First International SAT/SMT Solver Summer School

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MIT
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SAT/SMT Solver Research Story

- Concolic Testing
- Program Analysis
- Equivalence Checking
- Auto Configuration
- Bounded MC
- Program Analysis
- AI
- Solver-based programming languages
- Compiler optimizations using solvers
- Solver-based debuggers
- Solver-based type systems
- Solver-based concurrency bugfinding
- Solver-based synthesis
- Bio & Optimization
SAT/SMT Solver Research Story

Game Changer

• Formal methods, testing, synthesis, analysis, language design,…

• “Solving SE problem” to “Solving SE problem using SAT/SMT solvers”

• For any strategic framework, solver an indispensable tactic

• Inflection point in computing: Multicores

• Future of SAT/SMT is bright
Summer School vs. Conference

Diversity of Opinions

- Formal methods researchers to hackers
- Showcases diverse applications of solvers
- Conflict, and its resolution are essential for progress
- Educate, Inspire, Evangelize
Topics
SAT, SMT, Apps, AI, Theory

• Core SAT solver talks
  • Niklas Een (Berkeley) talk on MiniSAT
  • Sharad Malik (Princeton), Karem Sakallah (U. Mich) and Joao Marques-Silva (UC Dublin)
  • Youssef Hamadi (MSR Cambridge) talk on Parallel SAT
  • Carla Gomes & Bart Selman (Cornell) talk on stochastic local search-based SAT
  • Mate Soos talk on CryptoMiniSAT, and SAT apps in cryptography
Topics
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• Core SMT solver talks
  • Alberto Oliveras (UPC) talk on DPLL(T) and SMT Theory
  • Leonardo DeMoura & Nikolaj Bjorner (Microsoft Research) talk on SMT implementation
  • Cesare Tinelli (U. Iowa) talk on SMTLIB initiative
Topics
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• SMT solvers with focus on apps
  • Clark Barrett (NYU) talk on CVC3
  • Bruno Dutertre (SRI International) talk on Yices
  • Alessandro Cimatti (U. Trento) talk on MathSAT
  • Roberto Brutomesso & Natasha Sharygina (USI) talk on OpenSMT
  • Sanjit Seshia (UCB) & Randy Bryant (CMU) talk on UCLID (eager with approximations)
  • Emina Torlak (LogicBlox) talk on Kodkod/Alloy (eager)
  • Vijay Ganesh (MIT) talk on HAMPI: Solver for String Theories
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• SAT Apps Talks

  • Ed Clarke (CMU) talk on SAT for formal verification
  • Sharad Malik (Princeton) talk on SAT in software debugging and backbones
  • Karem Sakallah (UMich) talk on SAT in CEGAR flow for microprocessor verification
  • Joao Marques-Silva (UC Dublin) talk on SAT for optimization problems over Booleans
  • Armin Biere (Johannes Kepler U.) talk on SAT-based model-checking
  • Daniel Le Berre (Université d'Artois) talk on SAT4J: Pseudo-boolean optimizations
  • Armando Solar-Lezama (MIT) talk on Sketching: SAT-based program synthesis
Topics
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• SMT Apps Talks

  • Cristian Cadar (Imperial) talk on the Klee dynamic symbolic testing tool

  • Stephen McCamant (UCB) talk on Bitblaze and Webblaze security analysis systems

  • Lahiri & Qadeer (MSR) talk on HAVOC: precise and scalable program analysis

  • Candea & Bucur (EPFL) talk on S2E: Scalable, parallel, selective symbolic execution

  • Godefroid & Molnar (MSR) talk on SAGE: Automated whitebox fuzzing using SMT
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• SMT Apps Talks

  • Rustan Leino (Microsoft Research) talk on Boogie: An SMT-based verification engine
  
  • Ranjit Jhala (UCSD) talk on SMT solver-based type systems
  
  • Sorin Lerner (UCSD) talk on SMT solver-based compiler optimizations
  
  • Ruzica Piskac (EPFL) talk on SMT solver-based synthesis
  
  • Davidy Brumley (CMU) talk on Symbolic Execution and Automated Exploit Generation
Topics
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• AI and Theory talks
  • Henry Kautz (Rochester) talk on SAT solving in AI
  • Ryan Williams (IBM) talk on complexity theoretic aspects of the Boolean SAT problem
  • Shai Ben-David (U. Waterloo) talk on Independence results for the P vs. NP question
  • Sam Buss (UCSD) talk on Proof complexity and SAT
Acknowledgements

Sponsors

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Logistics
Class Timings, Lunch/Breaks, MIT facilities

• 8:30 AM to 6 PM (35 lectures). Each Lecture 1/1.15 hour

• Coffee + Pastries: morning and afternoon

• Lunch: 12:30 - 2:00 PM at Student Center (W20) 2nd floor (http://whereis.mit.edu)

• Please sign the attendance sheet

• Power cables provided in classroom. Return after use

• MIT wifi: sign-in as visitor

• Volunteers: Artur Dmowski, Hank Hoffman, Mary McDavid, George Rossick, Joe Near, Mike Carbin, Vijay Ganesh
Thanks & Welcome Again!!

http://people.csail.mit.edu/vganesh/summerschool