

Jason W. Croft

CONTACT INFORMATION

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EDUCATION

University of Illinois at Urbana-Champaign, Urbana, Illinois USA
Ph.D. in Computer Science, 2010 – 2017
Cumulative GPA: 3.88/4.00
Thesis: *Toward Predictable Control of Software-Defined Networks*
Advisor: Matthew Caesar

Boston College, Chestnut Hill, Massachusetts USA
Bachelor of Science in Computer Science, May 2009, *cum laude*
Minors: Mathematics, Music
Cumulative GPA: 3.68/4.00, Major GPA: 3.82/4.00
Thesis: *A Feedback-Based Restrictive Content Distribution System for Peer-to-Peer Networks*
Advisor: Robert Signorile

AWARDS AND FELLOWSHIPS

National Science Foundation Graduate Research Fellowship, Honorable Mention, 2011
Chirag Foundation Fellowship, University of Illinois at Urbana-Champaign, 2010
Phi Beta Kappa Society, 2009
Boston College Venture Competition 2009, 2nd Place (NetGene: Browser-Based Distributed Cloud Computing)
Computing Research Association Outstanding Undergraduate Award, Honorable Mention, 2009
Golden Key International Honor Society, 2008
Dean's Scholar Finalist, Boston College, 2008
Undergraduate Research Fellowship, Boston College, 2007 – 2008

PUBLICATIONS

Jason Croft, Anduo Wang, Matthew Caesar, and Brighten Godfrey. *Ravel: An Efficient Database-Defined Network*. In submission.

Wenxuan Zhou, Jason Croft, Bingzhe Lui, and Matthew Caesar. *NEAt: Network Error Auto-Correct*. In 15th USENIX Symposium on Networked Systems Design and Implementation (**NSDI '18**), Renton, Washington, USA, April 2018.

Wenxuan Zhou, Jason Croft, Bingzhe Lui, and Matthew Caesar. *NEAt: Network Error Auto-Correct*. In 2017 Symposium on SDN Research (**SOSR '17**), Santa Clara, California, USA, April 2017.

Anduo Wang and Jason Croft. *Automating SDN Composition: A Database Approach*. In 2017 Symposium on SDN Research (**SOSR '17**), Poster Session, Santa Clara, California, USA, April 2017.

Anduo Wang, Jason Croft, and Eduard Dragut. *Reflections on Data Integration for SDN*. In 2017 ACM International Workshop on Security in Software Defined Networks and Network Function Virtualization (**SDN-NFV Security '17**), Scottsdale, Arizona, USA, March 2017. (Invited paper)

Jason Croft, Shambwaditya Saha, Anduo Wang, and Madhusudan Parthasarathy. *NetSum: Mining Summaries of Network Configuration Changes*. In 2016 Workshop on Science of Security through Software-Defined Networking (**SoSSDN '16**), Poster Session, Chicago, Illinois, USA, June 2016.

Anduo Wang, Xueyuan Mei, Jason Croft, Matthew Caesar, and Brighten Godfrey. *Ravel: A Database-Defined Network*. In 2016 Symposium on SDN Research (**SOSR '16**), Santa Clara, California, USA, March 2016.

Jason Croft, Ratul Mahajan, Matthew Caesar, and Madan Musuvathi. *Systematically Exploring the*

Behavior of Control Programs. In 2015 USENIX Annual Technical Conference (**ATC '15**), Santa Clara, California, USA, July 2015.

Wenxuan Zhou, Dong Jin, Jason Croft, Matthew Caesar, and Brighten Godfrey. *Enforcing Customizable Consistency Properties in Software-Defined Networks*. In 12th USENIX Symposium on Networked Systems Design and Implementation (**NSDI '15**), Oakland, California, USA, May 2015.

Jason Croft, Ratul Mahajan, Matthew Caesar, and Madan Musuvathi. *Back to the Future: Forecasting Program Behavior in Automated Homes*. Microsoft Research Technical Report MSR-TR-2012-131, May 2012.

Jason Croft and Matthew Caesar. *Towards Practical Avoidance of Information Leakage in Enterprise Networks*. In 6th USENIX Workshop on Hot Topics in Security (**HotSec '11**), San Francisco, California, USA, August 2011.

