Mark Santolucito

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Research Interests

Program Synthesis/Verification, Reactive Systems, Software Engineering, Security, Computer Music

Education

Yale University

Yale University New Haven, CT

Computer Science Ph.D. - Advisor: Ruzica Piskac

New Haven, CT

2020 (Expected)

Computer Science M.S. - Advisors: Paul Hudak[†], Ruzica Piskac

2013-2015

Relevant Coursework: Software Analysis and Verification, Formal Semantics, Data Mining, Syntax Design, Compilers, Category Theory, Sound Synthesis, Robotics, Complexity

Amherst College Amherst, MA

Computer Science B.A. & Music B.A., Cum Laude

Advisors: Scott Kaplan, Jason Robinson

2009–2013

Professional Experience

Amazon New York, NY

SDE Intern - AWS Security Automation

Summer 2018

Applied my research on configuration file analysis to automatically build CloudFormation verification tools for code quality and security.

Geumgang University

Nonsan, South Korea

Visiting Faculty

Feb 2016-Aug 2016

Worked with other faculty and administration to design four-year curriculum map for new Computer Science major at the university. Taught three courses of my own design in a mix of Korean and English.

World Scholars, LLC New Haven, CT

Co-Founder, CTO

Feb 2017-Present

Co-founded an international educational exchange that has hosted more than 75 students in 4 separate programs with a revenue of \$60,000 USD in 2018. Designed curriculum, taught lectures, and managed technical operations. www.worldscholars.global

Awards and Honors

Yale Accelerator for Innovation Development

Yale Office of Cooperative Research

Fall 2019

Invited to participate in a program to advance my work on Automating eBPF Firewall Security toward commercialization.

Associates in Teaching

Yale Center for Teaching and Learning

Fall 2010

Given the opportunity to co-design and co-teach CPSC 334, Creative Embedded Systems. Graduate students are otherwise not allowed to act as instructors at Yale.

Program for Excellence in Science

AAAS Oct. 2018

By nomination of Dean Sleight of Yale, awarded a one-year sponsored membership in AAAS/Science.

Advanced Graduate Leadership Program

Yale University 2018–Present

\$3000 grant to fund additional career development.

Accelerator Funding

TSAI City Center for Innovation

Jan 2018

\$1000 grant from the Yale Entrepreneurship center to fund project and participate in accelerator program. Lead a team of four undergraduates to build free-space optics (laser) based mesh network to deliver secure and uncensored internet to infrastructure poor areas.

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Yale University 2017-2018

Awarded graduate funding on the recommendation of the Computer Science department.

Heidelberg Laureate Forum

Young Researcher Award Oct. 2017

Invited with full funding to attend the 5th HLF in Heidelberg, Germany with Turing Award winners and Fields Medalists.

Student Research Competition

FMCAD Oct. 2016

3rd Place Award for best student presentation.

Robert Willets Carle Fellow

Yale University 2014-2015

Awarded graduate funding on the recommendation of the Computer Science department

Travel Funding Awards

Summer schools: SSFT15, OPLSS2015, SAT/SMT2015, VTSA2017, ProbProg2017

Conferences: USENIX Security 2019, CAV2015/16/17, ICFP2015, POPL2016, FMCAD2016, CHI2019.

Best Undergraduate Thesis

Amherst College May 2013

Awarded to "the student who has written the best Computer Science thesis of the graduating class."

Lerner Piano Prize

Amherst College May 2013

Awarded to "the student who has achieved an exceptional level of ability and expressivity in the musical arts."

Pease Research Fellowship

Amherst College Fall 2012

\$500 grant for research in Representations of Media and Media Technology.

Dean of Faculty Funding

Amherst College June 2012

\$2080 grant for undergraduate thesis research in Media Technology.

Teaching Experience

• CPSC334: Creative Embedded Systems Fall 2019

Co-Instructor/Co-Course Designer Yale University

CS101: Intro to Computer Science
 Instructor/Course Designer
 Spring 2016
 Geumgang University

CS201: Object Oriented Programming
 Instructor/Course Designer
 Spring 2016
 Geumgang University

CS032: Computer Music
 Instructor/Course Designer
 Spring 2016
 Geumgang University

CPSC432/MUSI428: Computer Music Sound Synthesis
 Teaching Fellow
 Spring 2019, Spring 2018
 Yale University

CPSC431/MUSI427: Algorithmic Computer Music
 Teaching Fellow
 Fall 2018, Spring 2015
 Yale University

CPSC134/MUSI372: Programming Musical Applications
 Teaching Fellow
 Fall 2015
 Yale University

