

Paul Schmitt

CONTACT	112B North Stanworth Dr Princeton, NJ 08540	+1 (805) 636-5572 pschmitt@cs.princeton.edu http://cs.princeton.edu/~pschmitt
---------	--	--

EDUCATION	University of California, Santa Barbara Ph.D., Computer Science Thesis: <i>Network Measurement and Systems for Resource-Constrained Environments</i> Advisor: Elizabeth Belding	2017
	University of St. Thomas M.S., Software Engineering	2011
	University of St. Thomas B.A., Computer Science	2009

- | | |
|-------------------------------|---|
| PEER-REVIEWED
PUBLICATIONS | <ul style="list-style-type: none">[1] Low On Air: Inherent Wireless Channel Capacity Limitations
Paul Schmitt and Elizabeth Belding.
<i>Third Workshop on Computing within Limits (ACM LIMITS 2017)</i>. June 2017, Santa Barbara, CA[2] Helping the Lone Operator in the Vast Frontier
Thomas Pötsch, Paul Schmitt, Jay Chen, and Barath Raghavan.
<i>ACM Workshop on Hot Topics in Networks (HotNets 2016)</i>. November 2016, Atlanta, GA[3] PhoneHome: Robust Extension of Cellular Coverage (invited paper)
Paul Schmitt, Daniel Iland, Elizabeth Belding, and Mariya Zheleva.
<i>International Conference on Computer Communication and Networks (ICCCN 2016)</i>. August 2016, Waikoloa, HI[4] SmartCell: Small-Scale Mobile Congestion Awareness
Paul Schmitt, Daniel Iland, and Elizabeth Belding.
<i>IEEE Communications Magazine</i>. July 2016[5] Navigating Connectivity in Reduced Infrastructure Environments
Paul Schmitt and Elizabeth Belding.
<i>Second Workshop on Computing within Limits (LIMITS 2016)</i>. June 2016, Irvine, CA[6] Community-Level Access Divides: A Refugee Camp Case Study
Paul Schmitt, Daniel Iland, Elizabeth Belding, Brian Tomaszewski, Ying Xu, and Carleen Maitland.
<i>International Conference on Information and Communication Technologies and Development (ICTD)</i>. June 2016, Ann Arbor, MI[7] HybridCell: Cellular Connectivity on the Fringes with Demand-Driven Local Cells
Paul Schmitt, Daniel Iland, Mariya Zheleva, and Elizabeth Belding.
<i>IEEE INFOCOM 2016</i>. April 2016, San Francisco, CA |
|-------------------------------|---|

- [8] **A Study of MVNO Data Paths and Performance**
Paul Schmitt, Morgan Vigil, and Elizabeth Belding.
Passive and Active Measurements Conference (PAM 2016). March 2016, Heraklion, Crete, Greece
- [9] **Internet Media Upload Caching for Poorly-Connected Regions**
Paul Schmitt, Ramya Raghavendra, and Elizabeth Belding.
Sixth annual Symposium on Computing for Development (ACM DEV 2015).
December 2015, London, United Kingdom
- [10] **Internet Bandwidth Upgrade: Implications on Performance and Usage in Rural Zambia**
Mariya Zheleva, Paul Schmitt, Morgan Vigil, and Elizabeth Belding.
Information Technologies and International Development Journal (ITID).
Summer 2015
- [11] **The Increased Bandwidth Fallacy: Performance and Usage in Rural Zambia**
Mariya Zheleva, Paul Schmitt, Morgan Vigil, and Elizabeth Belding.
Fourth Annual Symposium on Computing for Development (ACM DEV).
December 2013, Cape Town, South Africa
- [12] **Bringing visibility to rural users in Ivory Coast**
Mariya Zheleva, Paul Schmitt, Morgan Vigil, and Elizabeth Belding.
International Conference on Information and Communication Technologies and Development (ICTD). December 2013, Cape Town, South Africa
- [13] **Community Detection in Cellular Network Traces**
Mariya Zheleva, Paul Schmitt, Morgan Vigil, and Elizabeth Belding.
International Conference on Information and Communication Technologies and Development (ICTD). December 2013, Cape Town, South Africa
- [14] **Communication Flow Patterns in the D4D Dataset**
Paul Schmitt, Morgan Vigil, Mariya Zheleva, and Elizabeth Belding.
NetMob Session on Data for Development (D4D). May 2013, Boston, MA

TECHNICAL
REPORTS

- [1] **Youth Mobile Phone and Internet Use, January 2015, Za'atari Camp, Mafraq, Jordan**
Carleen Maitland, Brian Tomaszewski, Elizabeth Belding, Karen Fisher, Ying Xu, Danny Iland, Paul Schmitt, and Amira Majid.
Penn State Univ., State College, PA, Tech. Rep., October 19 2015
-

POSTERS

- [1] **AirPress: Towards Scalable Spectrum Inventory**
Timothy LaRock, Paul Schmitt, Petko Bogdanov, Elizabeth Belding, and Mariya Zheleva. *Networked Systems Design and Implementation (NSDI)*. March 2016, Santa Clara, CA
- [2] **NosyNeighbor: Augmenting Post-Disaster Cellular Service with Local Cellular Networks**
Daniel Iland, Mariya Zheleva, Paul Schmitt, and Elizabeth Belding.
Sixteenth Workshop on Mobile Computing Systems and Applications (ACM HotMobile 2015). February 2015, Santa Fe, NM

RESEARCH
EXPERIENCE

Princeton University, Princeton, NJ

Postdoctoral Research Associate

August 2017 - present

Research Projects:

Advisor: Nick Feamster

Privacy

- **Privacy-preserving MVNO.** Re-architecting cellular core network components in order to offer location anonymity to users.

