

## Peter A. H. Peterson

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### CONTACT INFORMATION

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### RESEARCH INTERESTS

I perform research to improve the security and energy efficiency of operating systems. I also research Computer Science education and curriculum development. My current systems research combines non-lossy compression, heuristic models and classic operating systems concepts to create a transparent adaptive compression facility capable of automatically saving time, space and energy. My current security research includes Adaptive Compression systems that provide benefits while minimizing information leakage. Previous security projects focus on improving confidentiality in operating systems through information flow control and encryption. My ongoing education work centers on hands-on, publicly available computer security education homework and capture-the-flag exercises.

### EDUCATION

**Ph.D. Computer Science** **Fall 2013**  
University of California, Los Angeles Los Angeles, California

Committee: Peter L. Reiher (advisor), Todd Millstein (co-advisor), Junghoo “John” Cho,  
William J. Kaiser, D. Stott Parker  
Major field: *Software Systems* Minor fields: *Databases* and *Artificial Intelligence*  
Thesis Topic: *Datacomp: Locally Independent Adaptive Compression for Real-World Systems*

**M.Sc. Computer Science** **Winter 2009**  
University of California, Los Angeles Los Angeles, California

Committee: Peter L. Reiher (advisor), Junghoo “John” Cho, Todd Millstein  
Comprehensive: *Security Exercise Design Using DETER*

**Bachelor of Music Education (BME)** **May 1999**  
North Park University Chicago, Illinois

### PROFESSIONAL EXPERIENCE

**Research Scientist** **Starting May 2014**  
University of Southern California Information Sciences Institute Marina Del Rey, California

Will work with Dr. Jelena Mirkovic to develop and improve on-line computer security education resources on the DETER testbed. Will develop multiple reusable “capture-the-flag” exercises on DETER for public use. Will update and improve existing security education curriculum and evaluation mechanisms. Will assist educators using our exercises. Will collaborate on research proposals and papers involving use of security testbeds for education.

**Research Assistant** **July 2007–Fall 2013**  
University of California, Los Angeles Los Angeles, California

Member of Dr. Peter L. Reiher’s Laboratory for Advanced Systems Research (LASR). Performed operating systems research and development in the areas of adaptive compression, energy efficiency, and computer security. Developed and evaluated publicly available educational materials and supported their use at UCLA and elsewhere. Participated in regular lab meetings presenting and discussing current research. Assisted in the development and preparation of funding proposals. Identified research projects for and provided assistance to undergraduate and graduate researchers. Wrote, edited, and presented papers. Collaborated with Dr. William J. Kaiser’s lab in the Electrical Engineering department at UCLA to perform research with and develop software for their energy measurement platform.

**Director of Information Technology**  
The Yucaipa Companies

**October 2005–June 2006**  
West Hollywood, California

Hired to design, build, and maintain a highly secure and reliable internal network for a multi-billion dollar private equity firm. Completed “clean slate” rebuild using open-source tools resulting in a transparent but strongly compartmentalized network. Established and managed an in-house I.T. department.

**PC Coordinator**  
North Park University

**July 1999–June 2005**  
Chicago, Illinois

Wrote and maintained web-based password management software unifying the authentication credentials of multiple campus systems, resulting in more convenience for users and better security through stronger password requirements. Responsible for researching, installing, maintaining and monitoring the first network intrusion detection system at North Park, leading to proactive rather than reactive problem identification and threat resolution. Installed and maintained communications networks and performed various support duties.

TEACHING  
EXPERIENCE

**Co-instructor, Embedded Systems Security**  
University of California, Los Angeles

**Fall 2011**  
Los Angeles, California

Created research seminar with Dr. Peter L. Reiher introducing students to rigorous research principles and systems performance measurement. Divided 23 students into groups of four or five to investigate trade-offs between security-related work and energy consumption. Co-led weekly research meetings with each group to discuss potential experiments, methodologies, technical problems, results and deadlines. Observed final presentations and reviewed project papers. Received positive feedback from participants and developed several components into successful research projects for graduate students.

**Teaching Assistant, Graduate Computer Security**  
University of California, Los Angeles

**Spring 2008, 2010 & 2011**  
Los Angeles, California

Assisted up to 27 on-line Master’s students possessing a broad range of technical backgrounds. Addressed student questions via email and web forum and held office hours via on-line chat. Provided “in-person” assistance to students using remote terminal-sharing software. Graded exercises and helped develop and proctor exams.

