

Cliff C. Zou (Changchun Zou)
Curriculum Vitae

Department of Electrical and Computer Engineering
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RESEARCH INTERESTS

Computer and network security, especially modeling and defense of Internet viruses and worms, denial-of-service attacks, and statistical-based intrusion detection.

EDUCATION

Ph.D. in Electrical and Computer Engineering
University of Massachusetts at Amherst
Dissertation: *Modeling, Analysis, and Mitigation of Internet Worm Attacks*
Advisors: Weibo Gong and Don Towsley
Committee: Weibo Gong, Don Towsley, Lewis E. Franks, and Lixin Gao
expected: May 2005
Amherst, MA

M.S., and **B.S.** in Electrical Engineering
University of Science & Technology of China (USTC)
July 1999, & July 1996
Hefei, China

PUBLICATIONS

All papers are available for downloading: <http://tennis.ecs.umass.edu/~czou>

Refereed journal

Cliff C. Zou, Weibo Gong, Don Towsley, and Lixin Gao. "The Monitoring and Early Detection of Internet Worms," to appear in *IEEE/ACM Transactions on Networking*.

Refereed conferences and workshops

Cliff C. Zou, Weibo Gong, and Don Towsley. "Code Red Worm Propagation Modeling and Analysis," *9th ACM Conference on Computer and Communication Security (CCS'02)*, Nov. 18–22, 2002. Washington DC, U.S. (Acceptance ratio: 27/153=17.6%; CiteSeer citations: 32).

Cliff C. Zou, Lixin Gao, Weibo Gong, and Don Towsley. "Monitoring and Early Warning for Internet Worms," *10th ACM Conference on Computer and Communication Security (CCS'03)*, Oct. 27–31, 2003. Washington DC, U.S. (Acceptance ratio: 35/253=13.8%; CiteSeer citations: 19).

Cliff C. Zou, Weibo Gong, and Don Towsley. "Worm Propagation Modeling and Analysis under Dynamic Quarantine Defense," *ACM/CCS Workshop on Rapid Malcode (WORM'03)*, Oct. 27, 2003. Washington DC, U.S. (Acceptance ratio: 10/25=40%; CiteSeer citations: 5).

Cliff C. Zou, Don Towsley, and Weibo Gong. "Email Worm Modeling and Defense," *13th International Conference on Computer Communications and Networks (ICCCN'04)*, Oct. 11–13, 2004. Chicago, IL, U.S. (Best Paper Nominee, Acceptance ratio: 73/207=35.3%; CiteSeer citations: 6).

Papers under review

Cliff C. Zou, Nick Duffield, Don Towsley, and Weibo Gong. "Adaptive Defense Against Various Network Attacks," submitted to *ACM SIGMETRICS 2005*.

Cliff C. Zou, Don Towsley, and Weibo Gong. "On the Performance of Internet Worm Scanning Strategies," submitted to *Journal of Performance Evaluation* (CiteSeer citations: 2).

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Curriculum Vitae

Technical reports and other publications

- Cliff C. Zou, Don Towsley, Weibo Gong, and Songlin Cai. "Routing Worm: A Fast, Selective Attack Worm based on IP Address Information," UMass ECE Technical Report TR-03-CSE-06, November 2003 (CiteSeer citations: 4).
- Cliff C. Zou, Weibo Gong, and Don Towsley. "Feedback Email Worm Defense System for Enterprise Networks," UMass ECE Technical Report TR-04-CSE-05, April 16, 2004.
- Cliff C. Zou, Don Towsley, and Weibo Gong. "A Firewall Network System for Worm Defense in Enterprise Networks," UMass ECE Technical Report TR-04-CSE-01, February 2004.
- Cliff C. Zou, Hongsheng Xi, Baoqun Yin, Yaping Zhou, and Demin Sun. "Derivative Estimates Parallel Simulation Algorithm Based on Performance Potentials Theory." *International Federation of Automatic Control Conference (IFAC'99)*, July 5–9, 1999. Beijing, China.

Several papers above have been used as required reading in graduate courses at no less than nine U.S. universities, including: Georgia Institute of Technology, Univ. Wisconsin-Madison, Johns Hopkins University, UIUC, etc.

