

Cristian Lumezanu

CURRICULUM VITAE

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EDUCATION

University of Maryland, College Park, MD

Ph.D., Computer Science

September 2009

M.S., Computer Science

May 2006

Politehnica University, Bucharest, Romania

M.S., Computer Science

July 2003

B.S., Computer Science

June 2002

AWARDS

Computing Innovation Postdoctoral Fellowship, NSF/CRA/CCC 2009

Computer Science Department Fellowship, University of Maryland 2003 - 2005

Honorary Award for Outstanding Academic Results, Politehnica University, Bucharest 2002

Merit-based Fellowship, Politehnica University, Bucharest 1997-2002

PROFESSIONAL EXPERIENCE

Georgia Institute of Technology, *Postdoctoral fellow* November 2009 - present
Working in Nick Feamster's group; current projects include autonomous and flexible traffic engineering, fine-grained contracts for Internet connectivity, and performance-based algorithms for cloud applications.

University of Maryland, *Research assistant* June 2004 - October 2009
As a graduate student under the guidance of Neil Spring, I worked on projects spanning several areas in systems and networking: *overlay networks* (PeerWise mutual-advantageous routing overlays, appeared as part of my dissertation, also in NSDI 2009 and HotNets 2007), *Internet measurement* (measurement study on triangle inequality violations in the Internet latency space, in PAM 2009 and IMC 2009), *distributed systems* (OverSeq message ordering protocol, in Middleware 2006), and *security* (Pistachio static analysis tool for network protocol implementations, in Usenix Security 2006).

Alcatel-Lucent Bell Laboratories, *Researcher/Intern* Summer 2009
With Katherine Guo, I designed and built a system to eliminate redundant traffic and increase available bandwidth in cellular wireless networks.

IBM T.J. Watson Research Center, *Researcher/Intern* Summer 2005, Summer 2006
Worked in the distributed messaging systems group, with Sumeer Bholra and Mark Astley, and designed resource allocation protocols for information dissemination applications; our work appeared in ICDCS 2006 and ICDCS 2008.

PUBLICATIONS

REFEREED PUBLICATIONS

- 1 Triangle Inequality Variations in the Internet
Cristian Lumezanu, Randy Baden, Neil Spring, Bobby Bhattacharjee
IMC (Internet Measurement Conference), 2009
- 2 Symbiotic Relationships in Internet Routing Overlays
Cristian Lumezanu, Randy Baden, Dave Levin, Neil Spring, Bobby Bhattacharjee
NSDI (Symposium on Networked Systems Design and Implementation), 2009

- 3 Triangle Inequality and Routing Policy Violations in the Internet
Cristian Lumezanu, Randy Baden, Neil Spring, Bobby Bhattacharjee
PAM (Passive and Active Measurement Conference), 2009
- 4 Motivating Participation in Internet Routing Overlays
Dave Levin, Randy Baden, **Cristian Lumezanu**, Neil Spring, Bobby Bhattacharjee
NetEcon (Workshop on the Economics of Networks, Systems, and Computation), 2008
- 5 Online Optimization for Latency Assignment in Distributed Real-Time Systems
Cristian Lumezanu, Sumeer Bhola, Mark Astley
ICDCS (International Conference on Distributed Computing Systems), 2008
- 6 Measurement Manipulation and Space Selection in Network Coordinates
Cristian Lumezanu, Neil Spring
ICDCS (International Conference on Distributed Computing Systems), 2008
- 7 Rule-Based Static Analysis of Network Protocol Implementations
Octavian Udrea, **Cristian Lumezanu**, Jeffrey S. Foster
Journal of Information and Computation, Special Issue on Foundations and Automated Reasoning, volume 206, issues 2-4, 2008
- 8 PeerWise Discovery and Negotiation of Faster Paths
Cristian Lumezanu, Dave Levin, Neil Spring
HotNets (Workshop on Hot Topics in Networking), 2007
- 9 Boycotting and Extorting Nodes in an Internetwork
Dave Levin, Adam Bender, **Cristian Lumezanu**, Neil Spring, Bobby Bhattacharjee
NetEcon+IBC (Workshop on the Economics of Networked Systems and Incentive-Based Computing), 2007
- 10 Decentralized Message Ordering for Publish/Subscribe Systems
Cristian Lumezanu, Neil Spring, Bobby Bhattacharjee
Middleware (International Middleware Conference), 2006
- 11 Rule-Based Static Analysis of Network Protocol Implementations
Octavian Udrea, **Cristian Lumezanu**, Jeffrey S. Foster
Usenix Security, 2006
- 12 Utility Optimization for Event-Driven Distributed Infrastructures
Cristian Lumezanu, Sumeer Bhola, Mark Astley
ICDCS (International Conference on Distributed Computing Systems), 2006

