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### TEACHING INTERESTS

Engineering education is ailed by excitement, challenge, and discipline gaps. Students are excited about technology but do not pursue careers in engineering. Material taught in engineering classes becomes less challenging every year. Compartmental experience offered to students does not match reality of hazy separation between disciplines. Teaching goal is to contribute to the closing of these gaps through the development of new curricula.

### RESEARCH INTERESTS

Application of Signal Processing tools and methods to the study of networks. Topics of interest include optimal design of wireless networks, statistical signal processing in networks, distributed network optimization, game theoretic models of network behavior, collaboration in autonomous robot teams, networked control systems, and abstract representations of networked data structures.

### APPOINTMENTS

**University of Pennsylvania** Philadelphia, Pennsylvania  
Associate Professor July 2014 - present  
*Electrical & Systems Engineering*

**University of Pennsylvania** Philadelphia, Pennsylvania  
Assistant Professor July 2008 - July 2014  
*Electrical & Systems Engineering*

### EMPLOYMENT

**University of Minnesota** Twin Cities, Minnesota  
Research Associate December 2006 - June 2008  
*Electrical & Computer Engineering, Signal Process. in Commun.*

**University of Minnesota** Twin Cities, Minnesota  
Research Assistant May 2003 - December 2006  
*Electrical & Computer Engineering, Signal Process. in Commun.*

**Bellsouth** Montevideo, Uruguay  
Systems Engineer November 1998 - April 2003

**Universidad de la República Oriental del Uruguay** Montevideo, Uruguay  
Research Assistant March 1997 - December 1998  
*Electrical Engineering, Digital Communications*

**Universidad de la República Oriental del Uruguay** Montevideo, Uruguay  
Research Assistant August 1995 - February 1997  
*Physics, Applied Optics*

EDUCATION	<b>University of Minnesota</b>	Twin Cities, Minnesota
	Ph. D. in Electrical & Computer Engineering	December 2006
	<i>Thesis:</i> "Wireless Cooperative Communications and Networking" <i>Advisor:</i> Prof. Georgios B. Giannakis	
	<b>University of Minnesota</b>	Twin Cities, Minnesota
	M. Sc. in Electrical & Computer Engineering	September 2005
	<i>Thesis:</i> "Distributed Estimation in Wireless Sensor Networks" <i>Advisor:</i> Prof. Georgios B. Giannakis	
	<b>Universidad de la República Oriental del Uruguay</b>	Montevideo, Uruguay
	B. Sc. in Electrical Engineering	December 1998

## ACADEMIC HONORS

- Penn fellow, class of 2015.
- 2014 O. Hugo Schuck best paper award for the paper "Optimal power management in wireless control systems" (co-authored with K. Gatsis and G. Pappas).
- Best student paper award for K. Gatsis at the American Control Conference (ACC) 2013 for the paper "Optimal power management in wireless control systems" (co-authored with K. Gatsis and G. Pappas).
- 2012 S. Reid Warren, Jr. Award presented by Penn's undergraduate student body for outstanding teaching.
- 2010 National Science Foundation CAREER award for project "Towards a formal theory of wireless networking." Award No: 0952867.
- Best student paper award at the International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2006 for the paper "SOI-KF: Distributed Kalman filtering with low-cost communications using the sign of innovations" (co-authored with Georgios B. Giannakis and Stergios I. Roumeliotis).
- Best student paper award at ICASSP 2005 for the paper "Non-parametric distributed quantization-estimation using wireless sensor networks" (co-authored with Georgios B. Giannakis).
- Fulbright scholar, class of 2003.

## REVIEW AND EDITORIAL ACTIVITIES

- Signal Processing Society. Member of Signal Processing for Communications Technical Committee (2014-2016).
- Global Signal and Info. Process. Conf. (2014), Network Theory Symposium. Chair.
- Global Signal and Info. Process. Conf. (2013), Network Theory Symposium. Chair.
- Signal Processing Society. Member of Signal Processing for Communications Technical Committee (2011-2013).
- Asilomar Conf. Signals Systems Computers (2011). Technical area chair for Networking.
- Int. Conf. Acoustics, Speech, Signal Process.(2011). External expert reviewer.
- Int. Conf. Acoustics, Speech, Signal Process.(2010). External expert reviewer.
- EURASIP Journal on Wireless Communications and Networking, Special Issue on Cooperative Communications in Wireless Networks (2009). Guest Editor.
- Second International Workshop on Cross Layer Design, 2009. US Liaison.

- Int. Conf. Acoustics, Speech, Signal Process., (2009). External expert reviewer.
- First Workshop on Distributed Estimation and Control in Networked Systems (2009). Technical Program Committee.

