BERK BIRAND

Department of Electrical Engineering, Columbia University
1300 S.W. Mudd, 500 West 120th Street New York, NY 10027
berk@ee.columbia.edu; www.berkbirand.com; (774) 452-0771

EDUCATION

Columbia University, Fu Foundation School of Engineering & Applied Sciences, New York, NY
Ph.D Candidate in Electrical Engineering, June 2014
- Thesis title: *Cross-layer resource allocation algorithms in wireless and optical networks*
- Adviser: Prof. Gil Zussman
- Research focus: Cross-layer optimizations, performance optimization in mobile and ad-hoc networks, power allocation in optical networks
- Courses: Stochastic Modeling, Optimization Theory, Graph Theory, Approximation Algorithms, Control Theory, Queueing Networks

Columbia University, Fu Foundation School of Engineering & Applied Sciences, New York, NY
MS in Electrical Engineering, February 2010
- Concentration in Networking and Operations Research

Worcester Polytechnic Institute, Worcester, MA
Bachelor of Science in Electrical Engineering & Computer Science, May 2008, Major GPA: 3.92/4.00
- Concentration in Digital Design and Applied Cryptography

PUBLICATIONS

- P. Samadi, V. Gupta, B. Birand, H. Wang, R. Jensen, G. Zussman, and K. Bergman , "Software-addressable optical accelerators for data-intensive applications in cluster-computing platforms," *Proc. European Conference on Optical Communications (ECOC) 0601*, Sept. 2014

- P. Samadi, V. Gupta, B. Birand, H. Wang, G. Zussman, and K. Bergman , "Accelerating incast and multicast traffic delivery for data-intensive applications using physical layer optics.," *ACM SIGCOMM'14 Poster 89*, Aug. 2014

- B. Birand, H. Wang, K. Bergman, D. Kilper, T. Nandagopal, and G. Zussman , "Real-Time Power Control for Dynamic Optical Networks – Algorithms and Experimentation," *IEEE JSAC Special Issue on Energy Efficient Optical Networks (JSAC)*, May 2014

- B. Birand, H. Wang, K. Bergman, D. Kilper, T. Nandagopal, and G. Zussman , "Real-Time Power Control for Dynamic Optical Networks – Algorithms and Experimentation," in *Proc. ICNP '13*, Oct. 2013

- B. Birand, H. Wang, K. Bergman, and G. Zussman , "Measurements-based Power Control – A Cross-layered Framework," in *Proc. OSA OFC'13*, Mar. 2013

- B. Birand, M. Chudnovsky, B. Ries, P. Seymour, G. Zussman, and Y. Zwols, "Analyzing the Performance of Greedy Maximal Scheduling via Local Pooling and Graph Theory," *IEEE/ACM Transactions on Neworking*, vol. 20, no. 1, pp. 163–176, Feb. 2012

- B. Birand, M. Zafer, G. Zussman, and K-W. Lee, "Dynamic Graph Properties of Mobile Networks under Levy Walk Mobility," in *Proc. IEEE MASS'11*, Oct. 2011

- B. Birand, M. Chudnovsky, B. Ries, P. Seymour, G. Zussman, and Y. Zwols, "Analyzing the Performance of Greedy Maximal Scheduling via Local Pooling and Graph Theory," in *Proc. ACM MobiHoc S³ Workshop'10*, Sept. 2010 [**Invited Speaker, Best Theory Session Talk Award**]
- S-H. Yoo, D. Karakoyunlu, B. Birand, and B. Sunar, "Improving the Robustness of Ring Oscillator TRNGs," *ACM Transactions on Reconfigurable Technology and Systems*, Vol. 3, No. 2, May 2010
- B. Birand, M. Chudnovsky, B. Ries, P. Seymour, G. Zussman and Y. Zwols, "Analyzing the Performance of Greedy Maximal Scheduling via Local Pooling and Graph Theory," in *Proc. IEEE INFOCOM'10*, Mar. 2010 [17.5% acceptance rate, among 8 papers that got **nominated for Best Paper Award**, out of 1575 submissions]
- G. Hammouri, E. Öztürk, B. Birand, B. Sunar, "Unclonable Lightweight Authentication Scheme," in *Proc. 10th International Conference on Information and Communications Security (ICICS'08)*, in *Springer LNCS*, vol. 5308, pp.33-48, 2008

PATENTS

- D. Kilper, K. Bergman, B. Birand, and G. Zussman , "Reconfigurable optical system control.," *in submission*

STARTUP EXPERIENCE

Co-founder and CTO, Tuuum Inc., December 2012- June 2014
  - E-commerce website dedicated to disrupting the hegemony of art galleries and allowing emerging artists to market their work directly to emerging collectors - `www.tuuum.com`
  - Leading the engineering team, including optimizing the development process through agile development practices
  - Responsible for the design of the technical infrastructure and future scaling strategies

Co-founder, UhuruPacs, March 2012- June 2014
  - Non-profit mHealth startup aiming to revolutionize the way healthcare professional see patients in rural Uganda
  - Responsible for the deployment and operation of the SANA mobile platform and accompanying medical record system

Technical Consultant, Gramofon Social Music Jukebox, March 2013-May 2013
  - Managed technical team of four engineers responsible for prototype development
  - Designed initial hardware prototype and mobile software components
  - Project raised $250K on KickStarter

