Pedro E. Santacruz

Contact Information

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Academic Interests

Wireless communications, algorithms, distributed networks, information theory, graph theory, communication theory.

Education

Rice University, Houston, Texas, USA

Ph.D., Electrical Engineering, May 2013, GPA 3.80
Thesis Title: "Beyond Interference Avoidance: Distributed Sub-network Scheduling in Wireless Networks with Local Views "

- Advisor: Ashutosh Sabharwal

University of Texas at El Paso, El Paso, Texas, USA

M.S., Electrical Engineering, July, 2006, GPA 4.0
Thesis Title: "Analysis on the Effects of Nonllinear Amplification on Turbo Coding"

- Advisor: Bryan E. Usevitch

University of Texas at El Paso, El Paso, Texas, USA

B.S., Electrical Engineering, May, 2004
Summa Cum Laude, GPA 3.93

Experience

The University of Texas at Austin - Wireless Networking and Communications Group, Mobile & Pervasive Computing Group

Postdoctoral Fellow **September 2013 - present**
Research conducted on the Pharos testbed, a mobile computing testbed that allows the validation and experimentation of wireless communication protocols including network coding, routing, and distributed coordination. Experiments and results provide a system-wide understanding of implementation challenges and present a more realistic set of assumptions that guide improved design and development of wireless algorithms and protocols.

The University of Texas at Austin - Department of Electrical and Computer Eng.

Lecturer **August 2014 - present**
Full responsibility for teaching *EE 360C Algorithms*, an upper level course that covers advanced problem solving methods, algorithm design principles, complexity analysis, and the study of common algorithmic classes and their applications. The course has an enrollment of 70 students and responsibilities include lectures, office hours, and preparation of quizzes and exams for evaluation and assessment.

Rice University - Center for Multimedia Communications

Student Research Assistant **August 2006 - September 2013**
Analyzed the performance of wireless networks with local knowledge by studying the effect of incomplete and asymmetric information about channel states and network topology. Produced analytical tools and methods that lead to scalable solutions to manage interference in large networks. Developed fully distributed algorithms using graph theoretical tools to leverage available local information and improve the performance of current and next generation networks such as cellular, sensor, ad-hoc, and device-to-device networks.

Rice University

Teaching Assistant **August - December, 2010**

Conducted weekly review session for ELEC 241 (Fundamentals of Electrical Engineering) course at Rice University. ELEC 241 is a foundational course for undergraduates who have declared electrical engineering as their major, covering a wide range of topics including circuits, signals and systems, digital signal processing, and information theory. Objectives included clarifying key concepts and reinforcing material learned in class.

The Aerospace Corporation

Member of Technical Staff **Summer 2004 and Summer 2005**

Analyzed the effects of nonlinear amplification on turbo coding gain utilizing an actual space-qualified traveling wave tube. Prepared and performed simulations and experiments on a software-defined radio platform to compute the bit error rate (BER) of a satellite communication system. Created user-friendly tools to efficiently create link budget analyses.

Publications

Santacruz, P.E., Aggarwal, V., and Sabharwal, A., "Leveraging Physical Layer Capabilities: Distributed Scheduling in Interference Networks with Local Views," *IEEE/ACM Transactions on Networking*, November 2014.

Kalbarczyk, T., Walker, B., Julien, C., Hennessy, A., Santacruz, P.E., Michel, J., and Alford, A. "The Breadcrumb Router: Bundle Trajectory Tracking and Geographic Source Routing in DTN", *in Proceedings of the 6th Extreme Conference on Communication and Computing (ExtremeCom)*, August 2014.

Santacruz, P.E., "Beyond Interference Avoidance: Distributed Sub-Network Scheduling in Wireless Networks with Local Views," Ph.D. Thesis, Rice University, May 2013

Santacruz, P.E., Aggarwal, V., and Sabharwal, A., "Beyond Interference Avoidance: Distributed Sub-Network Scheduling in Wireless Networks with Local Views," *IEEE International Conference on Computer Communications INFOCOM*, Turin, Italy, April 2013

Santacruz, P.E. and Sabharwal, A., "Statistical resource decoupling in random access interference channel," *2010 44th Annual Conference on Information Sciences and Systems (CISS)*, 17-19 March 2010

Santacruz, P.E. "Analysis on the Effects of Nonlinear Amplification on Turbo Coding," Master's Thesis, July 2006

Grayver, E. and Santacruz, P.E., "Effect of nonlinear amplification on turbo coding gain," *IEEE Aerospace Conference, 2006*

Posters and Talks

"Random Access Systems with Local Views," *Richard Tapia Celebration of Diversity in Computing Conference*, Doctoral Consortium Presentation, San Francisco, CA, 2011

"Distributed Maximal Independent Graph Scheduling with Local Views," *IEEE School of Information Theory*, Poster, University of Texas, 2011

"Throughput Performance in Random Access Systems with Local View," *IEEE School of Information Theory*, Poster, University of Southern California, 2010

"Medium Access Protocol Analysis and Design: An Error-event Approach," *IEEE School of Information Theory*, Poster, Northwestern University, 2009

"Rate Analysis of Multiuser Random Access Protocols as Codes," *Rice Affiliates Conference*, Poster, Rice University, 2008

"Opportunistic Two-way Protocols for Random Access Networks," *ELEC 599 Research Project*, Presentation, Rice University, 2007

Related Coursework

- ELEC 433 - Architecture for Wireless Comm.
- ELEC 531 - Statistical Signal Processing
- ELEC 534 - Wireless Communications
- ELEC 535 - Information and Coding Theory
- ELEC 537 - Communication Networks
- ELEC 538 - Adv. Topics in Networking
- ELEC 541 - Error Correcting Codes
- CAAM 453 - Numerical Analysis
- CAAM 540 - Applied Functional Analysis
- CAAM 560 - Optimization Theory
- ENGI 600 - Professional Communications and Technical Writing

Honors and Awards

- AGEP Fellow at Rice University, 2006-2007
- NSF Bridge to the Doctorate Fellowship Recipient, 2005-2006
- GEM Fellowship recipient, 2004
- UTEP, College of Engineering, Student Marshall, 2004
- National Science Foundation (NSF) Scholar, 2003-2005
- National Action Council for Minorities in Engineering (NACME) Scholar, 2001-2003

Skills

- Mac OS, Linux/Unix, Windows
- MATLAB, Mathematica, Simulink, System Generator, C/C++, NS-2, LaTeX
- Proficient in spoken and written Spanish

Organizations

- Institute of Electrical and Electronics Engineers, IEEE (Member since 2001)
- Tau Beta Pi (Member since 2002, Cataloguer, 2003)
- Eta Kappa Nu (Member since 2002, Secretary, 2003)
- Society of Hispanic Professional Engineers, SHPE, (Member 2002-2007)
- Mexican-American Engineers and Scientists, MAES, (Member 2002-2006)
- Golden Key International Honour Society (Member 2001-2005)
- Rice-Houston Alliances for Graduate Education and the Professoriate (Participant 2006-2013)
- Rice University ECE Department Graduate Student Mentor (2009-2013)
- NASA Motivating Undergraduates in Science and Technology Project (Mentor, 2010-2012)
- Rice University Honor Council (Ombuds 2010-2012, Member 2011-2013)