Tim Nelson

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United States Citizen

EDUCATION

PhD in Computer Science (Expected: May 2013)
Worcester Polytechnic Institute
Worcester, MA

M.S. in Computer Science (May 2010) (4.0 GPA)
Worcester Polytechnic Institute
Worcester, MA

B.S. in Computer Science (May 2007) (Summa Cum Laude)
Worcester State University
Worcester, MA

A.A. in Computer Science (December 1999)
Diablo Valley College
Pleasant Hill, CA

REFEREED PUBLICATIONS

Aluminum: Principled Scenario Exploration Through Minimality
Tim Nelson, Salman Saghafi, Daniel J. Dougherty, Kathi Fisler, Shriram Krishnamurthi
International Conference on Software Engineering (ICSE) 2013 (To Appear)

Toward a More Complete Alloy
Tim Nelson, Daniel J. Dougherty, Kathi Fisler, Shriram Krishnamurthi
International Conference on Abstract State Machines, Alloy, B, and Z (ABZ) 2012

The Margrave Tool for Firewall Analysis
Tim Nelson, Christopher Barratt, Daniel J. Dougherty, Kathi Fisler, Shriram Krishnamurthi
USENIX Large Installation System Administration Conference (LISA) 2010

On the Finite Model Property in Order-Sorted Logic
Tim Nelson, Daniel J. Dougherty, Kathi Fisler and Shriram Krishnamurthi
Synthesis, Verification, and Analysis of Rich Models (SVARM) 2010

Copies of these papers are available at: http://www.cs.wpi.edu/~tn/publications

RESEARCH SOFTWARE

I have taken the lead in developing the following software packages:

The Margrave Tool for Policy Analysis
Margrave provides concrete scenarios that illustrate how security policies behave and interact. One might ask Margrave how packets are handled differently by different paths through a network, or use it to discover which policy rules contribute to that difference. Margrave supports several real-world policy languages, as well as its own intermediate policy language, and provides a flexible query language for users interested in verifying properties or in narrowing the scope of scenarios given.

Aluminum
Aluminum is a variant of the Alloy Analyzer that presents only minimal models: those in which every truth is necessary. Aluminum lets users explore explore the scenarios for a specification by augmenting a given model with consistent facts; the resulting minimal models illustrate the consequences of these additions.

PROFESSIONAL EXPERIENCE

Research

Research Assistant Sept 2007 – present
Applied Logic and Security Lab
Worcester Polytechnic University
Supervisors: Prof. Kathi Fisler, Prof. Daniel J. Dougherty.

My work is largely concerned with *scenario-finding*, a type of static analysis which computes and presents concrete examples of how a system might behave. In the Margrave project, we apply scenario-finding to security policies. Our Aluminum project investigates principled methods for exploring the space of scenarios. My dissertation, *Computing and Selecting First-Order Models in Policy Analysis*, encompasses both of these projects, with an eye toward making scenario-finding tools more useful for security professionals.

Industry Experience

Programmer/Analyst (Oct 2004 – Aug 2006)
SunGard Trust Tax Services (Worcester, MA)

Programmer/Analyst (Feb 2000 – Mar 2002)
Trust Tax Services of America (Worcester, MA)

I worked as part of a team to maintain and enhance fiduciary-tax preparation software, written largely in Borland Delphi (Object Pascal). I played a part in the design process for several projects. My key contributions included: a complete redesign and re-implementation of routines for printing and previewing tax documents stored in the PCL printer language; creation of database software for use in-house including custom SQL queries; and improvements to all aspects of the system to increase efficiency. After a hiatus, I returned to perform the same role under new management.

PROFESSIONAL SERVICE

Program Committees and Reviewing

2013 Program Committee of USENIX Large Installation System Administration (LISA)

2012 Program Committee of USENIX Large Installation System Administration (LISA)

2011 Program Committee of USENIX Large Installation System Administration (LISA)

Reviewer for ASIACCS, CCS, IEEE S&P, and IEEE Transactions on
Network and Service Management

Invited Talks

The Margrave Project for Configuration Analysis (joint with Shriram Krishnamurthi)
Cornell University
Formal Methods in Networking Summer School
June 2013 (Upcoming)

Applications and Foundations of Scenario-Finding Tools
Boston University
iBench Initiative Group
February 2013

Applications and Foundations of Scenario-Finding Tools
Massachusetts Institute of Technology
Software Design Group
December 2012

The Margrave Tool for Firewall Analysis
ACM Symposium on Computer Human Interaction for Management of Information Technology
December 2011

Other Contributions

Summaries of technical sessions of LISA 2011 and LISA 2012 published in `:login;`, the USENIX magazine.

TEACHING EXPERIENCE

Classroom Teaching

Guest Lecture: Security Models (October 2012)
Software Security Engineering Course
Worcester Polytechnic Institute

The class and I discussed different definitions of "security", and how building a secure system is not as simple as following a list of best practices. I presented the Bell-LaPadula, Biba, and Clark-Wilson security models and how they can be applied today.

Coding Practice Labs (November 2012 – December 2012)

I ran a weekly coding practice lab session for our object-oriented design concepts class. I worked with groups of anywhere from one to twenty students, giving them fresh exercises to reinforce their regular lab sessions.

Tutoring

Computer Center Technician (Jan 1999 – Dec 1999)
Computer Center Lab Assistant (Sept 1997 – Jan 1999)
Diablo Valley College (Pleasant Hill, CA)

I tutored students in general computer use as well as computer-science course material: C, Java, BASIC, data structures and algorithms. I also maintained existing computer equipment and installed and troubleshot new systems. After a promotion in 1999, I continued my tutoring duties, but also supervised up to 2 lab assistants.

Mentoring

Undergraduate Mentoring (June 2010 – August 2010)

I worked with a second-year undergraduate at Brown University to produce a new version of Margrave. I introduced the student to many new concepts, including propositional and first-order logic and satisfiability testing. The new version was successfully presented at LISA 2010.

AWARDS

First Place, Science Category
WPI Innovation Exchange (Poster Competition)
March 2013

Graduate Assistance in Areas of National Need (GAANN) Fellowship
September 2012 – present

Carl and Inez Weidenmiller Fellowship
September 2008 – May 2009

WPI Institute Fellowship
September 2007 – May 2008

Dean's List
Worcester State University
2004 – 2007