Co-founder, Demand-response Air Conditioning Systems, March 2012-April 2013
  - Innovative idea for leveraging the power of millions of distributed, window-unit AC systems to enter energy market
  - Built initial prototype for wirelessly controlling ACs from a centralized server
  - Won an entry to the extremely competitive IE@Columbia incubator program at the Columbia Business School

RESEARCH PROJECT AND WORK EXPERIENCE

Research Assistant, Columbia University WiM.Net Lab, August 2008-Present
  - Proved throughput-optimality of greedy and distributed algorithms using graph theoretic properties known as local pooling

- Improved previously known lower-bound on throughput for small input-queued switches
- Current work: Design scheduling algorithms for LTE-Advanced systems that are throughput-optimal in Network-MIMO scenarios
- Current work: Investigating cross-layer protocols for resolving bottlenecks at the interface between wireless and optical networks, and for reducing the energy consumption of optical networking devices

Research Intern, IBM Research T.J. Watson Research Center, September 2011-December 2011
- Member of the Wireless Networking Group under the supervision of Dr. Murtaza Zafer and Dr. Dakshi Agarwal
- Project details are confidential

Research Intern, IBM Research T.J. Watson Research Center, May 2010-September 2010
- Member of the Wireless Networking Group under the supervision of Dr. Murtaza Zafer and Dr. Kang-Won Lee. Part of the International Technology Alliance for Network and Information Science (ITA) project
- Investigated the use of evolving graphs, a novel graph model, for characterizing structural properties of mobile networks
- Examined metrics for predicting network performance measures based evolving graph structure

Major Qualifying Project, WPI Cryptography Lab, August 2007-March 2008
- Designed cryptographic circuit for preventing hardware cloning using unique semiconductor-level properties of FPGA chips
- Implemented same hardware as a random-number generator for use in low-power crypto protocols.
- Tested performance against resilience to side-channel attacks, such as temperature and voltage

Major Qualifying Project, WPI, August 2007-March 2008
- Independently developed location-based service application that uses Wi-Fi localization
- Employed the latest technologies, such as the Java Web Services API, Apache Axis2

Research Assistant, Worcester Polytechnic Institute, Worcester, MA, May-July 2007
- Investigated hardware implementation of True Random Number Generator
- Enabled a team of three to collect 3 times more data on test bed that I have written
- Simulated cryptographic circuit at the transistor-level
- Authored academic journal paper as result of research

Research Assistant, WPI CS Database Group, Worcester, MA, August 2006-2008
- Implemented improvements to XPath queries using Datalog optimizations
- Evaluated proof-of-concept optimization script by converting XPath queries into equivalent SQL statements

Software Engineering Intern, Garanti Teknoloji, Istanbul, Turkey

AWARDS/ACTIVITIES

IBM PhD Fellow, 2011-2012
Best Theory Session Talk Award, ACM MobiHoc 2010 S^3 Workshop, Chicago, IL, Sept. 2010
Millman Award for Outstanding Teaching Assistant, Columbia University EE Dept., 2010
Harold S. Black Award for Outstanding EE Senior, Worcester Polytechnic Institute, May 2008
Charles O. Thompson Scholar for Outstanding Achievement in Freshman Year, Worcester Polytechnic Institute, May 2005
Presidential Scholarship and International Scholarship, Worcester Polytechnic Institute, 2004-2008
Dean's List, Worcester Polytechnic Institute, Spring 2008

President, Eta Kappa Nu Electrical Engineering Honor Society, 2007-2008
Member, Tau Beta Pi Engineering Honor Society, Upsilon Pi Epsilon Computer Science Honor Society

TEACHING EXPERIENCE

Instructor, Columbia University, Department of Electrical Engineering, New York, NY
– CSEE W4140 - Networking Lab, Spring 2014.
– CSEE W4140 - Networking Lab, Spring 2011.

Teaching Assistant, Columbia University, Department of Electrical Engineering, New York, NY
– Millman Award for Outstanding Teaching Assistant, Columbia University EE Dept., 2010
– CSEE W4119 - Computer Networks, Spring 2010. Responsible for analytic aspects of the class.
– CSEE W4119 - Computer Networks, Spring 2009. Responsible for analytic aspects of the class.
– ELEN E3801 - Systems and Signals, Fall 2008. Performed review lectures as well as conducting laboratory sessions.

PROFESSIONAL ACTIVITIES

- Co-chair of ACM S^3 2011 Workshop co-located with MobiCom 2011

- Reviewer for *IEEE Journal on Selected Areas in Communications special issue on "Simple Wireless Sensor Networking Solutions,"IEEE/ACM Transactions on Networking, IEEE Transactions on Wireless Communications, IEEE INFOCOM '09, ACM MobiHoc '09, IFIP Networking '10, IEEE INFOCOM '10, ACM SIGMETRICS/Performance '12, ACM MobiHoc '14*

- NSF CIAN-ERC Columbia University Student Leadership Council Vice-President, April 2009-May 2011

- Student Member, IEEE

TECHNICAL SKILLS AND LANGUAGES

Foreign Languages: Fluent in English, French, and Turkish, intermediate-level in German
Programming Skills: CLisp, Python, Java, C, C++, 8086 Assembly, Perl, SQL, Visual Basic, VHDL . . .
Operating Systems: Linux (Debian/Gentoo), Mac OS X, Microsoft Windows
Applications: MatLab, PSpice, Xilinx, LATEX, Eclipse, Vim, Emacs
System Administration: Apache, nginx, Puppet, Rackspace Cloud, Amazon EC2, Oracle DB Server, Tomcat