## PUBLICATIONS

**Journal papers**

1. A. Mokhtari and A. Ribeiro, "Global convergence of online limited memory BFGS," *J. Machine Learning Research*, vol. (revised), April 2015.
2. S. Segarra and A. Ribeiro, "Stability and Continuity of Centrality Measures in Weighted Graphs," *IEEE Trans. Signal Process.*, vol. (revised), April 2015.
3. M. Zargham, A. Ribeiro, and A. Jadbabaie, "Accelerated backpressure algorithm," *IEEE Trans. Signal Process.*, vol. (revised), April 2015.
4. C. Eksin, H. Delic, and A. Ribeiro, "Demand response management in smart grids with heterogeneous consumer preferences," *IEEE Trans. Smart Grid*, vol. (to appear), March 2015.
5. Q. Ling, W. Shi, G. Wu, and A. Ribeiro, "DLM: Decentralized linearized alternating direction method of multipliers," *IEEE Trans. Signal Process.*, vol. (revised), March 2015.
6. S. Paternain and A. Ribeiro, "Online Learning of Feasible Strategies in Unknown Environments," *IEEE Trans. Autom. Control.*, vol. (submitted), March 2015.
7. S. Segarra, M. Eisen, and A. Ribeiro, "Authorship attribution through function word adjacency networks," *IEEE Trans. Signal Process.*, vol. (revised), March 2015.
8. S. Segarra, W. Huang, and A. Ribeiro, "Diffusion and Superposition Distances for Signals Supported on Networks," *IEEE Trans. Signal, Info. Process. over Networks*, vol. (revised), March 2015.
9. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Learning to coordinate in social networks," *Operations Research*, vol. (to appear), February 2015.
10. K. Gatsis, M. Pajic, A. Ribeiro, and G. Pappas, "Opportunistic control over shared wireless channels," *IEEE Trans. Autom. Control*, vol. (to appear), January 2015.
11. S. Segarra, M. Eisen, G. Egan, and A. Ribeiro, "Stylometric analysis of early modern period English plays," *Digital Scholarship in the Humanities*, vol. (submitted), January 2015.
12. W. Huang and A. Ribeiro, "Metrics in the space of high order networks," *IEEE Trans. Signal Process.*, vol. (submitted), November 2014.
13. A. Koppel, F. Jakubeic, and A. Ribeiro, "A saddle point algorithm for networked online convex optimization," *IEEE Trans. Signal Process.*, vol. (submitted), September 2014.
14. G. Carlsson, F. Memoli, A. Ribeiro, and S. Segarra, "Axiomatic construction of hierarchical clustering in asymmetric networks," *IEEE Trans. Info. Theory*, vol. (submitted), August 2014.
15. A. Mokhtari and A. Ribeiro, "RES: Regularized stochastic BFGS algorithm," *IEEE Trans. Signal Process.*, vol. 62, pp. 6089–6104, December 2014.
16. K. Gatsis, A. Ribeiro, and G. Pappas, "Optimal power management in wireless control systems," *IEEE Trans. Autom. Control*, vol. 59, pp. 1495–1510, June 2014.
17. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Bayesian quadratic network game filters," *IEEE Trans. Signal Process.*, vol. 62, pp. 2250 – 2264, May 2014.

18. M. Zargham, A. Ribeiro, A. Jadbabaie, and A. Ozdaglar, "Accelerated dual descent for network optimization," *IEEE Trans. Autom. Control*, vol. 59, pp. 905 – 920, April 2014.
19. Q. Ling and A. Ribeiro, "Decentralized dynamic optimization through the alternating direction method of multipliers," *IEEE Trans. Signal Process.*, vol. 62, pp. 1185 – 1197, March 2014.
20. Y. Hu and A. Ribeiro, "Optimal wireless communications with imperfect channel state information," *IEEE Trans. Signal Process.*, vol. 61, pp. 2751–2766, June 2013.
21. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Learning in network games with incomplete information," *IEEE Signal Process. Mag.*, vol. 30, pp. 30–42, May 2013.
22. J. Fink, A. Ribeiro, and V. Kumar, "Algorithms for controlling mobility while maintaining robust wireless connectivity," *IEEE Access*, vol. 1, pp. 290–309, May 2013.
23. F. Jakubiec and A. Ribeiro, "D-MAP: Distributed maximum a posteriori probability estimation of dynamic systems," *IEEE Trans. Signal Process.*, vol. 61, pp. 450–466, February 2013.
24. M. Zavlanos, A. Ribeiro, and G. Pappas, "Network integrity in mobile robotic networks," *IEEE Trans. Autom. Control*, vol. 58, pp. 3–18, January 2013.
25. C. Eksin and A. Ribeiro, "Distributed network optimization with heuristic rational agents," *IEEE Trans. Signal Process.*, vol. 60, pp. 5396–5411, October 2012.
26. Y. Hu and A. Ribeiro, "Optimal wireless networks based on local channel state information," *IEEE Trans. Signal Process.*, vol. 60, pp. 4913–4929, September 2012.
27. A. Ribeiro, "Optimal resource allocation in wireless communication and networking," *EURASIP J. Wireless Commun., Networking*, vol. 2012, August 2012.
28. J. LeNy, A. Ribeiro, and G. Pappas, "Adaptive communication-constrained deployment of unmanned vehicle systems," *IEEE J. Sel. Areas Commun.*, vol. 30, pp. 923–934, June 2012.
29. J. Fink, A. Ribeiro, and V. Kumar, "Robust control for mobility and wireless communication in cyber-physical systems with application to robot teams," *Proc. of the IEEE*, vol. 100, pp. 164–178, January 2012.
30. Y. Hu and A. Ribeiro, "Adaptive distributed algorithms for optimal random access channels," *IEEE Trans. Wireless Commun.*, vol. 10, pp. 2703–2715, August 2011.
31. A. Ribeiro, "Ergodic stochastic optimization algorithms for wireless communication and networking," *IEEE Trans. Signal Process.*, vol. 58, pp. 6369–6386, December 2010.
32. A. Ribeiro and G. Giannakis, "Separation principles in wireless networking," *IEEE Trans. Inf. Theory*, vol. 56, pp. 4488–4505, September 2010.
33. N. Gatsis, A. Ribeiro, and G. Giannakis, "A class of convergent algorithms for resource allocation in wireless fading networks," *IEEE Trans. Wireless Commun.*, vol. 9, pp. 1808–1823, May 2010.
34. A. Ribeiro, I. Schizas, S. Roumeliotis, and G. Giannakis, "Kalman filtering in wireless sensor networks – Incorporating communication cost in state estimation problems," *IEEE Control Systems Mag.*, vol. 30, pp. 66–86, April 2010.
35. A. Ribeiro, N. Sidiropoulos, and G. Giannakis, "Optimal distributed stochastic routing algorithms for wireless multihop networks," *IEEE Trans. Wireless Commun.*, vol. 7, pp. 4261–4272, November 2008.