**Teaching Assistant, Undergraduate Computer Security**  
University of California, Los Angeles

**Winter 2008 & Fall 2010**  
Los Angeles, California

Prepared and delivered interactive weekly lectures, live demos and command-line tutorials for up to 41 undergraduate students on security issues and the technical material necessary to complete coursework. Worked through examples and answered questions relating to the exercises, regular lectures, and exams. Assigned and graded exercises, administered quizzes, proctored midterms and finals, and provided student support through regular office hours, email and the class forum.

**Teaching Assistant, Computer Organization**  
University of California, Los Angeles

**Fall 2007**  
Los Angeles, California

Graded projects and proctored and graded exams for 53 undergraduate Computer Science students in an entry-level course focusing on concepts such as binary representation and conversion, logical operations, floating point arithmetic and MIPS assembly language.

Served as sole instructor for a semester-long Computer Networking class of undergraduate Computer Science majors focusing on high-level network organization and communications principles. Prepared readings and lectures, held office hours and created and graded all homework and exams.

## PUBLICATIONS

### CONFERENCES AND WORKSHOPS

1. J. Mirkovic and P. A. H. Peterson. "Class Capture-the-Flag Exercises". Invited paper to appear in the *USENIX Summit on Gaming, Games and Gamification in Security Education (3GSE)*, August 2014.
2. M. Gray, P. A. H. Peterson and P. Reiher. "Scaling Down Off-The-Shelf Data Compression: Backwards-Compatible Fine-Grain Mixing". In *Proceedings of the IEEE International Conference on Distributed Computing Systems (ICDCS)*, June 2012 (Acceptance rate: 14%).
3. C. Fleming, P. A. H. Peterson, E. Kline and P. Reiher. "Data Tethers: Preventing Information Leakage by Enforcing Environmental Data Access Policies". In *Proceedings of the IEEE International Conference on Communications (ICC)*, June 2012 (Acceptance rate: 37%).
4. A. Fujimoto, P. A. H. Peterson and P. Reiher. "Investigating the Energy Costs of Full Disk Encryption". In the *Workshop on Energy Consumption and Reliability of Storage Systems (ERSS)*, part of the *2012 International Green Computing Conference (IGCC)*, June 2012.
5. J. Mirkovic, M. Ryan, J. Hickey, K. Sklower, P. Reiher, P. A. H. Peterson, B. H. Kang, M. C. Chuah, D. Massey and G. Ragusa. "Teaching Security With Network Testbeds". In the *Proceedings of the ACM SIGCOMM Workshop on Education*, August, 2011.
6. P. A. H. Peterson, D. Singh, W. Kaiser and P. Reiher. "Investigating Energy and Security Trade-offs in the Classroom With the Atom LEAP Testbed". In the *4th USENIX Workshop on Cyber Security Experimentation and Test (CSET)*, August 2011.
7. P. A. H. Peterson. "Cryptkeeper: Improving Security with Encrypted RAM". In *Proceedings of the IEEE Conference on Technologies for Homeland Security (HST)*, November 2010.
8. P. A. H. Peterson and P. Reiher. "Security Exercises for the Online Classroom with DETER". In the *3rd USENIX Workshop on Cyber Security Experimentation and Test (CSET)*, August 2010.

### PRESENTATIONS

1. "Class Capture-the-Flag Exercises". To present at the *USENIX Summit on Gaming, Games and Gamification in Security Education (3GSE)*, August 2014.
2. "Investigating the Energy Costs of Full Disk Encryption". Presented at the *2nd Workshop on Energy Consumption and Reliability of Storage Systems (ERSS)*, San Jose, CA, June 2012.
3. "Scaling Down Off-The-Shelf Data Compression: Backwards-Compatible Fine-Grain Mixing". Presented at the *32nd Annual IEEE International Conference on Distributed Computing Systems (ICDCS)*, Macau, China, June 2012.
4. "Investigating Energy and Security Trade-offs in the Classroom With the Atom LEAP Testbed". Presented at the *4th USENIX Workshop on Cyber Security Experimentation and Test (CSET)*, San Francisco, CA, August 2011.
5. "Cryptkeeper: Improving Security with Encrypted RAM". Presented at the *12th Annual IEEE Conference on Technologies for Homeland Security Technologies (HST)*, Waltham, MA, November 2010.
6. "Security Exercises for the Online Classroom with DETER". Presented at the *3rd USENIX Workshop on Cyber Security Experimentation and Test (CSET)*, Washington, D.C., August 2010.

