MAKAI MANN

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SUMMARY

I am a fifth year Electrical Engineering PhD student at Stanford University working with Professor Clark Barrett on applying Satisfiability Modulo Theories (SMT) to formal verification. My interests also include optimization, control theory, robotics, and causal inference.

EDUCATION

Electrical Engineering PhD Candidate 2016 - present
Stanford University

Electrical Engineering MS 2016 - 2018
Stanford University

Systems Science and Engineering BS, Computer Science 2nd Major 2012 - 2016
Washington University in St. Louis (Summa Cum Laude)

Academic Awards and Scholarships

National Science Foundation Graduate Research Fellow 2018 - present

Stanford EDGE (Enhancing Diversity in Graduate Education) Fellow 2016 - present

Washington University Rodriguez Scholar 2012-2016

Washington University McLeod Scholar 2012-2016

Rick Grodsky ESE Award for Technical Achievement 2016
for Senior Design Project: Machine Learning Approaches to Solar Output Forecasting

ESE Outstanding Junior Award 2015

Tau Beta Pi Record Scholar 2015

ESE Outstanding Sophomore Award 2014

AISES Intel Scholar 2014

Relevant Coursework

Automated Reasoning

Logic and Artificial Intelligence

Convolutional Neural Networks for Visual Recognition

Probabilistic Graphical Models

Introduction to Statistical Signal Processing

Convex Optimization

Adaptive Signal Processing

Introduction to Linear Dynamical Systems

Error Correcting Codes

Character Animation: Modeling, Simulation and Control of Human Motion

EXPERIENCE

Research Assistant 2017 - present
Stanford University
Research in SMT-based model checking. Adapted partial order reduction for SAT/SMT based model checking of synchronous hardware. Developed an abstraction-refinement technique for array-manipulating systems with automatically discovered prophecy variables. Lead developer of solver-agnostic C++ SMT solving API, Smt-Switch, and a lightweight, adaptable model checker built on that API, Pono. Wrote Python bindings for CVC4.

Silicon Engineering Group Formal Verification Intern 2017 - 2019
Apple
Researching applications of SMT-based model checking for formal verification of Apple hardware designs. Consisted of two full-time, three month internships, and intermittent part-time internships.

Ballistic Missile Defense System Integration Intern 2015
MIT Lincoln Laboratory
Extended Kalman Filtering and multiple model state estimation algorithms development in MATLAB.

Software Development Intern 2014
Pacific Disaster Center
Developed an application to interpret and sort National Weather Service messages from a telnet stream.

Software Development Intern 2013
ArdentMC
Helped design an internal web communication platform.

Teaching Assistant for MATLAB (CSE 200) 2014 - 2015
Washington University in St. Louis

Peer Lead Team Learning Tutor for Calculus I and III 2013 - 2015
Washington University in St. Louis
Led students through exercised using modern educational techniques.

LEADERSHIP

EDGE Fellowship Mentor 2018 - 2020
Stanford University
Serve as a point-of-contact and mentor for two new EE PhD students.

Treasurer 2015 - 2016
Tau Beta Pi
Coordinated with the national organization and manage the budget.

SOFTWARE

Proficient In: Python, C++, Git,
Experience In: CMake, MATLAB, JasperGold
Repositories I contribute to:
https://github.com/makaimann/smt-switch https://github.com/upscale-project/pono/
https://github.com/CVC4/CVC4 https://github.com/yoni206/lazybv2int

SELECTED PUBLICATIONS

Partial Order Reduction for Deep Bug Finding in Synchronous Hardware 2020
Makai Mann, Clark Barrett
TACAS

Smt-Switch: a solver-agnostic C++ API for SMT Solving 2020
Makai Mann, Amalee Wilson, Cesare Tinelli, Clark Barrett
SMT Workshop

fault: A Python Embedded Domain-Specific Language for Metaprogramming Portable Hardware Verification Components 2020
Lenny Truong, Steven Herbst, Rajsekhar Setaluri, Makai Mann, Ross G. Daly, Keyi Zhang, Caleb Donovick, Daniel Stanley, Mark Horowitz, Clark Barrett, Pat Hanrahan
CAV

Unlocking the Power of Formal Hardware Verification with CoSA and Symbolic QED: Invited Paper 2019
Florian Lonsing, Karthik Ganesan, Makai Mann, Srinivasa Shashank Nuthakki, Eshan Singh, Mario Srouji, Yahan Yang, Subhashish Mitra, Clark Barrett
ICCAD

Agile SMT-Based Mapping for CGRAs with Restricted Routing Networks 2019
Caleb Donovick, Makai Mann, Clark Barrett, Pat Hanrahan
ReConFig

ShiftNets: Deep Convolutional Neural Networks for MR Image Reconstruction & the Importance of Receptive Field of View 2019
Philip K. Lee, Makai Mann, Brian A. Hargreaves
ISMRM

CoSA: Integrated Verification for Agile Hardware Design 2018
Cristian Mattarei, Makai Mann, Clark Barrett, Ross Daly, Dillon Huff, Pat Hanrahan
FMCAD