36. E. Msechu, S. Roulmeliotis, A. Ribeiro, and G. Giannakis, "Decentralized Quantized Kalman Filtering with Scalable Communication Cost," *IEEE Trans. Signal Process.*, vol. 56, pp. 3727–3741, August 2008.
37. A. Cano-Pleite, T. Wang, A. Ribeiro, and G. Giannakis, "Link-adaptive distributed coding for multi-source cooperation," *EURASIP J. Advances Signal Process.*, vol. 2008, p. 12 pages Article ID 352796, June 2008.
38. I. Schizas, G. Giannakis, S. Roulmeliotis, and A. Ribeiro, "Consensus in ad hoc WSNs with noisy links - part II: distributed estimation and smoothing of random signals," *IEEE Trans. Signal Process.*, vol. 56, pp. 1650–1666, April 2008.
39. I. Schizas, A. Ribeiro, and G. Giannakis, "Consensus in ad hoc WSNs with noisy links - part I: distributed estimation of deterministic signals," *IEEE Trans. Signal Process.*, vol. 56, pp. 350–364, January 2008.
40. A. Ribeiro, R. Wang, and G. Giannakis, "Multi-source cooperation with full-diversity spectral efficiency and controllable-complexity," *IEEE J. Sel. Areas Commun.*, vol. 25, pp. 415–425, February 2007.
41. A. Ribeiro, N. Sidiropoulos, G. Giannakis, and Y. Yu, "Achieving wireline random access throughput in wireless networking via user cooperation," *IEEE Trans. Inf. Theory*, vol. 53, pp. 732–758, February 2007.
42. A. Ribeiro, G. Giannakis, and S. Roulmeliotis, "SOI-KF: Distributed Kalman filtering with low-cost communications using the sign of innovations," *IEEE Trans. Signal Process.*, vol. 54, pp. 4782–4795, December 2006.
43. A. Ribeiro, X. Cai, and G. Giannakis, "Opportunistic multipath for bandwidth-efficient cooperative multiple access," *IEEE Trans. Wireless Commun.*, vol. 5, pp. 2321–2327, September 2006.
44. A. Ribeiro and G. Giannakis, "Bandwidth-constrained distributed estimation for wireless sensor networks - part II: unknown pdf," *IEEE Trans. Signal Process.*, vol. 54, pp. 2784–2796, July 2006.
45. J.-J. Xiao, A. Ribeiro, T. Luo, and G. Giannakis, "Distributed compression-estimation using wireless sensor networks," *IEEE Signal Process. Mag.*, vol. 23, pp. 27–41, July 2006.
46. A. Ribeiro and G. Giannakis, "Bandwidth-constrained distributed estimation for wireless sensor networks - part I: Gaussian case," *IEEE Trans. Signal Process.*, vol. 54, pp. 1131–1143, March 2006.
47. A. Ribeiro and G. Giannakis, "Fixed and random access cooperative networks," *EURASIP Newsletter*, vol. 17, pp. 3–24, March 2006.
48. A. Ribeiro, X. Cai, and G. Giannakis, "Symbol error probabilities for general cooperative links," *IEEE Trans. Wireless Commun.*, vol. 4, pp. 1264–1273, May 2005.

### Conference papers

1. C. Eksin and A. Ribeiro, "Distributed fictitious play in potential games of incomplete information," in *Proc. Conf. on Decision Control*, vol. (submitted), Osaka, Japan, December 15-18 2015.
2. K. Gatsis, A. Ribeiro, and G. Pappas, "Control with random access wireless sensors," in *Proc. Conf. on Decision Control*, vol. (submitted), Osaka, Japan, December 15-18 2015.
3. S. Paternain and A. Ribeiro, "Online Learning of Optimal Strategies in Unknown Environ-

- ments,” in *Proc. Conf. on Decision Control*, vol. (to appear), Osaka, Japan, December 15-18 2015.
4. A. Koppel, G. Warnell, E. Stumpe, and A. Ribeiro, “D4L: Decentralized Dynamic Discriminative Dictionary Learning,” in *Proc. Int. Conf. Intelligent Robots, Systems*, vol. (submitted), Hamburg, Germany, September 28 - October 2 2015.
  5. S. Segarra, A. G. Marques, G. Leus, and A. Ribeiro, “Interpolation of graph signals using shift-invariant graph filters,” in *European Signal Processing Conference (EUSIPCO)*, vol. (submitted), Nice, France, August 31 - September 4 2015.
  6. C. Eksin, H. Delic, and A. Ribeiro, “Real-Time Pricing with Uncertain and Heterogeneous Consumer Preferences,” in *Proc. American Control Conf.*, vol. (to appear), Chicago, IL, July 1-3 2015.
  7. S. Paternain and A. Ribeiro, “Online learning of feasible strategies in unknown environments,” in *Proc. American Control Conf.*, vol. (to appear), Chicago IL, Jul 1-3 2015.
  8. J. Stephan, J. Fink, B. Charrow, and A. Ribeiro, “Hybrid decentralized control system for communication aware mobile robotic teams,” in *Int. Conf. Robotics Automation*, vol. (submitted), Seattle WA, May 25-30 2015.
  9. C. Eksin, H. Delic, and A. Ribeiro, “Rational Consumer Behavior Models in Smart Pricing,” in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. (to appear), Brisbane, Australia, April 19-24 2015.
  10. W. Huang and A. Ribeiro, “Metrics in the space of high order proximity networks,” in *Proc. Int. Conf. Accoustics Speech Signal Process.*, p. (to appear), Brisbane Australia, April 19-24 2015.
  11. A. Koppel, F. Jakubeic, and A. Ribeiro, “Regret bounds of a distributed saddle point algorithm,” in *Proc. Int. Conf. Accoustics Speech Signal Process.*, vol. (to appear), Brisbane Australia, Apr 19-24 2015.
  12. A. Mokhtari, Q. Ling, and A. Ribeiro, “An approximate Newton method for distributed optimization,” in *Proc. Int. Conf. Accoustics Speech Signal Process.*, vol. (to appear), Brisbane Australia, Apr 19-24 2015.
  13. S. Segarra and A. Ribeiro, “Stability and continuity of centrality measures in weighted graphs,” in *Proc. Int. Conf. Accoustics Speech Signal Process.*, vol. (to appear), Brisbane Australia, April 19-24 2015.
  14. K. Gatsis, M. Pajic, A. Ribeiro, and G. Pappas, “Opportunistic sensor scheduling in wireless control systems,” in *Proc. Conf. on Decision Control*, pp. 3777–3782, Los Angeles CA, December 15-17 2014.
  15. M. Zargham, A. Ribeiro, and A. Jadbabaie, “Discounted integral priority routing for data networks,” in *Proc. Global Telecommun. Conf.*, pp. 1993–1998, Austin, TX, December 8-12 2014.
  16. S. Segarra and A. Ribeiro, “Dithering and betweenness centrality in weighted graphs,” in *Proc. Global Conf. Signal Info. Process.*, pp. 847–851, Atlanta, GA, Dec 3-5 2014.
  17. A. Mokhtari and A. Ribeiro, “Network Newton,” in *Proc. Asilomar Conf. on Signals Systems Computers*, vol. (to appear), Pacific Grove CA, November 2-5 2014.
  18. J. Stephan, J. Fink, B. Charrow, A. Ribeiro, and V. Kumar, “Robust routing and multi-confirmation transmission protocol for connectivity management of mobile robotic teams,” in *Int. Conf. Intelligent Robots Systems*, pp. 3753–3760, Chicago, IL, September 14-18 2014.