Jason Croft and Robert Signorile. *Secure Distribution of Confidential Information via Self-Destructing Data*. In 8th World Scientific and Engineering Academy and Society (WSEAS) International Conference on Data Networks, Communication, Computers (**DNCOCO '09**), Baltimore, Maryland, USA, November 2009.

Jason Croft and Robert Signorile. *A Self-Destructing File Distribution System with Feedback for Peer-to-Peer Networks*. In 9th World Scientific and Engineering Academy and Society (WSEAS) International Conference on Applied Computer Science (**ACS '09**), Genova, Italy, October 2009.

Gang Tan and Jason Croft. *An Empirical Security Study of the Native Code in the JDK*. In 17th USENIX Security Symposium 2008 (**USENIX Security '08**), San Jose, California, USA, July 2008.

Jason Croft and Gang Tan. *Security Analysis of the Native Code in Sun's JDK*. In 23rd Annual Computer Security Applications Conference (**ACSAC '07**), Work-in-Progress session, Miami, Florida, USA, December 2007.

RESEARCH
EXPERIENCE

Automating Network Repair April 2016 – Present
UIUC, Advisors: Prof. Matthew Caesar
Research Project
Investigated techniques to automatically repair updates to software-defined networks that violate correctness properties specified by a network administrator.

Database-Defined Networking June 2015 – Present
UIUC, Advisors: Prof. Matthew Caesar, Prof. Brighten Godfrey
Research Project
Designed an OpenFlow controller that uses a standard SQL database as the network control infrastructure, to allow a plain data representation of network topology, forwarding state, and control applications. Implemented runtime for PostgreSQL to communicate with OpenFlow switches, push updates to switches, and receive link state changes. Released on GitHub: <http://ravel-net.org/>.

Synthesizing and Mining Network Configuration Changes August 2015 – March 2017
UIUC, Advisors: Madhusudan Parthasarathy
Research Project
Extended NetGen (SOSR '15) to support synthesizing configuration changes for a large range of topologies. As part of follow-up work, investigated techniques to mine configuration changes from sets of data plane traces and summarize in the NetGen language.

Enforcing Consistency Properties in Software-Defined Networks April 2014 – April 2015
UIUC, Advisors: Prof. Matthew Caesar, Prof. Brighten Godfrey
Research Project
Developed mechanisms to synthesize update sequences that ensure network policies remain consistent between state transitions while minimizing delay.

Forecasting Program Behavior with Virtual Fast Forwarding May 2011 – July 2015
MSR, Advisors: Ratul Mahajan, Madan Musuvathi, Prof. Matthew Caesar
Internship
Designed a method of virtually “fast forwarding” software systems to give users and developers predictable control as they configure and develop applications for their systems. Building on techniques from real-time systems verification, model checking, and symbolic execution, we developed program

analysis techniques to generate models of code as timed automata and perform explicit state model checking to discover possible future behaviors of the real implementations. Incorporated novel partial order reduction to optimize the state space exploration of these implementations.

Circumventing Censorship with Protocol Steganography June 2012 – August 2012
ICSI, Advisors: Vern Paxson Internship
Investigated new techniques to camouflage potentially censored messages as innocuous web traffic.

Mitigating Network Extrusions with Practical Data Confinement June 2010 – May 2011
UIUC, Advisors: Prof. Matthew Caesar Research Project
Developed a distributed algorithm for network-wide protection against information leakage by confining data within a network perimeter. Processes receiving private data are forked and executed in parallel, one with and one without sensitive data, to detect dependence on the private data. By cloning a set of processes running across machines and coordinating their execution, we ensure outputs diverge—in packet contents or ordering—if and only if they are leaking data. Built on existing work to enforce determinism within the network to limit false positives.

Mitigating Information Leakage in Browsers with DittOS September 2010 – May 2011
UIUC, Advisors: Prof. Brighten Godfrey, Prof. Matthew Caesar CS598PBG Project
Designed and implemented DittOS, a modified Linux kernel providing real-time protection against information leakage in browsers with multi-process architectures. Each process consuming user-defined private data is forked to create a shadow copy with sensitive data scrubbed into random data. Divergent output between the original and shadow processes indicate dependence on private data and the destination is compared to a user-defined set of trusted destinations to determine if private data is leaked via buggy or malicious browser code, plugins, or extensions.