CPSC112: Intro to Android App Development
 Teaching Fellow
 Fall 2014
 Yale University

COSC111/COSC112: Introduction to Computer Science I/II
 Fall 2011-Spring 2013
 Amherst College

Student Project Advising

Nathan Nuñes, REU Summer Research '19 - An online interface for live programming by example

Maxwell Levatich, Summer Research '19 - Language agnostic SMT-based program repair

Kairo Morton, Summer Research '19 - Neural Network guided grammar selection for SyGuS

Nicholas Shoemaker, Independent Research '18/9 - Program transformations for MSP430

Elven Shum, Summer Research '19 - TSL synthesis for Android Apps with RxKotlin

Vivek Goplan, Summer Research '18 - Synthesizing SDNs as Functional Reactive Programs

Ryan Lim, BS Thesis '18 - Protecting Strong Anonymity in Mesh Networks

Kate Rogers, BS Thesis '18 - Synthesizing DSP Filters on Non-Commutative Sound Samples [10]

Drew Goldman, Independent Research '18 - On the Usability of Programming-By-Example for Scripting Tasks [11]

Halley Young, REU Summer Research '17 - Musical Refinement Types

Aeden Lombardo, REU Summer Research '17 - Synthesizing Music Synthesis [10]

Haohong Xu, BS Thesis '17 - Optimization of Synthesized Functional Reactive Programs

Aaron Shim, BS Thesis '16 - Towards Error-Free Configuration Files: A Learning Based Approach [12]

Marvin Qian, BS Thesis '15 - Representative Example Generation for Cooperative Programming

Invited Talks

Fashion Institute of Technology, NYC, USA Programming Digital Embroidery	Oct 2019
Facebook Faculty Networking Event, San Francisco, USA Automated Firewall Repair and Verification.	June 2019
NYC CS Fair, NYC, USA How to Play Your Laptop Like an Instrument: Live Coding for Music	Mar 2019
Yale Computer Science Society, New Haven, USA Panel Discussion - An Inside Look: CS Graduate School	Feb 2018
Code441 Hackathon, Hamilton, Bermuda Applications of Association Rule Learning and Neural Networks	Dec 2018
IBM PL Day, Yorktown Heights, USA Learning to Verify Infrastructure as Code.	Dec 2018
Xerox PARC, Palo Alto, USA Language Learning for Verification of Configuration Files	Oct 2018
New England Programming Languages Symposium, Cambridge, USA Digital Signal Processing Programming-by-Example.	Sept 2018
Verification and Synthesis for Software Evolution at ETAPS, Greece Learning Models of Configuration Correctness.	Apr 2018
Learning in Verification Workshop at ETAPS, Greece Using Machine Learning to Synthesize Specifications for Configuration Files	Apr 2018
IBM PL Day, Yorktown Heights, USA Synthesizing Functional Reactive Programs.	Dec 2017
Roslyn High School, NYC, USA Majoring in Computer Science - the Why and How.	Nov 2017
Instituto Superior Técnico (IST), Portugal Language Learning for Verification of Configuration Files.	May 2017
Saarland University, Germany Verifying Configuration Files with Examples.	Sept 2016
Monthly Music Hackathon, NYC, USA Workshop on Algorithmic Composition with Euterpea.	Jan 2015

Service

Organizer

SEConfig 2019, CAV Buddy System 2015,2016,2017

Program Committee

SYNT 2019, ML4PL 2018, FARM 2016

Publicity Chair

FARM 2017, FARM 2016

Journal Referee

TOPLAS 2017

Reviewer

IMWUT 2019, NIME 2019

Subreviewer

iFM 2018, SMT 2017, ESOP 2017, ICDCIT 2016, VSTTE 2015

Artifact Evaluation Committee

PLDI 2018

OMI Associate Director

Organize events and manage student membership of the Open Music Initiative - omi. yale. edu

Yale CS Social Leader

Organize the weekly CS socials in the department 2016-2017

Publications (indicates published proceedings, ↓ indicates alphabetic author ordering)

[1] Formal methods and computing identity-based mentorship for early stage researchers.

Mark Santolucito and Ruzica Piskac.

In ACM Technical Symposium on Computer Science Education (SIGCSE), 2020.

To Appear.

[2] Using wearables for data driven decision making in education.

Mark Santolucito, Dan Hoffman, Seungoh Paek, and Maria Hwang. Under submission, 2020.

[3] **Grammar filtering for syntax-guided synthesis**.

