Soummya Kar

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Education

Carnegie Mellon University
August 2005 – May 2010: Ph.D in Electrical and Computer Engineering

Indian Institute of Technology, Kharagpur
May 2001 – May 2005: BTech in Electronics and Electrical Communication Engineering

Academic Honors

- 2011 A.G. Milnes Award for the Ph.D. thesis of exceptional quality that is likely to have a significant impact in the field of electrical and computer engineering
- 2010 Bertucci Fellowship, College of Engineering, Carnegie Mellon University
- A Best Student Paper award in the 40th Asilomar Conference on Signals, Systems and Computers, Oct. 2006, Monterey, California
- JBNSTS Fellow, May 2001 – to date
- HPCL Fellowship, May 2001 – May 2005

Work Experience

- Assistant Research Professor, Electrical and Computer Engineering Dept., Carnegie Mellon University, May 2011 – to date
- Postdoctoral Research Associate, Electrical Engineering Dept., Princeton University, July 2010 – April 2011
- Graduate Research Fellow, Electrical and Computer Engineering Dept., Carnegie Mellon University, August 2005 – May 2011
- Student Research Intern, Motorola Inc., Bangalore, India, April 2003 – May 2003

Publications

Journal Publications

Accepted

[1] S. Kar and J.M.F. Moura, "Gossip and distributed Kalman filtering: Weak consensus under weak detectability", *IEEE Transactions on Signal Processing*, vol. 59, no. 4, pp. 1766 – 1784, April 2011

[2] S. Kar and J.M.F. Moura, "Convergence rate analysis of distributed gossip (linear parameter) estimation: Fundamental limits and tradeoffs", *IEEE Journal of Selected Topics in Signal Processing – Signal Processing in Gossiping Algorithms Design and Applications*, vol. PP, no. 99, 14th March, 2011. DOI: 10.1109/JSTSP.2011.2127446

[3] A. Dimakis, S. Kar, J.M.F. Moura, M.G. Rabbat and A. Scaglione, " Gossip algorithms for distributed signal processing", *Proceedings of the IEEE*, vol. 98, no. 11, pp. 1847 – 1864, Nov. 2010.

[4] S. Kar, B. Sinopoli, and J.M.F. Moura, "Kalman filtering with intermittent observations: Weak convergence to a stationary distribution", *IEEE Transactions on Automatic Control*, conditionally accepted as regular paper, Nov. 2010.

[5] U. A. Khan, S. Kar, and J. M. F. Moura, "Higher dimensional consensus: Learning in large-scale networks," *IEEE Transactions on Signal Processing*, vol. 58, 2010.

[6] U. A. Khan, S. Kar, and J. M. F. Moura, "DILAND: An algorithm for distributed sensor localization with noisy distance measurements," *IEEE Transactions on Signal Processing*, vol. 58, no. 3, pp., March, 2010.

[7] U. A. Khan, S. Kar, and J. M. F. Moura, "Distributed sensor localization in random environments using minimal number of anchor nodes," *IEEE Transactions on Signal Processing*, vol. 57, no. 5, pp. 2000-2016, May 2009.

[8] S. Kar and J.M.F. Moura, "Distributed consensus algorithms in sensor networks: quantized data and random link failures", *IEEE Transactions on Signal Processing*, vol. 58, no. 3, pp., 2010.

[9] S. Kar and J.M.F. Moura, "Distributed consensus algorithms in sensor networks with imperfect communication: link failures and channel noise", *IEEE Transactions on Signal Processing*, vol.57, no. 5, pp. 355-369, January 2009.

[10] S. Kar and J.M.F. Moura, "Sensor networks with random links: topology design for distributed consensus", *IEEE Transactions on Signal Processing*, Vol.56, No.7, pp. 3315-3326, July 2008.

[11] S. Kar, S.A. Aldosari and J.M.F. Moura, "Topology for distributed inference on graphs", *IEEE Transactions on Signal Processing*, vol. 56, no. 6, pp. 2609–2613, Jun. 2008.

Submitted

[12] S. Kar and J.M.F. Moura, "Moderate deviations of the random Riccati equation", *IEEE Transactions on Automatic Control*, conditionally accepted as regular paper, Oct. 2010.

[13] S. Kar, J.M.F. Moura and K. Ramanan, "Distributed parameter estimation in sensor networks: nonlinear observation models and imperfect communication", *submitted to the IEEE Transactions on Information Theory*, 51 pages, August 2008.

Technical Reports/to be submitted

[14] S. Kar, R. Tandon, H.V. Poor, and S.Cui, "Distributed detection in noisy sensor networks, Feb. 2011

[15] S. Kar, H.V. Poor, and S. Cui, "Multi-agent bandit problems: Asymptotically efficient distributed allocation rules", March 2011

[16] S. Kar, S. Cui, H.V. Poor, and J.M.F. Moura, "Large deviations in distributed Kalman filtering", Dec. 2010.