Secure Distribution of Confidential Information September 2008 – April 2009
BC, Advisors: Prof. Robert Signorile B.S. Thesis
Designed a method of securely distributing confidential data and preventing endpoint data loss in P2P networks using self-destructing data and reputation. Built off existing P2P trust algorithms to design a trust metric based on feedback of a peer's usage of sensitive data.

Inter-language Security of Multilingual Software May 2007 – May 2008
BC, Advisors: Prof. Gang Tan Undergraduate Research Fellowship
Investigated and analyzed inter-language security of multilingual software to identify and remove safety-critical bugs in frameworks such as JNI and .NET. Audited source code of JDK 1.6 to create taxonomy of bugs and create tools to facilitate writing of reliable and secure multilingual software.

ACADEMIC
EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, Illinois USA

Teaching Assistant September 2015 – May 2017
Designed programming assignments and implemented auto-grader for Coursera massive open online course *Cloud Networking* with 40k registered students (<https://www.coursera.org/course/cloudnetworking>).

Boston College, Chestnut Hill, Massachusetts USA

Vice President, Association for Computing Machinery September 2008 – May 2009
Planned meetings and organized events for local Boston College chapter, including department-wide code obfuscation competition.

Teaching Assistant September 2007 – December 2008
Graded student projects, programs, and homework assignments. Provided help and support to students in computer lab. Assisted professor with developing programming assignments.

- CS361 Information Security, Fall 2007
- CS383 Algorithms, Spring 2008
- MT435 Mathematical Programming, Fall 2008

PROFESSIONAL
EXPERIENCE

International Computer Science Institute, Berkeley, California USA

Research Intern, Networking Group May 2012 – August 2012
Advised by Vern Paxson.

Microsoft Research, Redmond, Washington USA

Research Intern, Networking and Research Group
Advised by Ratul Mahajan and Madan Musuvathi.

May 2011 – May 2012

Microsoft Corporation, Redmond, Washington USA

Software Design Engineer in Test, Forefront/Active Directory August 2009 – August 2010
Authored internally used tool for bug and error reporting of client software. Maintained existing code for Security State Assessment feature test suites and proposed solutions to improve its overall quality and stability. Developed framework for collecting traces from performance tests on cloud applications and merging with on-premise test results.

Software Design Engineer in Test Intern, Forefront Protection Manager June 2008 – August 2008
Designed and authored automated test cases in Forefront Protection Manager for malware outbreak containment component leveraging anti-malware and network access protection services. Received positive performance review with recommendation for full time hire.

CONFERENCE
PRESENTATIONS

2017 ACM International Workshop on Security in Software Defined Networks and Network Function Virtualization (SDN-NFV Security '17), Scottsdale, Arizona, USA, March 2017.

2015 USENIX Annual Technical Conference (ATC '15), Santa Clara, California, USA, July 2015.

Sixth USENIX Workshop on Hot Topics in Security (HotSec '11), San Francisco, CA, USA, August 2011.

First New England Undergraduate Computing Symposium (NEUCS '09), Poster Session, Wellesley, MA, USA, April 2009.

Twenty-third Annual Computer Security Applications Conference (ACSAC '07), Work-in-Progress Session, Miami, Florida, USA, December 2007.

PROFESSIONAL
SERVICE

Program-committee member, Hot-IoT 2016
External reviewer, SIGCOMM 2014
External reviewer, SIGCOMM 2013

PATENTS

Jason Croft, Ratul Mahajan, and Madan Musuvathi. *Modeling and Predicting Control System Behavior Through Fast-Forwarding*, Patent pending, application #20130158974.

ADVISED
STUDENTS

Branden Kroske (University of Central Florida). *Sending Programs "Back to the Future" with DeLorean*, Illinois Trust Institute Internship Program, 2012.

RELEVANT
COURSEWORK

Advanced Computer Networks, Advanced Operating Systems, Advanced Distributed Systems, Advanced Internetworking, Graduate Algorithms, Topics in Software Engineering

SKILLS

- Languages: Python, C#, Java, C++, SQL, Bash Scripting, L^AT_EX
- Programming Platforms/APIs: Linux kernel, Windows 7 kernel, Z3, Gurobi, PostgreSQL
- Applications: Emacs, Microsoft Visual Studio, Git, Subversion
- Operating Systems: Linux (Ubuntu), Windows (7, Server 2003/2008, Azure)