## WHITE PAPERS

D. Singh, P. A. H. Peterson, P. Reiher and W. Kaiser. “The Atom LEAP Platform For Energy-Efficient Embedded Computing: Architecture, Operation, and System Implementation”, December 2010. Available at <http://lasr.cs.ucla.edu/~pedro/docs/leap-aosi.pdf>

## EDUCATIONAL MATERIALS

### Computer Security Exercises

Created five hands-on, exploratory security exercises that simulate real-world environments and problems using widely-used open source software and DETERLab, a large, free-to-use public security and education testbed with approximately 400 physical computers and a reconfigurable network. Designed exercises to instantiate safe and remotely-accessible environments where both traditional and on-line students can experience, understand, and remediate engaging but challenging issues involving permissions, firewalls, computer forensics, common software exploits, eavesdropping, insertion, “man-in-the-middle” attacks and network intrusion detection systems.

Successfully utilized these exercises over many quarters at UCLA and supported instructors at other institutions that incorporated the exercises into their courses. As of 2013, individual exercises have been used approximately 65 times as part of courses at 18 different institutions in the US and abroad. Downloadable materials are available at <http://lasr.cs.ucla.edu/~pedro/docs/sec labs/>. Official on-line copies of these exercises, including answer keys and sample answers, grading spreadsheets and source code are available after authentication at <http://education.deterlab.net/>.

### Investigating Energy and Security Trade-offs

Authored the *zPad Design Document*, a fictional “internal memo” describing a security and energy research program for a tablet computer manufacturer, which served as the project framework for our course introducing students to systems research. Identified and described the five open-ended research topics available to student groups and the guidelines regarding project deliverables. Paper describing course experiences at <http://lasr.cs.ucla.edu/~pedro/docs/cset-2011.pdf>. Design document available at <http://lasr.cs.ucla.edu/~pedro/docs/zpad-design.pdf>.

## SERVICE & MENTORING

### Reviewer

2014 Computer Science Doctoral Admission Committee

**Winter 2014**  
University of California, Los Angeles

### Member and Lab Representative

Computer Science Graduate Student Committee

**2007–May 2012**  
University of California, Los Angeles

Original member of the Computer Science Graduate Student Committee (CSGSC) at UCLA, which self-organized to fill the perceived need for communication and a greater sense of community within the department. Worked with the CSGSC to brainstorm areas for improved student support, which over time included a mentoring program, student-to-student forums and a wiki containing tips and frequently asked questions. Involved in organizing a weekly tea time, game night, departmental picnics and other events. Served as my lab’s CSGSC representative.

### Co-creator and Co-Chair, Emcee

\$CONTEST: So You Think You Can Present?!

**May 2010 & April 2011**  
University of California, Los Angeles

Co-created and co-chaired (in 2010) and emceed (in 2011) a presentation contest to increase community awareness of student research within the department and provide opportunities for students to polish presentation skills. Sought and obtained sponsorship from Northrop-Grumman’s Future Technical Leaders program. Chose (via committee) six contestants to give 15-minute presentations, followed by short critiques from a faculty “celebrity panel.” Student votes ranked the contestants (each of whom received a monetary prize), while the judges awarded trophies for “Most Style” and “Most Substance.” We provided food, pens, T-shirts, and other goodies. We received overwhelmingly positive feedback from students and faculty, and the Northrop-Grumman liaison rated the contest a “grade 10 event.”

**Mentor and Panelist****2009–2010**

CSGSC Incoming Graduate Student Programs

University of California, Los Angeles

Served as a mentor in 2009 and 2010 for the CSGSC-created incoming graduate student mentoring program. Acted as a 2010 panelist for a special “students only” info-session intended to encourage new students to ask questions they might not feel comfortable asking of faculty or staff.

## GRANTS

- CSET 2011 Student Travel Grant
- UCLA Student Presentation Travel Grant (used for HST 2010)
- CSET 2010 Student Travel Grant

PROFESSIONAL  
MEMBERSHIPS

- ACM
- IEEE
- USENIX