University of California, Santa Barbara, Santa Barbara, CA

Research Assistant, MOMENT Lab

September 2012 - July 2017

Research Projects:

Advisor: Elizabeth Belding

Network Measurement

- **Cellular congestion detection.** Developed system and algorithm for passive detection and characterization of cellular base station radio congestion. Conducted measurement campaign comparing congestion in the United States, rural Guatemala, and a large refugee camp in Jordan. Findings of extreme congestion at the base station level in refugee camp allowed local organizations to approach carriers to find solutions.
- **Mobile data network performance analysis.** Studied performance and behaviors for traffic on mobile network operator (MNO) and mobile virtual network operator (MVNO) networks. Found that poor performance of MVNOs may be attributable to inefficient network topologies, lack of peering arrangements, and inflated paths relative to the underlying carrier.
- **Rural Internet / Cellular Usage Analysis.** Investigated usage patterns and performance analysis in rural African environments. Focused on Internet traffic before and after a network upgrade, finding that TCP performance degraded despite increased bandwidth. Explored cellular communication flow patterns, uncovering correlations between the underlying population densities of source and destination antennas, call durations and physical distance.

Connectivity in Resource-Poor Areas

- **HybridCell.** Developed HybridCell, which enables coexistence between commercial and local cellular coverage to augment poorly performing existing infrastructure. HybridCell monitors nearby commercial cellular networks and dynamically adjusts local network usage based on the “health” of the commercial network.

Dynamic Spectrum Access (DSA)

- **AirPress.** Developed a system that allows for one-pass spectrum characterization. AirPress employs wavelet decomposition to achieve rapid transmitter detection in low and high noise environments.

Field work:

- | | |
|--|----------------------|
| • Cellular and data communications infrastructure analysis in Za’atari refugee camp, Jordan. | January 2015 |
| • Cellular network infrastructure and performance analysis in San Cristóbal, Alta Verapaz, Guatemala | January 2015 |
| • Expanding local partnership and deployment of local cellular network in Macha, Zambia | December 2013 |

International Computer Science Institute (ICSI), Berkeley, CA

Research Intern

June 2016 - September 2016

- Advisors: Barath Raghavan, ICSI, Jay Chen, NYU
- Project: **WISPR**. Developed a network protocol, WISPR (Wireless Internet Service Providers with Redundancy), that enables multipath over low-cost, heterogeneous wireless links.

IBM Research, Yorktown Heights, NY

Research Intern

June 2013 - September 2013

- Advisor: Ramya Raghavendra, IBM Research
- Project: **VillageCache**. Developed a system that transparently scrapes uploads and redelivers locally-created media in users' web sessions without accessing the Internet bottleneck link for poorly-connected networks. Engineered time-shifted upload functionality for YouTube and Facebook content in order to mitigate bandwidth congestion during peak usage times.

**GRANTS AND
AWARDS**

- 2016-2017 UCSB President's Dissertation Year Fellowship
- 2014-2015 Dean's Fellowship, UCSB

**TEACHING
EXPERIENCE**

University of California, Santa Barbara	2013
Teaching assistant for Object Oriented Design and Implementation	
University of California, Santa Barbara	2013
Teaching assistant for Network Computing	
University of California, Santa Barbara	2012
Teaching assistant for Object Oriented Design and Implementation	
University of St. Thomas	2012
Lead instructor for Computer Networking	
University of St. Thomas	2011
Lead instructor for Operating Systems	

**ACADEMIC
ACTIVITIES**

- Reviewer for IEEE INFOCOM
- Reviewer for IEEE International Conference on Data Mining
- Representative on UCSB CS Graduate Student Cabinet
- PC member of the Graduate Student Workshop in Computing 2014, UCSB
- PC member of the Graduate Student Workshop in Computing 2013, UCSB

**PROFESSIONAL
EXPERIENCE**

Network Administrator at University of St. Thomas	2006 - 2012
• Managed university LAN/WAN/WLAN; supervised student employees.	

- Technologies used: Cisco IOS, CatOS, NX-OS, Cisco WCS; Cisco Nexus 7000, Cisco 3000 series, Cisco 4500 series, Cisco 6500 series.

Network Administrator at **Blue Earth County**

2002 - 2006

- Managed multi-site network and authored RFPs, RFIs, contracts, and grants.
- Technologies used: Cisco IOS, Cisco CatOS, ESRI ArcGIS.

SKILLS AND INTERESTS

Programming & Software:

- C/C++, Python, GnuRadio, USRP, OpenLTE, OpenBTS, OpenWRT, OpenFlow, Open vSwitch, Android, Awk, Bash, Squid, Tinyproxy, L^AT_EX, MATLAB, R, bro, snort, tstat, QGIS, Cisco IOS, NX-OS, CatOS

Languages:

- English (native); French (beginner); Spanish (beginner)