19. G. Carlsson, F. Memoli, A. Ribeiro, and S. Segarra, "Hierarchical quasi-clustering methods for asymmetric networks," in *Proc. Int. Conf. Machine Learning*, vol. 32, pp. 352–360, Beijing, China, June 21-26 2014.
20. C. Eksin, H. Delic, and A. Ribeiro, "Distributed demand side management of heterogeneous rational consumers in smart grids with renewable sources," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 1100 – 1104, Florence Italy, May 4-9 2014.
21. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Information aggregation in a beauty contest game," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 4783 – 4787, Florence Italy, May 4-9 2014.
22. A. Koppel, F. Jakubiec, and A. Ribeiro, "A saddle point algorithm for networked online convex optimization," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 8292 – 8296, Florence Italy, May 4-9 2014.
23. Q. Ling and A. Ribeiro, "Decentralized linearized alternating direction method of multipliers," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 5447-5451, Florence Italy, May 4-9 2014.
24. A. Mokhtari and A. Ribeiro, "A quasi-Newton method for large scale support vector machines," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 8302-8306, Florence Italy, May 4-9 2014.
25. S. Segarra and A. Ribeiro, "A stable betweenness centrality measure in networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 3859-3863, Florence Italy, May 4-9 2014.
26. K. Gatsis, M. Pajic, A. Ribeiro, and G. Pappas, "Opportunistic scheduling of control tasks over shared wireless channels," in *Proc. ACM/IEEE Int. Conf. Cyber-Physical Systems*, pp. 48–59, Berlin Germany, April 14-17 2014.
27. S. Segarra and A. Ribeiro, "Hierarchical clustering and consensus in trust networks," in *Proc. of the fifth IEEE Int. Workshop on Computational Advances in Multi-Sensor Adaptive Process.*, pp. 85–88, Saint Martin, December 15-18 2013.
28. A. De, A. Ribeiro, W. Moran, and D. E. Koditschek, "Convergence of Bayesian histogram filters for location estimation," in *Proc. Conf. on Decision Control*, pp. 7047–7053, Florence Italy, December 10-13 2013.
29. K. Gatsis, M. Pajic, A. Ribeiro, and G. Pappas, "Power-aware communication for wireless sensor-actuator systems," in *Proc. Conf. on Decision Control*, pp. 4006–4011, Florence Italy, December 10-13 2013.
30. P. Molavi, C. Eksin, A. Ribeiro, and A. Jadbabaie, "Learning to coordinate in a beauty contest game," in *Proc. Conf. on Decision Control*, pp. 7358 – 7363, Florence Italy, December 10-13 2013.
31. M. Zargham, A. Ribeiro, and A. Jadbabaie, "Accelerated dual descent for constrained convex network flow optimization," in *Proc. Conf. on Decision Control*, pp. 1037 – 1042, Florence Italy, December 10-13 2013.
32. M. Zargham, A. Ribeiro, and A. Jadbabaie, "Accelerated backpressure algorithm," in *Proc. Global Telecommun. Conf.*, pp. 2269 – 2275, Atlanta GA, December 9-13 2013.
33. G. Carlsson, F. Memoli, A. Ribeiro, and S. Segarra, "Alternative axiomatic constructions for hierarchical clustering of asymmetric networks," in *Proc. Global Conf. Signal Info. Process.*, pp. 791–794, Austin TX, December 3-5 2013.
34. A. Mokhtari and A. Ribeiro, "Regularized stochastic BFGS algorithm," in *Proc. Global Conf. Signal Info. Process.*, pp. 1109–1112, Austin TX, December 3-5 2013.

35. G. Carlsson, F. Memoli, A. Ribeiro, and S. Segarra, "Hierarchical clustering methods and algorithms for asymmetric networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 1773–1777, Pacific Grove CA, November 3-6 2013.
36. K. Yuan, Q. Ling, W. Yin, and A. Ribeiro, "A linearized Bregman algorithm for decentralized basis pursuit," in *Proc. European Signal Process. Conf.*, pp. 1–5, Marrakech Morocco, September 9-13 2013.
37. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Distributed filters for Bayesian network games," in *Proc. European Signal Process. Conf.*, pp. 1–5, Marrakech Morocco, September 9-13 2013.
38. Q. Ling and A. Ribeiro, "Decentralized dynamic optimization through the alternating direction method of multipliers," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 170–174, Darmstadt Germany, June 16-19 2013.
39. Y. Hu and A. Ribeiro, "Cognitive access algorithms for multiple access channels," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 120–124, Darmstadt Germany, June 16-19 2013.
40. A. Mokhtari and A. Ribeiro, "A dual stochastic DFP algorithm for optimal resource allocation in wireless systems," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 21–25, Darmstadt Germany, June 16-19 2013.
41. K. Gatsis, A. Ribeiro, and G. Pappas, "Optimal power management in wireless control systems," in *Proc. American Control Conf.*, pp. 1562–1569, Washington DC, June 17-19 2013.
42. G. Carlsson, F. Memoli, A. Ribeiro, and S. Segarra, "Axiomatic construction of hierarchical clustering in asymmetric networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 5219-5223, Vancouver Canada, May 26-31 2013.
43. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Bayesian quadratic network game filters," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 4589 – 4593, Vancouver Canada, May 26-31 2013.
44. S. Segarra, M. Eisen, and A. Ribeiro, "Authorship attribution using function words adjacency networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 5563-5567, Vancouver Canada, May 26-31 2013.
45. M. Zargham, A. Ribeiro, and A. Jadbabaie, "Network optimization under uncertainty," in *Proc. Conf. on Decision Control*, pp. 7470–7475, Maui Hawaii, December 10-13 2012.
46. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Dynamic games with side information in economic networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 520–524, Pacific Grove CA, November 4-7 2012.
47. F. Jakubiec and A. Ribeiro, "Distributed maximum a posteriori probability estimation for tracking of dynamic systems," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 1478–1482, Pacific Grove CA, November 4-7 2012.
48. B. Arzani, R. Guerin, and A. Ribeiro, "A Distributed Routing Protocol for Predictable Rates in Wireless Mesh Networks.," in *Proc. Int. Conf. on Network Protocols*, pp. 1–10, Austin TX, October 30 - November 2 2012.
49. C. Eksin, P. Molavi, A. Ribeiro, and A. Jadbabaie, "Learning in linear games over networks," in *Proc. Allerton Conf. on Commun. Control Computing*, pp. 434–440, Monticello IL, October 1-5 2012.
50. M. Zargham, A. Ribeiro, and A. Jadbabaie, "A distributed line search for network opti-



