

# Rohan Bavishi

SENIOR UNDERGRADUATE, COMPUTER SCIENCE, IIT KANPUR

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EDUCATION	<b>Indian Institute of Technology Kanpur</b> , Uttar Pradesh, India <i>Bachelor of Technology</i> , Computer Science and Engineering, <i>Jul' 13 - Jul' 17 (Expected)</i> <b>GPA: 9.7/10</b> (Overall)
RESEARCH INTERESTS	Program Analysis and Verification, Automated Debugging and Synthesis, Compiler Optimizations, Decision Procedures
PUBLICATIONS	<b>Rohan Bavishi</b> , Awanish Pandey, Subhajit Roy, "To Be Precise : Regression Aware Debugging", <i>Proceedings of the 2016 ACM International Conference on Object Oriented Programming Systems Languages &amp; Applications (OOPSLA)</i> , Amsterdam, Netherlands  <b>Rohan Bavishi</b> , Awanish Pandey, Subhajit Roy, "Regression Aware Debugging for Mobile Applications", <i>Proceedings of the 1<sup>st</sup> International Workshop on Mobile Development Mobile!</i> 2016, Amsterdam, Netherlands [ <i>Invited Paper</i> ]
AWARDS & ACHIEVEMENTS	Awarded the <b>SIGPLAN PAC Scholarship</b> for paper presentation at <b>OOPSLA '16</b> <b>Academic Excellence Award 2013-14</b> , IIT Kanpur Secured an <b>All-India-Rank of 202</b> in JEE Advanced 2013 amongst 150,000 candidates Secured an <b>All-India-Rank of 175</b> in JEE Mains 2013 amongst 20,00,000 candidates Secured an <b>All-India-Rank of 33</b> in AMTI-Mathematics Olympiad
RESEARCH PROJECTS	<b>New Strategy for Analysis of Concurrent Programs via Sequentialization</b> <i>Supervisor : Prof. Subhajit Roy</i> <i>Aug '16 - Present</i> <ul style="list-style-type: none"><li>- Using <b>CSeq</b> for code-to-code translation of concurrent programs into equivalent sequential ones</li><li>- Devising solving strategies to reduce verification time on existing backends like CBMC</li></ul> <b>Improving Bug Localization Using Interpolant-Based Proofs</b> <i>Supervisor : Prof. Subhajit Roy</i> <i>Jul '15 - Aug '16</i> <ul style="list-style-type: none"><li>- Devised a new method to improve the quality of bug localizations, in terms of reduced superfluous program locations, for a given set of passing and failing test-cases</li><li>- Interpolants are constructed from passing tests to derive <i>soft</i> roadblocks. These roadblocks then discourage localizations violating these interpolants, thereby improving bug localization quality</li><li>- Upto 45% improvement in localization quality as compared to the state-of-the-art tool BugAssist.</li><li>- <i>Paper accepted in OOPSLA, one of the premier peer-reviewed conferences in Programming Languages</i></li></ul> <b>Using SAT/QBF-Solvers to Detect Side-Channel Vulnerabilities in Hardware</b> <i>Supervisors : Prof. Paolo Ienne and Mr. Andrew Becker</i> <i>May '16 - Present</i> <ul style="list-style-type: none"><li>- Summer internship project at the Processor Architecture Laboratory, EPFL, Switzerland</li><li>- Studied various side-channel attacks, mitigation techniques and their proofs of effectiveness using formal methods</li><li>- Developed a QBF-Encoding technique to verify whether a cryptographic circuit is secure against a popular side-channel attack based on fault-injection</li><li>- In the process of writing a paper and submitting to a peer-reviewed conference</li></ul>

## Implementation of DirectFix in CBMC

Supervisor : Prof. Subhajit Roy

May '15 - Jul '15

- Ported the described *Component-Based-Synthesis* algorithm in [DirectFix](#) to CBMC
- Reproduced the experimental results provided in the paper, and devised further optimizations
- [Github Link](#)

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## ACADEMIC PROJECTS

### Re-Inventing A Median Algorithm for Disk-Resident Data

Supervisor : Prof. Surender Baswana

Aug '14 - Nov '14

- Re-invented a two-pass *deterministic* algorithm to find the median of large data-sets (approx. 1 TB)
- The algorithm developed was similar to the one described in the [paper](#) by Munro-Paterson (1980)
- Carried out extensive tests to evaluate the performance of the algorithm
- [Report](#)

### Peer-to-Peer Dropbox

Supervisor : Prof. Subhajit Roy

Aug '13 - Nov '13

- A linux application for backing-up and syncing files between two or more peers
- Users have a shared folder across different machines, with local copies. Changes made in any one copy are synced across all devices
- Linux *inotify* API used to track changes in the shared folder and *rsync* used to sync the modifications to ensure efficient transfer
- Multithreading with mutexes used to parallelize syncing and file-monitoring operations
- [Github Link](#)

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## COURSE PROJECTS

### End-to-End Compiler for Perl-like Language

Course : Compilers | Supervisor : Prof. Subhajit Roy

Jan '15 - Apr '15

- Built an end-to-end compiler that takes a subset of the Perl language and outputs MIPS assembly
- Implemented Features such as *operator overloading*, *dynamic type-checking*, *variable function arguments*, *hashes*, *lists*, *type-based namespaces* etc.
- [Github Link](#)

### Integer Superscalar Processor Simulator based on MIPS-R10K

Course : Computer Architecture | Supervisor : Prof. Mainak Chaudhuri

Jan '15 - Apr '15

- Implemented a superscalar processor simulator based on the MIPS R10K architecture with support for integer instructions only
- Implemented support for Out-of-Order execution, multiple instruction issue and commit, precise interrupts and branch-misprediction rollback
- Configurable parameters supported such as issue width, number of functional units, branch-prediction algorithm, RAS/BTB size, active-list size etc.
- Performed experiments on various synthesized benchmarks to measure performance gains over an in-order processor design. Repeated the experiment with varying parameter configurations
- [Report](#)

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## COMPUTER SKILLS

**Languages:** C, C++, Python, Bash, Verilog, L<sup>A</sup>T<sub>E</sub>X, Assembly (x86, MIPS)  
**SAT/SMT Solvers:** MathSAT, Z3, Yices  
**Research Tools:** CBMC (Proficient), KLEE, CSeq

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## EXTRA INTERESTS

**Project Euler:** Solved : 257/560 (*India Rank : 11*)  
**Hobbies:** Competitive Programming, CTF & Wargames, Quizzing