

Aly El Gamal

Assistant Professor, School of Electrical and Computer Engineering
Purdue University

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EDUCATION

University of Illinois at Urbana-Champaign, Ph.D. in *Electrical and Computer Engineering*,
May 2014, GPA: 4.0

Dissertation: *Interference Channels with Coordinated Multi-Point Transmission*

Advisor: Prof. Venugopal V. Veeravalli

University of Illinois at Urbana-Champaign, M.S. in *Mathematics*, May 2013,

GPA: 3.96

Nile University, M.S. in *Electrical Engineering*, Jul. 2009, GPA: 3.82

Thesis: *The Two-Way Wiretap Channel: Theory and Practice*

Advisors: Prof. Moustafa Youssef and Prof. Hesham El Gamal

Cairo University, B.S. in *Computer Engineering*, Jul. 2007

Grade: Distinction with Honors Degree

PROFESSIONAL EXPERIENCE

Assistant Professor, School of Electrical and Computer Engineering, Purdue University, August
2015—Now

Simons Postdoctoral Fellow, University of Texas at Austin, May 2015 – August 2015

Advisors: Prof. Sriram Vishwanath and Prof. Francois Baccelli

Postdoctoral Research Associate, University of Southern California, May 2014 – May 2015

Advisor: Prof. Salman Avestimehr

Summer Intern, Qualcomm Inc. The Office of the Chief Scientist, May – Aug. 2012

Project Description: Indoor localization in Ultra Wide-Band Environments

Managers: Alok Gupta, Bin Tian

Research Assistant, University of Illinois at Urbana-Champaign, Aug. 2009 – May 2014

Advisor: Prof. Venugopal V. Veeravalli

Research Assistant, Nile University, Nov. 2007 – Aug. 2009

Advisors: Prof. Moustafa Youssef and Prof. Hesham El Gamal

Teaching Assistant, Cairo University, Sep. 2007 – Jan. 2008

Department of Computer Engineering

Summer Intern, Ohio State University, Jul. – Sep. 2006

Project Description: Developing a reliable Data Collection Protocol for Body Area Networks

Advisors: Prof. Emre Ertin and Prof. Hesham El Gamal

Summer Intern, Ohio State University, Jul. – Sep. 2005

Project Description: Developing a Multi-Hop Protocol for Wireless Sensor Networks

Advisor: Prof. Lee Potter

AWARDS

Huawei Innovation Research Program (HIRP) OPEN Award, Nov. 2015.

DARPA Contract Award for the Spectrum Collaboration Challenge (SC2), Nov. 2016.

PUBLICATIONS

Book

Venugopal V. Veeravalli, Aly El Gamal: Interference Management in Wireless Networks: Fundamental Bounds and the Role of Cooperation. Cambridge University Press, Fall 2017.

Journal Papers (In Preparation / Submitted)

[J9] Aly El Gamal: On the Value of Transmitter Cooperation with no CSIT in Locally Connected Interference Networks. In preparation for submission to IEEE Transactions on Information Theory.

[J8] Manik Singhal, Aly El Gamal: Joint Uplink-Downlink Cell Associations in Interference Networks with Local Connectivity. In preparation for submission to IEEE Transactions on Information Theory.

[J7] Yasemin Karacora, Tolunay Seyfi, Aly El Gamal: Optimal Message Assignments and Degrees of Freedom in Interference Networks with Block Erasures. In preparation for submission to IEEE Transactions on Information Theory.

[J6] Aamir Anis, Aly El Gamal, A. Salman Avestimehr, Antonio Ortega: A Sampling Theory Perspective of Graph-based Semi-supervised Learning. Submitted to IEEE Transactions on Information Theory, May 2017.

[J5] Meghana Bande, Aly El Gamal, Venugopal V. Veeravalli: Degrees of Freedom in Wireless Interference Networks with Cooperative Transmission and Backhaul Load Constraint. Submitted to IEEE Transactions on Information Theory, Oct. 2016, revised May 2017.