Kairo Morton, Bill Hallahan, Elven Shum, Ruzica Piskac, and Mark Santolucito.

In The Thirty-Fourth AAAI Conference on Artificial Intelligence (AAAI), 2020.

To Appear.

[4] Live programming by example.

Mark Santolucito, William T. Hallahan, and Ruzica Piskac.

In Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems, May 2019.

[5] **Studio report: Yale open music initiative.**

Scott Petersen, Mark Santolcuito, and Konrad Kaczmarek.

In International Computer Music Conference (ICMC), 2019.

[6] $\blacksquare \downarrow_{7}^{A}$ Temporal stream logic: Synthesis beyond the bools.

Bernd Finkbeiner, Felix Klein, Ruzica Piskac, and Mark Santolucito.

In International Conference on Computer Aided Verification (CAV), July 2019.

[7] $\mathbf{I}_{\mathbf{z}}^{\mathbf{A}}$ System design with TSL.

Bernd Finkbeiner, Felix Klein, Ruzica Piskac, and Mark Santolucito.

In SYNT workshop at CAV, July 2019.

[8] $\blacksquare \downarrow_z^A$ Synthesizing functional reactive programs.

Bernd Finkbeiner, Felix Klein, Ruzica Piskac, and Mark Santolucito.

In Haskell Symposium, October 2019.

[9] Statically verifying continuous integration configurations.

Mark Santolucito, Jialu Zhang, Ennan Zhai, and Ruzica Piskac.

CoRR, abs/1805.04473, 2018.

[10] Programming-by-example for audio: Synthesizing digital signal processing programs.

Mark Santolucito, Kate Rogers, Aedan Lombardo, and Ruzica Piskac.

In Functional Art and Music (FARM) at ICFP, 2018.

[11] Programming by example: Efficient, but not "helpful".

Mark Santolucito, Drew Goldman, Allyson Weseley, and Ruzica Piskac.

In PLATEAU at SPLASH 2018, 2018.

Also presented at SYNT 2018.

[12] **S**ynthesizing configuration file specifications with association rule learning.

Mark Santolucito, Ennan Zhai, Rahul Dhodapkar, Aaron Shim, and Ruzica Piskac.

Proc. ACM Program. Lang., 1(OOPSLA), October 2017.

[13] 🗐 🎔 Version space learning for verification on temporal differentials.

Mark Santolucito.

In International Symposium on Software Testing and Analysis (ISSTA), 2017.

Also presented as poster at FMCAD 2016 Student Research Competition, 3rd Place Award.

[14] $\blacksquare \downarrow_z^A$ Vehicle platooning simulations with functional reactive programming.

Bernd Finkbeiner, Felix Klein, Ruzica Piskac, and Mark Santolucito.

In Safe Control of Autonomous Vehicles Workshop at CPSWeek, 2017.

https://arxiv.org/abs/1803.10383.

[15] Probabilistic automated language learning for configuration files.

Mark Santolucito, Ennan Zhai, and Ruzica Piskac.

In International Conference on Computer Aided Verification (CAV), 2016.

[16] Media Modules: Intermedia Systems in a Pure Functional Paradigm.

Mark Santolucito, Donya Quick, and Paul Hudak.

In International Computer Music Conference (ICMC), 2015.

[17] Using javascript as an intermediate language for FRP.

Mark Santolucito and Ruzica Piskac.

Poster at ICFP Student Research Competition, 2015.

[18] **A** Real-time interactive music in haskell.

Paul Hudak, Donya Quick, Mark Santolucito, and Daniel Winograd-Cort.

In Functional Art and Music (FARM) at ICFP, 2015.

[19] Communalizing the interfaces of single player games.

Mark Santolucito and Maria Hwang.

Extended abstract in Digital Games Research Association Conference, 2014.

[20] Translating Raid the fridge!: Promoting healthy eating habits through the game Monster Appetitie.

Maria Hwang, Pantiphar Chantes, and Mark Santolucito.

Extended Abstract and Poster at Games Learning and Society 10, Best in Show Award, 2014.

[21] Simquabbin project: Game-based environmental science education in a virtual world.

Mark Santolucito and Scott Payne.

Extended Abstract and Poster at Games Learning and Society 9, 2013.

[22] Designing a community to support long-term interest in programming for middle school children.

Kyle J. Harms, Jordana H. Kerr, Michelle Ichinco, *Mark Santolucito*, Alexis Chuck, Terian Koscik, Mary Chou, and Caitlin L. Kelleher.

In Proceedings of the 11th International Conference on Interaction Design and Children, IDC '12, 2012.