TECHNICAL REPORTS

- 13 Online Optimization for Latency Assignment in Distributed Real-Time Systems
Cristian Lumezanu, Sumeer Bhola, Mark Astley
IBM Research Report 24503, IBM TJ Watson Research Center, 2008
- 14 Playing Vivaldi in Hyperbolic Space
Cristian Lumezanu, Neil Spring
CS-TR-4843, University of Maryland, College Park, 2006

UNDER SUBMISSION

- 15 PeerWise: Symbiotic Relationships in Internet Routing Overlays
Cristian Lumezanu, Randy Baden, Dave Levin, Neil Spring, Bobby Bhattacharjee
*under submission to **Transactions on Networking***
- 16 Don't Love Thy Nearest Neighbor
Cristian Lumezanu, Dave Levin, Bo Han, Neil Spring, Bobby Bhattacharjee
under submission

TALKS AND PRESENTATIONS

- 1 Triangle Inequality Variations in the Internet
Conference talk, IMC, Chicago, IL, November 2009

- 2 Redundancy Elimination in Cellular Wireless Networks
Invited talk, Alcatel-Lucent Bell Laboratories, Murray Hill, NJ, August 2009
- 3 Using Internet Geometry to Improve End-to-End Communication
Invited talk, Georgia Tech, Atlanta, GA, June 2009
- 4 Symbiotic Relationships in Internet Routing Overlays
Conference talk, NSDI, Boston, MA, April 2009
- 5 Triangle Inequality and Routing Policy Violations in the Internet
Conference talk, PAM, Seoul, Korea, April 2009
- 6 Measurement Manipulation and Node Selection in Network Coordinates
Conference talk, ICDCS, Beijing, China, June 2008
- 7 PeerWise Discovery and Negotiation of Faster Paths
Conference talk, HotNets, Atlanta, GA, November 2007
- 8 Decentralized Message Ordering for Publish/Subscribe Systems
Conference talk, Middleware, Melbourne, Australia, December 2006
- 9 Online Optimization for Latency Assignment in Distributed Real-Time Systems
Invited talk, IBM T.J. Watson Research Center, Hawthorne, NY, August 2006
- 10 Utility Optimization for Event-Driven Distributed Infrastructures
Conference talk, ICDCS, Lisbon, Portugal, July 2006
- 11 Utility Optimization for Event-Driven Distributed Infrastructures
Invited talk, IBM T.J. Watson Research Center, Hawthorne, NY, August 2005

TEACHING EXPERIENCE

Teaching Assistant, University of Maryland

Computer Networks (CMSC 711)

Spring 2007

Helped Professor Neil Spring prepare and teach the graduate Computer Networks class. I taught two lectures focusing on network coordinate systems.

Computer Science II (CMSC 214)

Fall 2003, Spring 2004

Held recitations two times a week. The course aimed to introduce Computer Science majors to advanced C/C++ programming concepts.

Teaching Assistant, Politehnica University Bucharest

Communication Protocols

Spring 2002

My duties included holding recitations two times per week, grading weekly projects and the final exam. The course focused on introductory computer networks concepts.