Journal Publications

[J4] Navid Naderializadeh, Aly El Gamal, A. Salman Avestimehr: Fundamental Limits of Non-Coherent Interference Alignment via Matroid Theory. To appear in IEEE Transactions on Information Theory, 2017.

[J3] Aly El Gamal, V. Srekanth Annapureddy, Venugopal V. Veeravalli: Interference Channels with CoMP Transmission: Degrees of Freedom, Message Assignment, and Fractional Reuse. IEEE Transactions On Information Theory, vol. 60, no. 6, pp. 3483-3498, May. 2014.

[J2] Aly El Gamal, Onur Ozan Koyluoglu, Moustafa Youssef, Hesham El Gamal: Achievable Secrecy Rate Regions for the Two-Way Wiretap Channel. IEEE Transactions On Information Theory, vol. 59, no. 12, pp. 8099-8114, Dec. 2013.

[J1] V. Srekanth Annapureddy, Aly El Gamal, Venugopal V. Veeravalli: Degrees of Freedom of Interference Channels with CoMP Transmission and Reception. IEEE Transactions On Information Theory, vol. 58, no. 9, pp. 5740-5760, Sep. 2012.

Conference Papers (In Preparation / Submitted)

[C18] Manik Singhal, Aly El Gamal: Joint Uplink-Downlink Cell Associations in Interference Networks with Local Connectivity. In preparation for submission to Allerton Conference on Communications, Control, and Computing, Jul. 2017

Conference Publications

- [C17] Yasemin Karacora, Tolunay Seyfi, Aly El Gamal: The Role of Transmitter Cooperation in Linear Interference Networks with Block Erasures. Asilomar Conference on Signals, Systems, and Computers, Nov. 2017
- [C16] Aly El Gamal: Topological Interference Management: Linear Cooperation is not useful for Wyner's Networks. IEEE International Symposium on Information Theory, Aachen, Jun. 2017.
- [C15] Aly El Gamal: Cell Associations that Maximize the Average Uplink-Downlink Degrees of Freedom. IEEE International Symposium on Information Theory (ISIT), Barcelona, Jul. 2016.
- [C14] Aly El Gamal: Cloud-Based Topological Interference Management: A Case with No Cooperative Transmission Gain. IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Edinburgh, Jul. 2016.
- [C13] Meghana Bande, Aly El Gamal, Venugopal V. Veeravalli: Flexible Backhaul Design with Cooperative Transmission in Cellular Interference Networks. International Symposium on Information Theory (ISIT 2015), Hong Kong, Jun. 2015.
- [C12] Aly El Gamal, Navid Naderializadeh, A. Salman Avestimehr: When Does an Ensemble of Matrices with Randomly Scaled Rows Lose Rank?. International Symposium on Information Theory (ISIT 2015), Hong Kong, Jun. 2015.
- [C11] Navid Naderializadeh, Aly El Gamal, A. Salman Avestimehr: Topological Interference Management with just Retransmission: What are the Best Topologies. International Conference on Communications (ICC 2015), London, Jun. 2015.
- [C10] Aamir Anis, Aly El Gamal, A. Salman Avestimehr, Antonio Ortega: Asymptotic Justification for Band-Limited Interpolation of Graph Signals for Semi-Supervised Learning. International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2015), Brisbane, Apr. 2015.
- [C9] Aly El Gamal, Venugopal V. Veeravalli: Flexible Backhaul Design and Degrees of Freedom for Linear Interference Channels. International Symposium on Information Theory (ISIT), Hawai'i, Jun. 2014
- [C8] Aly El Gamal, Venugopal V. Veeravalli: Dynamic Interference Management, Asilomar Conference on Signals, Systems, and Computers, Nov. 2013
- [C7] Aly El Gamal, V. Sreekanth Annapureddy, Venugopal V. Veeravalli: Degrees of Freedom of Locally Connected Interference Channels with Cooperating Multiple-Antenna Transmitters. International Symposium on Information Theory (ISIT), MIT, Cambridge, Jul. 2012
- [C6] Aly El Gamal, V. Sreekanth Annapureddy, Venugopal V. Veeravalli: Degrees of Freedom of Locally Connected Interference Channels with Coordinated Multi-Point (CoMP) Transmission. International Conference on Communications (ICC), Ottawa, Jun. 2012
- [C5] Aly El Gamal, V. Sreekanth Annapureddy, Venugopal V. Veeravalli: On Optimal Message Assignments for Interference Channels with CoMP Transmission. 46th Annual Conference on Information Sciences and Systems (CISS), Princeton, NJ, Mar. 2012
- [C4] V. Sreekanth Annapureddy, Aly El Gamal, Venugopal V. Veeravalli: Degrees of Freedom of Cooperative Interference Networks. International Symposium on Information Theory (ISIT), Saint Petersburg, Aug. 2011
- [C3] V. Sreekanth Annapureddy, Aly El Gamal, Venugopal V. Veeravalli: Degrees of Freedom of the K-user Interference Channel with Transmitter Cooperation. International Symposium on Information Theory (ISIT), Austin, Jun. 2010