[17] L. Xie, D.H. Choi, S. Kar, and H.V. Poor, "Distributed state estimation in wide-area power systems", March 2011.

[18] S. Kar and K. Ramanan, "Large deviations in jump Markov processes: revisited", Dec. 2010.

Book Chapters/Magazine Articles

[19] U. A. Khan, S. Kar, and J. M. F. Moura, "Distributed algorithms in sensor networks," in *Handbook on Sensor and Array Processing*, Simon Haykin and K. J. Ray Liu, Eds. Wiley-Interscience, New York, NY, April 2009

[20] S. Cui, Z. Han, S. Kar, T. Kim, H.V. Poor, and A. Tajer, "Coordinated data injection attack and detection in smart grid", *submitted to the IEEE Signal Processing Magazine, April 2011*

Conference Proceedings

[21] A. Tajer, S. Kar, H.V. Poor, and S. Cui, "Distributed joint cyber attack detection and state recovery in smart grids", *submitted to the IEEE SmartGridComm*, April 2011.

[22] L. Sankar, S. Kar, R. Tandon, and H.V. Poor, "Competitive privacy in the smart grid: An information theoretic approach", *submitted to the IEEE SmartGridComm*, April 2011.

[23] R. Tandon, S. Kar, and H.V. Poor, "On the sum-rate of the binary Hamming CEO problem", *submitted to the IEEE Globecom*, March 2011.

[24] Q. Zhao, S. Kar, L. Hui, H.V. Poor, and S. Cui, "Robust distributed least squares estimation in sensor networks with node failures", *submitted to the IEEE Globecom*, March 2011.

[25] S. Kar, H.V. Poor, and S. Cui, "Bandit problems in networks: Asymptotically efficient distributed allocation rules", *submitted to the 50th IEEE Conference on Decision and Control*, March 2011.

[26] S. Kar, R. Tandon, H.V. Poor, and S. Cui, "Distributed detection in noisy sensor networks", *in proceedings of the IEEE International Symposium on Information Theory*, July 31 – August 5, Saint Petersburg, Russia.

[27] L. Xie, D.H. Choi, and S. Kar, "Cooperative distributed state estimation: local observability relaxed", *in proceedings of the IEEE Power and Energy Society General Meeting*, July 24 – July 28, Detroit, MI.

[28] S. Kar and J.M.F. Moura, "Global emergent behavior in clouds of agents", *in proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing*, May 22 – 27, 2011, Prague, Czech Republic.

[29] S. Kar, S. Cui, H.V. Poor, and J.M.F. Moura, "Convergence results in distributed Kalman filtering", *in proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing*, May 22 – 27, 2011, Prague, Czech Republic.

[30] S. Kar, J.M.F. Moura, and K. Ramanan, "Sample path large deviations for the randomly sampled continuous-discrete Kalman filter", *in proceedings of the 49th IEEE Conference on Decision and Control*, pp. 7375 – 7382, Dec. 2010, Atlanta, GA.

[31] U.A. Khan, S. Kar, A. Jadbabaie, and J.M.F. Moura, "On connectivity, observability, and stability in distributed estimation", *in proceedings of the 49th IEEE Conference on Decision and Control*, pp. 6639 – 6644, Dec. 2010, Atlanta, GA.

[32] S. Kar, B. Sinopoli and J.M.F. Moura, "A random dynamical systems approach to filtering in large-scale networks", *in proceedings of the American Control Conference*, Baltimore, Maryland, June 30-July 2, 2010.

[33] U.A. Khan, S. Kar and J.M.F. Moura, "Designing the parameters of high dimensional consensus: multi-objective optimization and pareto-optimality", *in proceedings of the 35th IEEE International Conference on Acoustics, Speech and Signal Processing*, Dallas, Texas, March 14-19, 2010.

[34] U. A. Khan, S. Kar, and J. M.F. Moura, "Distributed sensor localization using barycentric coordinates," *in proceedings of the 3rd International Workshop on Computational Advances in Multi- Sensor Adaptive Processing*, Aruba, Dutch Antilles, Dec. 2009.

[35] U. A. Khan, S. Kar and J. M. F. Moura, "Distributed average consensus: Beyond the realm of linearity," in proceedings of the *43rd IEEE Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 7-10, 2009.

[36] U. A. Khan, S. Kar and J. M. F. Moura, "Asymptotic noise analysis of high dimensional consensus," in proceedings of the 43rd *IEEE Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 7-10, 2009

[37] U. A. Khan, S. Kar, and J. M. F. Moura, "Distributed localization in networks of mobile agents," in proceedings of the 47th *Annual Allerton Conference on Communication, Control and Computing*, Monticello, IL, Sep. 30-Oct. 2, 2009.