- mization,” in *Proc. American Control Conf.*, pp. 472–477, Montreal Canada, June 27-29 2012.
51. J. Fink, A. Ribeiro, and V. Kumar, “Motion planning for robust wireless networking,” in *Proc. Int. Conf. Robotics Autom.*, vol. 2419-2426, Saint Paul, MN, May 14-18 2012.
  52. C. Eksin and A. Ribeiro, “Heuristic rational models in social networks,” in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 3077–3080, Kyoto Japan, March 25-30 2012.
  53. Y. Hu and A. Ribeiro, “Optimal wireless multiuser channels with imperfect channel state information,” in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 3021–3024, Kyoto Japan, March 25-30 2012.
  54. F. Jakubiec and A. Ribeiro, “Distributed maximum a posteriori probability estimation of dynamic systems with wireless sensor networks,” in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 2857–2860, Kyoto Japan, March 25-30 2012.
  55. J. LeNy, A. Ribeiro, and G. Pappas, “Robot deployment with end-to-end wireless communication constraints,” in *Proc. Conf. on Decision Control*, pp. 4232–4238, Orlando FL, December 12-15 2011.
  56. Y. Hu and A. Ribeiro, “Optimal transmission over a fading channel with imperfect channel state information,” in *Global Telecommun. Conf.*, pp. 1–5, Houston TX, December 5-9 2011.
  57. C. Eksin and A. Ribeiro, “Network optimization with heuristic rational agents,” in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 53–57, Pacific Grove CA, November 6-9 2011.
  58. M. Zavlanos, A. Ribeiro, and G. Pappas, “A framework for integrating mobility and routing in mobile communication networks,” in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 1461–1465, Pacific Grove CA, November 6-9 2011.
  59. Y. Hu and A. Ribeiro, “Optimal random access for wireless networks in the presence of fading,” in *Proc. Allerton Conf. on Commun. Control Computing*, pp. 800–807, Monticello IL, September 28-30 2011.
  60. M. Zargham, A. Ribeiro, A. Ozdaglar, and A. Jadbabaie, “Accelerated dual descent for network optimization,” in *Proc. American Control Conf.*, pp. 2663–2668, San Francisco CA, June 29 - July 1 2011.
  61. M. Zavlanos, A. Ribeiro, and G. Pappas, “Distributed control of mobility and routing in networks of robots,” in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 236–240, San Francisco CA, June 26-29 2011.
  62. Y. Hu and A. Ribeiro, “Optimal wireless networks based on local channel state information,” in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 3124–3127, Prague Czech Republic, May 22-27 2011.
  63. M. Zavlanos, A. Ribeiro, and G. Pappas, “Mobility and routing control in networks of robots,” in *Proc. Conf. on Decision Control*, vol. (to appear), pp. 7545–7550, Atlanta GA, December 15-17 2010.
  64. J. Fink, A. Ribeiro, V. Kumar, and B. M. Sadler, “Optimal robust multihop routing for wireless networks of mobile micro autonomous systems,” in *Proc. Military Commun. Conf.*, pp. 1268–1273, San Jose CA, October 31 - November 3 2010.
  65. Y. Hu and A. Ribeiro, “Adaptive distributed algorithms for optimal random access channels,” in *Proc. Allerton Conf. on Commun. Control Computing*, pp. 1474–1481, Monticello IL, September 29 - October 1 2010.

66. A. Ribeiro, "Stochastic learning algorithms for optimal design of wireless fading networks," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 1–5, Marakech Morocco, June 20-23 2010.
67. A. Ribeiro, "Ergodic stochastic optimization algorithms for wireless communication and networking," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 3326–3329, Dallas TX, March 14-19 2010.
68. A. Ribeiro, "Stochastic soft backpressure algorithms for routing and scheduling in wireless ad-hoc networks," in *Proc. of the third IEEE Int. Workshop on Computational Advances in Multi-Sensor Adaptive Process.*, pp. 137–140, Aruba Dutch Antilles, December 13-16 2009.
69. A. Ribeiro, "Layers and layer interfaces in wireless networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 2557–2560, Taipei Taiwan, April 19-24 2009.
70. N. Gatsis, A. Ribeiro, and G. Giannakis, "Cross-layer optimization of wireless fading ad-hoc networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 2353–2356, Taipei Taiwan, April 19-24 2009.
71. A. Ribeiro and G. Giannakis, "Optimal layered architectures of wireless networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 2147–2151, Pacific Grove CA, November 4-7 2008.
72. A. Ribeiro and G. Giannakis, "Robust stochastic routing and scheduling for wireless ad-hoc networks," in *Proc. Wireless Commun. Mobile Computing Conf.*, pp. 50–55, Crete Island Greece, August 6-8 2008.
73. E. Msechu, A. Ribeiro, S. Roumeliotis, and G. Giannakis, "Distributed Kalman filtering based on quantized innovations," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 3293–3296, Las Vegas NV, March 31 - April 4 2008.
74. A. Ribeiro and G. Giannakis, "Optimal FDMA over wireless fading mobile ad-hoc networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, pp. 2765–2768, Las Vegas NV, March 31 - April 4 2008.
75. A. Ribeiro and G. Giannakis, "Layer separability of wireless networks," in *Proc. Conf. on Info. Sciences and Systems*, pp. 821–826, Princeton Univ. Princeton NJ, March 19-21 2008.
76. E. Msechu, S. Roumeliotis, A. Ribeiro, and G. Giannakis, "Distributed iteratively quantized Kalman filtering for wireless sensor networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 646–650, Pacific Grove CA, November 4-7 2007.
77. I. Schizas, G. Giannakis, S. Roumeliotis, and A. Ribeiro, "Anytime optimal distributed Kalman filtering and smoothing," in *Proc. IEEE Workshop on Statistical Signal Process.*, pp. 368–372, Madison WI, August 26-29 2007.
78. I. Schizas, G. Giannakis, and A. Ribeiro, "Distributed MAP and LMMSE estimation of random signals using ad hoc wireless sensor networks with noisy links," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 1–5, Helsinki Finland, June 17-20 2007.
79. A. Ribeiro and G. Giannakis, "Joint stochastic routing and scheduling for multihop wireless ad-hoc networks," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 1–5, Helsinki Finland, June 17-20 2007.
80. A. Ribeiro, T. Luo, N. Sidiropoulos, and G. Giannakis, "Modelling and optimization of stochastic routing for wireless multihop networks," in *Proc. IEEE Int. Conf. on Computer Commun.*, pp. 1748–1756, Anchorage AK, May 6-12 2007.