[C2] Aly El Gamal, Onur Ozan Koyluoglu, Moustafa Youssef, Hesham El Gamal: New Achievable Secrecy Rate Regions for the Two Way Wiretap Channel. Information Theory Workshop (ITW), Cairo, Jan. 2010

[C1] Aly El Gamal, Moustafa Youssef, Hesham El Gamal: Randomization for Security in Half-Duplex Two-Way Gaussian Channels. Global Communications Conference (Globecom), Hawaii, Dec. 2009

TALKS

“Information Theory of Cloud-Based Cooperative Interference Management”

University of Padova, Padova, Jul. 2017

“Information Theory of Cloud-Based Cooperative Interference Management”

EURECOM, Sophia Antipolis, Jul. 2017

“Topological Interference Management: Linear Cooperation is not useful for Wyner’s Networks.”

International Symposium on Information Theory (ISIT), Aachen, Jun. 2017

“Cooperation in Large Cellular Networks: Insights and Fundamental Limits”

Information Theory and Applications Workshop (ITA), San Diego, Feb. 2017

“Cell Associations that Maximize the Average Uplink-Downlink Degrees of Freedom.”

International Symposium on Information Theory (ISIT), Barcelona, Jul. 2016

“Cloud-Based Topological Interference Management: A Case with No Cooperative Transmission Gain.”

Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Edinburgh, Jul. 2016

“Cloud-Based Cell Associations”

Information Theory and Applications Workshop (ITA), San Diego, Feb. 2016

“Cellular Interference Management and Spectral Graph Learning”

Purdue University, Apr. 2015

“Cellular Interference Management and Spectral Graph Learning”

Worcester Polytechnic Institute, Mar. 2015

“Two Recent Result in Random Matrix Theory and their Applications in Wireless Interference Management and Semi-Supervised Learning”

University of Texas, Austin, Feb. 2015

“Two Recent Result in Random Matrix Theory and their Applications in Wireless Interference Management and Semi-Supervised Learning”

Control, Communications and Networks Seminar, University of Southern California, Oct. 2014

“Flexible Backhaul Design and Degrees of Freedom for Linear Interference Networks”

International Symposium on Information Theory (ISIT), Hawai’i, Jul. 2014

“Flexible Backhaul Design for Locally Connected Interference Networks”

Information Theory and Applications Workshop (ITA), San Diego, Feb. 2014

“Dynamic Interference Management”

Asilomar Conference on Signals, Systems, and Computers, Monterey, Nov. 2013

“Interference Channels with Coordinated Multi-Point Transmission”

Massachusetts Institute of Technology (MIT), Oct. 2013

“Interference Channels with Coordinated Multi-Point Transmission”

Télécom ParisTech, Paris, Jul. 2013

“Dynamic Interference Management”

