CEGAR (CounterExample-Guided Abstraction Refinement) approach to include ordering predicates. Created a set of sound and complete inference rules for these predicates. Implemented a proof of concept in OCaml and proved the correctness of Peterson's algorithm.	May - Jul, 2014
OTHER PROJECTS	<b>Improvements in Container based Virtualisation</b> Undergraduate Thesis Project, Indian Institute of Technology, Bombay Advisors: Prof. Umesh Bellur, Prof. Purushottam Kulkarni <i>Surveyed and experimented with ways to impose limits on usage of resources like CPU and IO, specifically in Docker containers.</i>	Aug, 2015 - Apr, 2016
	<b>Load Generator Scalability Improvement</b> Research and Development Project, Indian Institute of Technology, Bombay Advisor: Prof. Varsha Apte <i>Studied the operation and implementation of a load generator and suggested optimisations to improve its scalability and capacity.</i> Profiled and instrumented the load generator code to identify possible code to optimize. Optimized the execution of individual worker threads to improve the single core load generation capacities by about 6X. Improved multicore scalability by reducing synchronization between the worker threads.	Jan - April, 2015
SERVICE	<b>Master of Science in Computer Science Admissions Committee</b> Carnegie Mellon University	Dec, 2018 - Feb, 2019
TEACHING AND MENTORSHIP	<b>15-300: Research and Innovation in Computer Science</b> Carnegie Mellon University, Teaching Assistant	Aug - Nov, 2018
	<b>15-745: Optimizing Compilers for Modern Architectures</b> Carnegie Mellon University, Teaching Assistant	Jan - May, 2018
	<b>CS 213 (minor): Data Structures and Algorithms</b> Indian Institute of Technology, Bombay, Teaching Assistant	Jan - Apr, 2016
	<b>CS 296: Software Systems Laboratory</b> Indian Institute of Technology, Bombay, Teaching Assistant	Aug - Nov, 2015
	<b>Signals and Systems MOOC on edX run by IIT Bombay</b> Indian Institute of Technology, Bombay, Teaching Assistant	Dec - Jun, 2015
	<b>Department Academic Mentor</b> Mentored 5 sophomores in academic and general matters at Indian Institute of Technology, Bombay.	Aug, 2014 - Apr, 2015
SKILLS	Proficient in Java, Datalog. Familiar with C++, Python, Scala, LLVM.	
ACADEMIC HONOURS AND ACHIEVEMENTS	Secured <b>All India Rank 16</b> in <b>IIT JEE</b> and <b>All India Rank 38</b> in <b>AIEEE</b> . Invited for the <b>ITCSC-INC Winter School</b> held at the Chinese University of Hong Kong, Hong Kong in January 2014. Offered <b>KVPY</b> , <b>NTSE</b> and <b>INSPIRE</b> fellowships.	