RESEARCH EXPERIENCE

University of Massachusetts at Amherst Amherst, MA
Research Assistant, Complex Systems Modeling and Control Lab 09/1999–present

In recent years, scan-based worms (such as Code Red, Slammer, Blaster, etc.) and mass-mailing email worms have posed tremendous threats to computer networks. My Ph.D. research concentrates on the modeling of and defense against these malicious codes. On worm modeling, we extend epidemic models to consider network congestion and human countermeasures in modeling a worm's propagation; we also model and analyze various worm-scanning strategies and email worm propagation. On worm detection, we present a novel Kalman-filter-based early detection system. On worm defense, we present a dynamic quarantine defense system and study how to protect an enterprise network from various worm infections.

AT&T Labs Research Florham Park, NJ
Graduate Intern 06/2004–08/2004

To defend against various network attacks under a dynamically changing environment, it is necessary to find a systematic way to automatically tune a defense system's configurations. Working under the supervision of Nick Duffield, I presented an *adaptive defense* principle based on cost minimization and provided detailed adaptive defense systems for defending against various Distributed Denial-of-Service (DDoS) attacks and Internet worm infections.

Quadrant Engineering Inc. Amherst, MA
Graduate Intern 06/2000–01/2001

For the project "High Dimension Clustering for Computer Intrusion Detection," funded by the U.S. Air Force, I used classification methods and the Hidden Markov Model to detect anomaly activities in real web traces for intrusion detection.

University of Science & Technology of China China
Research Assistant 09/1996–06/1999

Cliff C. Zou (Changchun Zou)

Curriculum Vitae

In the parallel simulation of a discrete-event dynamic system theory, I presented a new *screwy-partitioning* algorithm on parallel matrix computation that exhibited near linear speedup on an SIMD parallel computer.

TEACHING EXPERIENCE

University of Massachusetts

Teaching Assistant, Department of Electrical & Computer Engineering

Amherst, MA

09/2000–01/2001

I was a Teaching Assistant for an undergraduate course, “Digital System Design,” that had more than 150 students. I was solely responsible for developing and grading lab projects, and designing and maintaining the course’s website. I also graded homework and exams with another TA. I was named *Outstanding Graduate Teaching Assistant* by my department.

University of Science & Technology of China

Instructor, Department of Information Science

China

02/1997–07/1998

I was an instructor for two undergraduate computer courses, “Introduction of the Computer and its Applications” and “BASIC Programming Language.” I was solely responsible for lectures, labs, and homework. From this experience, I realized I loved teaching and that this feeling would shape my lifelong career path—to seek opportunities to share my knowledge with others, with passion, for the benefit of us all.

PRESENTATIONS AND INVITED TALKS

Conference presentations of full-length papers:

- ACM Computer and Communication Security (CCS) 2002
- ACM Computer and Communication Security (CCS) 2003
- ACM Workshop on Rapid Malcode (WORM) 2003
- International Conference on Computer Communications and Networks (ICCCN) 2004

Invited talks entitled “Modeling, Analysis, and Mitigation of Internet Worm Attacks”:

- AT&T Labs Research, Florham Park, NJ, December 9, 2003
- CS Dept. Colloquium, Worcester Polytechnic Institute (WPI), MA, January 16, 2004

HONORS

Best Paper Nominee in ICCCN 2004.

Interviewed by *National Public Radio* (NPR) on my research “dynamic quarantine of Internet worm” (by Correspondent Larry Abramson), September 2003.

Outstanding Graduate Teaching Assistant, University of Massachusetts, 2000/2001.

Graduate School Fellowship, University of Massachusetts, 1999/2000.

Guo Moruo Scholarship, the highest scholarship in the University of Science & Technology of China (USTC), 1996.

PROFESSIONAL SERVICE

Paper reviewing for: IEEE Transactions on Computers; IEEE Security & Privacy Magazine;

Simulation: Transactions of The Society for Modeling and Simulation International; ICC 2004; WORM 2004; INFOCOM 2005; QEST 2004.

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REFERENCES

Weibo Gong, (Advisor) Professor

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Don Towsley, (Co-advisor) Professor

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Phone: (413) 545-0207 E-mail: towsley@cs.umass.edu

Nick Duffield, Technology Leader

Network Management & Performance Dept., AT&T Labs Research
180 Park Ave, P.O. Box 971, Florham Park, NJ 07932-0971
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Wenke Lee, Assistant Professor

College of Computing, Georgia Institute of Technology, Atlanta, GA 30332-0280
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Lewis E. Franks, Professor Emeritus

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Lixin Gao, Associate Professor

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