International Symposium on Information theory (ISIT), Istanbul, Jul. 2013

“Locally Connected Interference Channels with CoMP: Degrees of Freedom, Message Assignment and Fractional Reuse”

International Symposium on Information theory (ISIT), MIT, Jul. 2012

“Degrees of Freedom of Locally Connected Interference Channels with Coordinated Multi-Point Transmission”

International Conference on Communications (ICC), Ottawa, Jun. 2012

“Degrees of Freedom of Interference Channels with CoMP Transmission and Reception”

Communication Theory Workshop (CTW), Hawai’i, May 2012

“On Optimal Message Assignments for Interference Channels with CoMP Transmission”

Conference on Information Sciences and Systems (CISS), Princeton, Mar. 2012

“Degrees of Freedom of Cooperative Interference Networks”

International Symposium on Information theory (ISIT), Saint Petersburg, Aug. 2011

“Degrees of Freedom (DoF) of Locally Connected Interference Channels with Coordinated Multi-Point (CoMP) Transmission”

North American School of Information theory, UT Austin, May 2011

“On the connection between expander bipartite graphs and the degrees of freedom of the K-user Interference Channel with transmitter cooperation”

Midwestern Conference on Combinatorics, Cryptography and Computing, Illinois State University, Sep., 2010

“Degrees of Freedom of the K-user Interference Channel with transmitter cooperation”

North American School of Information theory, USC, Aug. 2010

“New Achievable Secrecy Rate Regions for the Two Way Wiretap Channel”

Information theory Workshop, Cairo, Jan. 2010

“Randomization for Security in Half-Duplex Two-Way Gaussian Channels”

North American School of Information theory, Northwestern University, Aug. 2009

TEACHING EXPERIENCE

Purdue University, Department of Electrical and Computer Engineering,

ECE 270 Introduction to Digital System Design, Spring 2017, Instructor

ECE 301 Signals and Systems, Fall 2015, Fall 2016, Fall 2017 Instructor

ECE 368 Data Structures, Spring 2016, Instructor

University of Illinois at Urbana-Champaign, Department of *Electrical and Computer Engineering*, ECE 563 Information Theory, Fall 2010, Teaching Assistant

Cairo University, Department of *Computer Engineering*

Database Systems, Fall 2007, Teaching Assistant

Logic Design, Fall 2007, Teaching Assistant

Operating System Design, Fall 2007, Teaching Assistant

Microprocessors, Fall 2007, Teaching Assistant

COURSE WORK

University of Illinois at Urbana-Champaign

Department of *Electrical and Computer Engineering*

Random Processes, Coding Theory, Detection and Estimation Theory, Introduction to Optimization, Control System Theory and Design, Vector Space Signal Processing, Statistical Learning and Pattern Recognition

Department of *Mathematics*

Real Analysis 1, Real Analysis 2, Combinatorial Mathematics, Mathematical Logic

Department of *Computer Science*

Computational Complexity, Distributed Algorithms

Department of *Psychology*

Models of Decision and Choice

Nile University

Wireless Intelligent Networks Center

Stochastic Processes, Information Theory, Circuits for Wireless Communications, Design of Communication Systems, Antenna Theory, Fundamentals of Wireless Communications, Computer Networks, Wireless Networks

PROFESSIONAL SERVICE

- TPC Member for IEEE WCNC'17, WPMC'17, ICNC'18
 - Reviewer for IEEE Transactions on Information Theory, IEEE Transactions on Wireless Communications, IEEE Transactions on Communications, IEEE Transactions on Signal Processing, IEEE Journal on Selected Areas in Communications - Signal Processing (JSAC), and several conferences including Allerton, IEEE ISIT, IEEE ICC, IEEE Globecom, IEEE CAMSAP, and IWCIT
 - Organizing Committee Member for 2012 Coordinated Science Lab (CSL) Student Conference
 - On-Site registration for 2010 IEEE Information Theory Workshop (ITW) in Cairo
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PROGRAMMING LANGUAGES

nesC, Java, C++, SQL, Assembly (8086 Family), Python, MATLAB