[38] S. Kar and K. Ramanan, "Large Deviations for jump Markov processes: revisited", *in proceedings of the 15th INFORMS Applied Probability Society Conference*, Cornell University, Ithaca, NY, USA, July 12-15, 2009

[39] U. A. Khan, S. Kar and J. M. F. Moura, "Higher dimensional consensus algorithms in sensor networks," *in proceedings of the 34th IEEE International Conference on Acoustics, Speech, and Signal Processing*, Taipei, Taiwan, pp. 2857-2860, Apr. 19-24, 2009.

[40] S. Kar and J.M.F. Moura, "A mixed time-scale algorithm for distributed parameter estimation : Nonlinear observation models and imperfect communication," *in proceedings of the 34th IEEE International Conference on Acoustics, Speech, and Signal Processing*, Taipei, Taiwan, pp. 3669-3672, Apr. 19-24, 2009.

[41] U. A. Khan, S. Kar and J. M. F. Moura, "A liner iterative algorithm for distributed sensor localization," *in proceedings of the 42nd IEEE Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA, pp. 1160-1164, Oct. 26-29, 2008

[42] S. Kar and J.M.F. Moura, "Distributed linear parameter estimation in sensor networks: Convergence properties", *in proceedings of the 42nd IEEE Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, pp. 1347-1351 , Oct. 26-29, 2008

[43] S. Kar and K. Ramanan, "Sample path large deviations for networks of G/M/N queues", *in IFORMS Annual Meeting*, Washington, D.C., Oct. 12-15, 2008.

[44] U. A. Khan, S. Kar, B. Sinopoli and J. M. F. Moura, "Distributed sensor localization in Euclidean spaces: Dynamic environments," *in proceedings of the 46th Annual Allerton*

Conference on Communication, Control and Computing, Monticello, IL, pp. 361-366, Sep. 24-26, 2008

[45] S. Kar, J.M.F. Moura and K. Ramanan, "Large deviations for many server networks with long range dependent and batch arrivals", *in proceedings of the 46th Annual Allerton Conference on Communication, Control and Computing*, Monticello, IL, pp. 669-674, Sep. 24-26 2008.

[46] S. Kar and J.M.F. Moura, "Distributed Average Consensus in Sensor Networks with Quantized Inter-Sensor Communication," *in proceedings of the 33rd IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Las Vegas, Nevada, USA, pp. 2281-2284, March 31-April 4, 2008.

[47] S. Kar and J.M.F. Moura, "Distributed Consensus Algorithms in Sensor Networks with Communication Channel Noise and Random Link Failures," *in proceedings of the 41st Asilomar Conference on Signals, Systems and Computers,* Pacific Grove, CA, pp. 676-680, Nov. 4-7, 2007

[48] S. Kar and J.M.F. Moura, "Consensus Based Detection in Sensor Networks: Topology Optimization Under Practical Constraints," *in proceedings of the 1st International Workshop on Information Theory in Sensor Networks*, Santa Fe, NM , June 2007

[49] S. Kar and J. M. F. Moura, "Distributed Average Consensus in Sensor Networks with Random Link Failures," *in proceedings of the 32nd International Conference on Acoustics, Speech, and Signal Processing*, Honolulu, Hawaii, pp. 1013-1016, April 15-20, 2007.

[50] S. Kar and J. M. F. Moura, "Ramanujan Topologies for Decision Making in Sensor Networks," *in proceedings of the 44th Annual Allerton Conference on Communication, Control and Computing*, Monticello, IL **,** Sept. 27-29, 2006

[51] S. Kar and J. M. F. Moura, "Topology for global average consensus", *in proceedings of the 40th Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA, pp. 276-280, Oct. 27-Nov. 1, 2006

Invited Seminars

- "Distributed Kalman filtering: Convergence and tradeoffs", Electrical Engineering Departmental Seminar, Texas A&M University, Nov. 16, 2010.
- "Large Deviations of jump Markov processes: revisited", Probability and Mathematical Finances Seminar, Dept. of Mathematical Sciences, Carnegie Mellon University, April 20, 2009.

Professional Service

Reviewer for: IEEE Transactions on Signal Processing, IEEE Transactions on Automatic Control, IEEE Transactions on Information Theory, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Circuits and Systems-I, Siam Journal on Control and Optimization, Annals of Applied Probability, EURASIP Journal on Advances in Signal Processing, Mathematics of Operation Research, IEEE International Conference on Acoustics, Speech and Signal Processing, IEEE Conference on Decision and Control, American Control Conference, IEEE International Symposium on Information Theory, IEEE Globecom.

Patents

One patent on distributed mobile asset tracking systems (pending)