Nishant Totla

University of California, Berkeley

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Education

University of California, Berkeley **Aug '12 - present**
Graduate Student in Electrical Engineering and Computer Sciences
Advisor: Sanjit Seshia
Areas of interest: Formal Methods, Programming Languages, Software Synthesis and Verification

Indian Institute of Technology Bombay **July '08 - May '12**
Bachelor of Technology in Computer Science, Minor in Mathematics **GPA**: 9.36/10

Scholastic Achievements

- Prestigious *Qualcomm Innovation Fellowship* for the year 2013-14
- *Gold Medal* at the 39th International Physics Olympiad (2008), Hanoi, Vietnam
- *Aditya Birla Group Scholarship 2008* for securing an *All India Rank 2* in IIT Joint Entrance Examination (IIT-JEE) 2008 out of 320,000 students
- Placed among *top 25* students in India in the Indian National Mathematics Olympiad (2007)
- *National Gold Medal* in the Indian National Physics Olympiad (2008)
- *National Gold Medal* in the Indian National Chemistry Olympiad (2008)
- *National Gold Medal* in the Indian National Astronomy Olympiad (2007, 2008)
- *CBSE merit scholarship* for securing an *All India Rank 43* in All India Engineering Entrance Examination (AIEEE) 2008 out of 800,000 students

Research Experience

Massive Parallelization for SAT Solvers **June '13 - present**
Advisor: Sanjit Seshia, UC Berkeley **[Graduate Student Researcher, UC Berkeley]**
- Currently working on designing a hybrid parallelized SAT Solver based on a combination of the portfolio and divide-and-conquer approaches
- Optimizing the solver specially for model checking and verification benchmarks

Synthesis-based Compiler for GreenArrays **Nov '12 - present**
Advisor: Rastislav Bodík, UC Berkeley **[Graduate Student Researcher, UC Berkeley]**
- Developing a retargetable (hardware independent) compiler toolchain
- Framework based on program synthesis, currently optimized for the GreenArrays GA144 chip
- Work currently under submission at PLDI 2014 Conference

Comparing Expressive Power of Temporal Logics **Aug '11 - May '12**
Advisors: S Krishna, IIT Bombay; Paritosh Pandya, TIFR **[Bachelors' Thesis, IIT Bombay]**
- Proved results comparing expressive powers of various fragments of Metric Temporal Logic, using Ehrenfeucht-Fraïssé (EF) games
- Discovered several previously unknown expressibility results, with simple proofs

Synthesis from Incompatible Specifications **May '11 - July '11**
Advisors: Pavol Černý, University of Colorado, Boulder; Thomas Henzinger, IST Austria
[Summer Internship, IST Austria]
- Developed algorithm to create optimal implementation to minimize distance from two incompatible specifications using simulation and bisimulation distance defined between state machines
- Published work in 2012 EMSOFT Conference, Tampere, Finland

Complete Instantiation-based Interpolation **May '10 - July '10**
Advisors: Thomas Wies, New York University; Thomas Henzinger, IST Austria
[Summer Internship, IST Austria]
- Built a generic framework to build new interpolation procedures via reduction to existing interpolation procedures. Problems in an extended theory are reduced to those in a base theory
- Obtained the first complete interpolation procedures for theories of arrays and linked-lists
- Published work in 2013 POPL Conference, Rome, Italy

Publications

- **Nishant Totla**, Thomas Wies, "Complete Instantiation-based Interpolation", *Proceedings of the 40th Annual Symposium of Principles of Programming Languages (POPL), ACM Press, 2013*
- Pavol Černý, Sivakanth Gopi, Thomas A. Henzinger, Arjun Radhakrishna, **Nishant Totla**, "Synthesis from Incompatible Specifications", *Proceedings of the 12th Annual Conference on Embedded Software (EMSOFT), ACM Press, 2012*
- Phitchaya Mangpo Phothilimthana, Tikon Jelvis, Rohin Shah, **Nishant Totla**, Sarah Chasins, Rastislav Bodík, "Chlorophyll: Synthesis-Aided Compiler for Low-Power Spatial Architectures", *Under submission at the 35th Annual Programming Language Design and Implementation Conference, 2014*

Class Projects

Automatic Generation of Program Invariants **Aug '12 - Dec '12**

Guide: George Necula, UC Berkeley

- Extensively surveyed major theoretical and heuristic techniques for automatically generating program invariants
- Techniques specially focused on completeness for integer programs

Crowd-sourcing for Software Debugging and Verification **Aug '12 - Apr '13**

Guide: Sanjit Seshia, UC Berkeley

- Designed a framework for human-aided program verification
- Users provide complex invariants that require creativity, and automatic techniques are used to discharge proofs

Extracting Variant Data from Templatized Web Pages **Jan '11 - May '11**

Guide: Sudarshan S, IIT Bombay

- Developed a tool that learns the template of a website from a small set of representative web pages, and uses the template to extract only relevant variant data
- Built a search index on specific sites using this tool, demonstrating more relevant search results

Modeling the Selective Repeat Protocol in EventB **Jan '11 - May '11**

Guide: Om Damani, IIT Bombay

- Formally specified correctness and efficiency properties and designed a model for the selective repeat sliding window packet transfer protocol
- Proved correctness of the model with refinements in EventB using the RODIN tool

Leadership Experience

- Institute Student Mentor during 2011-12, responsible for mentoring 14 freshmen and providing guidance for academic and extracurricular activities at IIT Bombay
- Department Academic Mentor during 2011-12, part of a team of student mentors to guide and motivate academically weak students from the Dept. of Computer Science, IIT Bombay
- TechniC Core Group Member, worked for promotion and organization of technical activities and competitions at IIT Bombay

Extra-Curricular Activities

- *19th position* at the onsite regional finals of the *ACM International Collegiate Programming Contest 2011* held at Amrita University
- Selected (among 14 students from around the world) to witness the launch of the satellite Measat 3a from Baikonur Cosmodrome, Kazakhstan (June 22, 2009)
- Awarded Certificate of Special Mention for excellence in technical activities for 2008-09 by IIT Bombay