81. I. Schizas, A. Ribeiro, and G. Giannakis, "Consensus-based distributed parameter estimation in ad hoc wireless sensor networks with noisy links," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 2, pp. 849–852, Honolulu HI, April 15-20 2007.
82. A. Ribeiro, G. Giannakis, and N. Sidiropoulos, "Distributed routing algorithms for wireless multihop networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 3, pp. 517–520, Honolulu HI, April 15-20 2007.
83. Y. Wu, A. Ribeiro, and G. Giannakis, "Robust routing in wireless multi-hop networks," in *Proc. Conf. on Info. Sciences and Systems*, pp. 637–642, Johns Hopkins Univ. Baltimore MD, March 14-16 2007.
84. A. Cano-Pleite, T. Wang, A. Ribeiro, and G. Giannakis, "Link-adaptive distributed coding for multi-source cooperation," in *Global Telecommun. Conf.*, pp. 1–5, San Francisco CA, November 27 - December 1 2006.
85. A. Ribeiro, T. Luo, N. Sidiropoulos, and G. Giannakis, "A general optimization framework for stochastic routing in wireless multi-hop networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 1367–1371, Pacific Grove CA, October 29 - November 1 2006.
86. I. Schizas, A. Ribeiro, and G. Giannakis, "Distributed estimation with ad hoc wireless sensor networks," in *Proc. of European Signal. Process. Conf.*, pp. 1–5, Florence Italy, September 4-8 2006.
87. A. Ribeiro, R. Wang, and G. Giannakis, "Multi-source cooperation with full-diversity spectral efficiency and controllable-complexity," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 1–5, Cannes France, July 2-5 2006.
88. A. Ribeiro, G. Giannakis, and S. Roumeliotis, "SOI-KF: distributed Kalman filtering with low-cost communications using the sign of innovations," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 4, pp. 153–156, Toulouse France, May 14-19 2006.
89. A. Ribeiro, R. Wang, and G. Giannakis, "Linear complex-field coding for cooperative networking," in *Proc. of the first IEEE Int. Workshop on Computational Advances in Multi-Sensor Adaptive Process.*, pp. 48–51, Puerto Vallarta Mexico, December 13-15 2005.
90. A. F. Sha, A. Ribeiro, and G. Giannakis, "Bandwidth-constrained MAP estimation for wireless sensor networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 215–219, Pacific Grove CA, October 28 - November 1 2005.
91. X. Wang, Y. Yu, and A. Ribeiro, "Performance analysis of cooperative random access with long PN spreading codes," in *Proc. Asilomar Conf. on Signals Systems Computers*, pp. 499–503, Pacific Grove CA, October 28 - November 1 2005.
92. A. Ribeiro and G. Giannakis, "Distributed Kalman filtering based on severely quantized WSN data," in *Proc. of IEEE Workshop on Statistical Signal Process.*, pp. 1250–1255, Bordeaux France, July 17-20 2005.
93. A. Ribeiro, N. Sidiropoulos, and G. Giannakis, "Achieving wireline random access throughput in wireless networking via user cooperation," in *Proc. IEEE Workshop on Signal Process. Advances in Wireless Commun.*, pp. 1033–1037, New York NY, June 5-8 2005.
94. A. Ribeiro and G. Giannakis, "Distributed quantization-estimation using wireless sensor networks," in *Proc. IEEE Int. Conf. Commun.*, vol. 2, pp. 730–736, Seoul Korea, May 16-20 2005.
95. A. Ribeiro, Y. Yu, G. Giannakis, and N. Sidiropoulos, "Increasing the throughput of spread-Aloha protocols via long PN spreading codes," in *Proc. IEEE Int. Conf. Commun.*, vol. 5, pp. 3628–3631, Seoul Korea, May 16-20 2005.

96. A. Ribeiro and G. Giannakis, "Non-parametric distributed quantization-estimation using wireless sensor networks," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 4, pp. 61–64, Philadelphia PA, March 18-23 2005.
97. Y. Yu, A. Ribeiro, N. Sidiropoulos, and G. Giannakis, "Cooperative random access with long PN spreading codes," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 3, pp. 517–520, Philadelphia PA, March 18-23 2005.
98. A. Ribeiro and G. Giannakis, "Distributed estimation in Gaussian noise for bandwidth-constrained wireless sensor networks," in *Proc. Asilomar Conf. on Signals Systems Computers*, vol. 2, pp. 1407–1411, Pacific Grove CA, November 7-10 2004.
99. A. Ribeiro, X. Cai, and G. Giannakis, "Symbol error probabilities for general cooperative links," in *Proc. IEEE Int. Conf. Commun.*, vol. 6, pp. 3369–3373, Paris France, June 20-24 2004.
100. A. Ribeiro, X. Cai, and G. Giannakis, "Opportunistic multipath for bandwidth-efficient cooperative networking," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, vol. 4, pp. 549–552, Montreal Canada, May 17-21 2004.