Instructor, Politehnica University Bucharest

Cisco Networking Academy Program

March 2001 - July 2002

Taught the CCNA curriculum to classes of 15-20 students. The course covered the basic foundations of networking and taught students how to install, configure and operate networks. It integrated face-to-face teaching with hands-on lab exercises and realistic network simulations.

SERVICE

Committee member, Poster and demo session, Sigcomm 2010

External reviewer, IPTPS 2005, Infocom 2005, NSDI 2006, HiPC 2006, IMC 2006, WORLDS 2006, Sigmetrics 2006, Sigmetrics 2007, ICNP 2007, Sigmetrics 2008, IMC 2008, Infocom 2009, Sigmetrics 2009

PATENTS

1 Method and apparatus for reducing redundant traffic in communication networks

Katherine Guo, **Cristian Lumezanu**

Patent filed, 2010

2 Distributed online optimization for latency assignment and slicing

Mark Astley, Sumeer Bhola, **Cristian Lumezanu**

United States Patent 20090178047, 2009/07/09

3 System and method for distributed utility optimization in a messaging infrastructure

Mark Astley, Sumeer Bhola, Cristian Lumezanu
United States Patent 20080016217, 2008/01/17

MISCELLANEOUS

Citizenship: Romanian

Visa Status: F1

RESEARCH PROJECTS

PeerWise overlay networks

In my dissertation I show how to make end-to-end communication between Internet users fast, fair, and scalable using routing overlay networks. Although they offer improved communication performance, existing routing overlay networks (such as RON) are neither scalable nor fair: the cost of measuring and computing path performance metrics between participants is high (which limits the number of participants) and they lack robustness to misbehavior and selfishness (which could discourage the participation of nodes that are more likely to offer than to receive service).

I designed and built PeerWise, a latency-reducing routing overlay that employs the properties of the Internet delay space to make end-to-end communication fast, fair and scalable. PeerWise offers several properties desired in a practical communication infrastructure. It preserves the *connectivity* and *scalability* of the underlying routing layer. In addition, it offers increased *end-to-end performance* to users by finding low latency paths. Finally, it provides *fairness* through an incentive mechanism that encourages participation of honest users and discourages free-loaders and adversaries. To obtain these properties, I use three design principles, derived from real world observations and validated with measurement and experimentation: that triangle inequality violations (TIVs) in the Internet predict detours—shorter-than-default alternate one-hop paths, that network coordinates can be used to scalably discover TIVs, and that overlay edges should exist only between nodes that can provide detours for each other. Publications describing PeerWise appeared in HotNets 2007, ICDCS 2008, PAM 2009, NSDI 2009, and IMC 2009.

Architecture for Cellular Wireless Network Acceleration

Cellular wireless networks are increasingly becoming a *de facto* medium for Internet access, with bandwidth requirements growing constantly over the past years. Sadly, the capacity of these networks has not met the growing bandwidth demand. Reducing redundant traffic becomes important in alleviating congestion and improving application experience on mobile devices.

I designed and built a system to eliminate redundant traffic in cellular networks. The system uses fingerprint-based encoding between synchronized packet caches deployed on mobile users and at the edge of the radio network: one cache encodes repeated content from packets with pointers (fingerprints) to packets that were already sent and stored in cache, while the other cache reconstructs the original packet. I evaluated the scheme using both wireless traces and live experiments in a large wireless service provider.

Distributed optimization for information dissemination applications

Recent years have witnessed the emergence of distributed information dissemination and processing applications such as stock tickers, program trading, medical alerting, environmental monitoring, and airline ticket pricing. These applications are generally deployed on fixed overlay topologies, sometimes with several applications sharing the same infrastructure; improving their performance often requires efficient resource allocation. I formulated the resource allocation as a constrained optimization problem. and used the concept of utility functions to measure the benefit of an application. I developed two distributed optimization algorithms, LRGP and LLA, that optimize the overall utility while keeping the resources (network bandwidth and CPU share) of the underlying infrastructure uncongested. This work appeared in ICDCS 2006 and ICDCS 2008.