

# Mark Santolucito

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## Research Interests

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

## Education

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### Yale University

Computer Science Ph.D. - Advisor: Ruzica Piskac

New Haven, CT

May 2020

### Yale University

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

New Haven, CT

May 2015

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

### Amherst College

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

Amherst, MA

May 2013

Advisors: Scott Kaplan, Jason Robinson

## Professional Experience

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### Barnard College, Columbia University

Tenure Track Assistant Professor

New York, NY

Fall 2020–

### Amazon

SDE Intern - AWS Security Automation

New York, NY

Summer 2018

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

### Geumgang University

Visiting Faculty

Nonsan, South Korea

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

Co-Founder, CTO

New Haven, CT

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

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### Honorable Mention

Google Bughunter Hall of Fame

Nov. 2019

Identified and reported a security vulnerability via Google's Bughunter program on their Infrastructure as Code tool, Cloud Composer.

### Associates in Teaching

Yale Center for Teaching and Learning

Fall 2019

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.

### 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

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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.

## Theres and Dennis M. Rohan Fellow

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

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- CPSC334: *Creative Embedded Systems* Fall 2019  
Co-Instructor/Co-Course Designer Yale University
- CS101: *Intro to Computer Science* Spring 2016  
Instructor/Course Designer Geumgang University
- CS201: *Object Oriented Programming* Spring 2016  
Instructor/Course Designer Geumgang University
- CS032: *Computer Music* Spring 2016  
Instructor/Course Designer Geumgang University
- CPSC432/MUSI428: *Computer Music Sound Synthesis* Spring 2019, Spring 2018  
Teaching Fellow Yale University

- *CPSC431/MUSI427: Algorithmic Computer Music* *Fall 2018, Spring 2015*  
Teaching Fellow Yale University
- *CPSC134/MUSI372: Programming Musical Applications* *Fall 2015*  
Teaching Fellow Yale University
- *CPSC112: Intro to Android App Development* *Fall 2014*  
Teaching Fellow Yale University
- *COSC111/COSC112: Introduction to Computer Science I/II* *Fall 2011-Spring 2013*  
Lead TA Amherst College

### Student Project Advising

Nathan Nuñez, 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 [?]  
 Drew Goldman, Independent Research '18 - On the Usability of Programming-By-Example for Scripting Tasks [?]  
 Halley Young, REU Summer Research '17 - Musical Refinement Types  
 Aeden Lombardo, REU Summer Research '17 - Synthesizing Music Synthesis [?]  
 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 [?]  
 Marvin Qian, BS Thesis '15 - Representative Example Generation for Cooperative Programming

### Invited Talks

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

Saarland University, Germany  
Verifying Configuration Files with Examples.

Sept 2016

Monthly Music Hackathon, NYC, USA  
Workshop on Algorithmic Composition with Euterpea.

Jan 2015

## Service

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### **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](http://omi.yale.edu)*

### **Yale CS Social Leader**

*Organize the weekly CS socials in the department 2016-2017*