#### Book chapters

1. A. Ribeiro, I. Schizas, J. J. Xiao, G. Giannakis, and T. Luo, "Distributed estimation under bandwidth and energy constraints," in *Wireless Sensor Networks: Signal Processing and Communications Perspectives* (A. Swami, Q. Zhao, Y. Hong, and L. Tong, eds.), Wiley, February 2007.
2. I. Schizas, A. Ribeiro, and G. Giannakis, "Dimensionality reduction compression and quantization for distributed estimation with wireless sensor networks," in *Wireless Communications* (P. Agrawal, D. Andrews, P. Fleming, G. Yin, and L. Zhang, eds.), vol. 143 of *IMA Volumes in Mathematics and its Applications*, pp. 259–296, Springer, New York, April 2006.

#### Theses

1. A. Ribeiro, *Wireless cooperative communications and networking*. PhD thesis, University of Minnesota, Twin cities, April 2007.
2. A. Ribeiro, "Distributed quantization-estimation for wireless sensor networks," Master's thesis, University of Minnesota, Twin cities, August 2005.

#### SEMINARS

1. Rutgers University, ECE Colloquium, *Axiomatic construction of hierarchical clustering in asymmetric networks*, March 25, 2015.
2. Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative Technology Alliance, Review meeting, *Decentralized network deployment for micro autonomous systems*, March 23, 2015.
3. Information Theory and Applications Workshop, University of California at San Diego, *Network Newton*, February 5, 2015.
4. University of Delaware, *Axiomatic construction of hierarchical clustering in asymmetric networks*, October 6, 2014.
5. Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative

- Technology Alliance, Review meeting, *Decentralized network deployment for micro autonomous systems*, April 1, 2014.
6. Information Theory and Applications Workshop, University of California at San Diego, *Hierarchical quasi-clustering methods for asymmetric networks*, February 13, 2014.
  7. Princeton University, *Axiomatic construction of hierarchical clustering in asymmetric networks*, November 12, 2013.
  8. University of California at Los Angeles, *Bayesian network games*, October 23, 2013.
  9. Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative Technology Alliance, Review meeting, *Robust wireless networks for connectivity management*, March 29, 2013.
  10. 1st IEEE/ACM Workshop on Signal Processing Advances in Sensor Networks (CPSWeek), Keynote, *Bayesian network games*, April 8, 2013.
  11. Bellairs workshop on Signal Processing and Networks, McGill University, *Axiomatic construction of hierarchical clustering in asymmetric networks*, February 20, 2013.
  12. Information Theory and Applications Workshop, University of California at San Diego, *Bayesian quadratic network game filters*, February 14, 2013.
  13. Universidad de la Republica Oriental del Uruguay, *Axiomatic construction of clustering in asymmetric networks*, December 12, 2012.
  14. Universidad de la Republica Oriental del Uruguay, *Algorithms for controlling mobility while maintaining robust wireless connectivity*, December 11, 2012.
  15. Air Force Office of Scientific Research, Science of Information, Computation and Fusion, Review meeting, *MURI highlight technical talk: Asymmetric clustering*, December 5, 2012.
  16. Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative Technology Alliance, Review meeting, *Robust wireless networks for connectivity management*, March 29, 2012.
  17. Pennsylvania State University, *Optimal resource allocation in wireless communication and networking*, March 1, 2012.
  18. MAST Sensing, Perception, and Processing Thrust Research Directions Workshop, University of Michigan, *Communication issues in mobile micro autonomous systems*, February 24, 2012.
  19. Information Theory and Applications Workshop, University of California at San Diego, *Circles of trust: An axiomatic theory of clustering in asymmetric networks*, February 6, 2012.
  20. State University of New York at Buffalo, *Optimal resource allocation in wireless communication and networking*, February 3, 2012.
  21. Air Force Office of Scientific Research, Science of Information, Computation and Fusion, Review meeting, *Hierarchical clustering of asymmetric data*, November 9, 2011.
  22. Stanford University, *Optimal resource allocation in wireless communication and networking*, October 6, 2011.
  23. Cornell University, *Optimal resource allocation in wireless communication and networking*, October 6, 2011.
  24. IEEE new technologies conference at Boeing, *Robust control of mobility and communica-*

*tions in autonomous robot teams*, August 9, 2011.

25. University of Delaware, *Optimal resource allocation in wireless communication and networking*, May 2, 2011.
26. Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative Technology Alliance, Review meeting, *Robust wireless networks for connectivity management*, April 1, 2011.
27. Princeton University, *Optimal resource allocation in wireless communication and networking*, March 31, 2011.
28. Northwestern University, *Optimal resource allocation in wireless communication and networking*, March 11, 2011.
29. Carnegie Mellon University, *Optimal resource allocation in wireless communication and networking*, February 24, 2011.

#### RESEARCH FUNDING

1. *Optimal Communication for faster sensor network coordination (Award No: 1302222)*, National Science Foundation. M. Zavlanos (principal investigator), V. Preciado, and A. Ribeiro. Awarded amount: \$774,000, October 2013 - October 2016.
2. *CoDoN: Categorification of Data over Networks (Award No: 1304-560288)*, DARPA Defense Sciences Office. R. Ghrist (principal investigator) and A. Ribeiro. Awarded amount: \$1,300,000, July 2012 - June 2016.
3. *New Paradigms for Scalable, Online, Decentralized Optimization (Award No: N00014-12-1-0997)*, Office of Naval Research. A. Jadbabaie (principal investigator), A. Ozdaglar, A. Rahklin, and A. Ribeiro. Awarded amount: \$1,500,000, November 2010 - October 2015.
4. *Circles of Trust: An Axiomatic Construction of Clustering in Asymmetric Networks (Award No: 1217963)*, National Science Foundation, Division: Computer and Communications Foundations. A. Ribeiro (principal investigator). Awarded amount: \$305,215, August 2012 - July 2015.
5. *Control Science for Next Generation Sensing (Award No: FA9550-10-1-0567)*, Air Force Office of Scientific Research, Multi-University Research Initiative. D. Koditschek (principal investigator), A. Jadbabie, V. Kumar, A. Ribeiro, University of Minnesota, University of California at Berkeley. Awarded amount: \$7,000,000, November 2010 - October 2015.
6. *CAREER: Towards a formal theory of wireless networking (Award No: 0952867)*, National Science Foundation, Division: Computer and Communications Foundations, Program: Communication and Information Theory. A. Ribeiro (principal investigator). Awarded amount: \$400,000, September 2010 - August 2015.
7. *Distributed statistical inference of dynamic systems with sensor networks (Award No: 1017454)*, National Science Foundation, Division: Computer and Communications Foundations, Program: Sensor Networks. A. Ribeiro (principal investigator). Awarded amount: \$300,000, September 2010 - August 2013.
8. *Theoretical foundations of wireless networks (Award No: W911NF-10-1-0388)*, Army Research Office, Network Sciences Division. A. Ribeiro (principal investigator). Awarded amount: \$300,000, August 2010 - July 2013.
9. *Robust wireless networks for connectivity management*, Army Research Laboratory, Micro Autonomous Systems and Technology Collaborative Technology Alliance (Contract No: W911NF-08-2-0004). A. Ribeiro (principal investigator). Awarded amount: \$387,668,

November 2009 - October 2014.

10. *Quantitative analysis and design of control networks (Award No: 0931239)*, National Science Foundation, Division: Computer and Network Systems, Program: Computer Systems, Information Technology Research. G. Pappas (principal investigator), R. Alur, I. Lee, R. Mangharam, and A. Ribeiro. Awarded amount: \$1,509,319, September 2009 - August 2012.

## TEACHING

1. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2014. Class rating: *td/4*, instructor rating: *td/4*, difficulty rating: *td/4*. Enrollment: 72.
2. *Signal and Information Processing (ESE 224)*, University of Pennsylvania, Spring 2014. Class rating: *td/4*, instructor rating: *td/4*, difficulty rating: *td/4*. Enrollment: 35.
3. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2014. Class rating: 2.18/4, instructor rating: 2.41/4, difficulty rating: 3.12/4. Enrollment: *td*.
4. *Modern convex optimization (ESE 605)*, University of Pennsylvania, Spring 2014. Class rating: 2.97/4, instructor rating: 2.92/4, difficulty rating: 3.32/4. Enrollment: 40.
5. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2013. Class rating: 2.57/4, instructor rating: 2.76/4, difficulty rating: 3.26/4. Enrollment: 47.
6. *Optimal design of wireless systems (ESE 675)*, University of Pennsylvania, Spring 2013. Class rating: 3.00/4, instructor rating: 3.56/4, difficulty rating: 2.67/4. Enrollment: 3.
7. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2012. Class rating: 2.93/4, instructor rating: 3.24/4, difficulty rating: 3.49/4. Enrollment: 47.
8. *Optimal design of wireless systems (ESE 675)*, University of Pennsylvania, Spring 2012. Class rating: 3.00/4, instructor rating: 3.56/4, difficulty rating: 2.67/4. Enrollment: 9.
9. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2011. Class rating: 3.16/4, instructor rating: 3.36/4, difficulty rating: 3.38/4. Enrollment: 49.
10. *Special topics in Electrical and Systems Engineering: Optimal design of wireless networks (ESE 680)*, University of Pennsylvania, Spring 2011. Class rating: 2.75/4, instructor rating: 3.05/4, difficulty rating: 3.17/4. Enrollment: 10.
11. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2010. Class rating: 2.65/4, instructor rating: 3.16/4, difficulty rating: 3.34/4. Enrollment: 43.
12. *Special topics in Electrical and Systems Engineering: Optimal design of wireless networks (ESE 680)*, University of Pennsylvania, Spring 2010. Class rating: 3.21/4, instructor rating: 3.57/4, difficulty rating: 2.71/4. Enrollment: 14.
13. *Stochastic systems analysis and simulation (ESE 303)*, University of Pennsylvania, Fall 2009. Class rating: 2.61/4, instructor rating: 2.94/4, difficulty rating: 3.44/4. Enrollment: 37.
14. *Data communications (ESE 408)*, University of Pennsylvania, Spring 2009. Class rating: 4/4, instructor rating: 4/4, difficulty rating: 3.50/4. Enrollment: 2.

## DOCTORAL STUDENTS

<b>Yichuan Hu</b> <i>Distributed Algorithms for Optimal Design of Wireless Networks</i>	University of Pennsylvania <i>December 2013</i>
<b>Ceyhun Eksin</b> <i>Bayesian Network Games</i>	University of Pennsylvania <i>January 2015</i>
<b>James Stephan</b> <i>To be defined</i>	University of Pennsylvania <i>May 2015 (estimated)</i>
<b>Santiago Segarra</b> <i>To be defined</i>	University of Pennsylvania <i>May 2016 (estimated)</i>
<b>Aryan Mokhtari</b> <i>To be defined</i>	University of Pennsylvania <i>December 2016 (estimated)</i>
<b>Alec Koppel</b> <i>To be defined</i>	University of Pennsylvania <i>May 2017 (estimated)</i>
<b>Weiyu Huang</b> <i>To be defined</i>	University of Pennsylvania <i>May 2018 (estimated)</i>
<b>Santiago Paternain</b> <i>To be defined</i>	University of Pennsylvania <i>May 2018 (estimated)</i>
<b>Mark Eisen</b> <i>To be defined</i>	University of Pennsylvania <i>May 2019 (estimated)</i>
<b>Fernando Gama</b> <i>To be defined</i>	University of Pennsylvania <i>May 2019 (estimated)</i>
<b>Shi-Ling Phuong</b> <i>To be defined</i>	University of Pennsylvania <i>May 2019 (estimated)</i>
<b>Zhen Xiang</b> <i>To be defined</i>	University of Pennsylvania <i>May 2019 (estimated)</i>