Bruno Sinopoli

Carnegie Mellon University
Electrical & Computer Engineering
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Education

Degree	Discipline	University	Date
Laurea	Electrical Engineering	Universita' di Padova	1998
M.S.	Electrical Engineering	UC Berkeley	2003
Certificate	Management of Technology	UC Berkeley	2005
Ph.D.	Electrical Engineering	UC Berkeley	2005

Areas of expertise

Control Systems, Smart Infrastructures (e.g. smart grids, smart buildings), Wireless Sensor and Actuator Networks, Cloud Computing, Security of Cyber-Physical Systems, Video Streaming applications, Energy Systems, Data center energy efficiency.

Positions

Full Professor.
Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.
Courtesy appointments: Robotics Institute and Mechanical Engineering.
Affiliation with ICES, Cylab, PDL, NETL fellow.
March 2007-present.

Co-director, Smart Infrastructure Institute,
Institute for Complex Engineered Systems, Carnegie Mellon University, Pittsburgh, PA.
May 2013- present.

Postdoctoral fellow
Department of Electrical Engineering, Stanford University, Palo Alto, CA.
November 2005-February 2007 (60% appointment).

Postdoctoral Fellow
Department of Electrical Engineering and Computer Science, University of California, Berkeley, CA.
November 2005, February 2007 (40% appointment).

Summer Associate, A.T. Kearney Management Consulting, Milano, Italy, summer 2001. Worked in the telecommunications group.

Awards and Honors

1. Microsoft Indoor Localization Competition, winners in the infrastructure-based category, at IPSN 2015 with Patrick Lazik, Niranjini Rajagopal, Oliver Shih, and Anthony Rowe http://research.microsoft.com/en-us/events/indoorloccompetition2015/

2. Chaires Internationales, Universite' Libre de Bruxelles, 2012.

3. George Tallman Ladd Research Award, Carnegie Institute of Technology, Carnegie Mellon, 2010.

4. NSF Career Award, NSF, February 2010.

5. Eli Jury Award, University of California, Berkeley, 2006.

6. Best student paper award finalist, Asian Control Conference, ASCC, 2009 (as advisor).

7. Best student paper award finalist, IEEE Conference on Decision and Control, 2007 (as advisor).

8. Best student paper award finalist, IEEE Conference on Decision and Control, 2003.

Graduate Student Advising

Ph.D. Students

1. Paul Griffioen, August 2016 – Present

2. Yan Xu, "Markov Decision Processes," August 2015 - Present. (co-advised with P. Weng)

3. Mihovil Bartulovic, "Dynamic Adaptive Video Streaming over HTTP," August 2014 - Present.

4. John (Adam) Costanzo, "Structure Identification in Networks of Dynamical Systems," August 2014 - Present.

5. Lucas Balthazar, "Distributed Optimization," August 2013 - Present. (co-advised with J. Xavier)

6. Niranjini Rajagopal, "Indoor Localization," December 2012 - Present. (co-advised with A. Rowe)

7. Xiaofei Liu, "Robust Structural Observability of Dynamical Networks," August 2012 - Present.

8. Sean Weerakkody, "Cyber-Physical Security," August 2012 - Present.

9. Steven Aday, "Automated People Mover Control," September 2011 – Present.

10. Xiaoqi Yin, "Resource Allocation in Smart Infrastructure: Case Studies in Video Delivery and Electric Power Networks," August 2010 - July 2016.
    Present Position: Software Engineer, Google Inc. (to start July 2016)

11. Sabina Zejnilovic, "Localizing a diffusion source on graphs: analysis and design of node selection strategies," August 2010 - May 2016. (co-advised with J. P. Gomes)
    Present Position: Postdoctoral Scholar at Instituto Superior Tecnico, Lisbon, Portugal

12. Rohan Chabukswar, "Secure Detection in Cyberphysical Control Systems," August 2009 - May 2014.
    Present Position: Senior Research Scientist, United Technologies Research Center, Cork, Ireland

13. Jonathan Taylor, "Control for fluid networks," January 2009 - May 2013. (co-advised with W. Messner)
    Present Position: Perception Lead, Bossa Nova Robotics, Pittsburgh, PA

14. Dragana Bajovic, "Event Detection in Large Scale Sensor Networks," August 2008 - May 2013. (co-advised with J. Xavier). Dragana received the **A.G. Milnes Award**, awarded to a graduating ECE PhD student for the PhD thesis work judged to be of the highest quality and which has had or is likely to have significant impact in her field.
    Present Position: Assistant Professor, University of Novi Sad, Novi Sad, Serbia

15. Yilin Mo, "Secure and Dependable Control Systems," August 2007 - December 2012.
    Present Position: Assistant Professor at Nanyang Technological University, Singapore

16. Luca Parolini, "Models, Metrics, and Control Strategies for Data Centers," September 2007 - December 2010. (co-advised with B. Krogh)
    Present Position: Researcher at GE Global Research Europe, Munich, Germany

17. James Weimer, "Large-Scale Multi-Source Detection Using Wireless Sensor Networks," August 2006 - May 2010. (co-advised with B. Krogh).
    Present Position: Research Professor at the University of Pennsylvania, Philadelphia, PA

Master's Students

1. Sindhura Chayapathy, "Design of an Indoor Localization System," May 2015 - May 2016. co-advised with A. Rowe

2. Tejal Kudav, "Sensory Supplementation via Echolocation," September 2014 - May 2015. co-advised with P. Grover, L. Heller

3. David Pearson, "Synchrophasor GPS Security," August 2011 - May 2013.

4. Xiaorui Wang, "Climbing Robots Development and Coordination," January 2010 - December 2010.

5. Mohammadreza Aghajani, "Dynamic Power Allocation in Server Farms", August 2008 - May 2010.

6. Vinay Gunasekaran, "Modeling of Smart Valve Networks," January 2009 - December 2009. co-advised with W. Messner

7. Aakash Shah, "Enhancing the integrity of SCADA and control system devices," September 2007 - May 2008. co-advised with A. Perrig

Published Intellectual Contributions

Book Chapters

1. B. Sinopoli, A. Perrig, H.J. Kim and Y. Mo, "Security of Cyber-Physical Systems", in "Cyber-Physical Systems", part of the SEI Series in Software Engineering, 2016, pp 237-256, Addison Wesley, 2016.

2. L. Parolini, B. Sinopoli and B. Krogh "Models and Control Strategies for Data Centers in the Smart Grid", in "Control and Optimization Methods for Electric Smart Grids", Vol. 3 of the series "Power Electronics and Power Systems", pp. 223-237, Springer Verlag, 2011.

3. Over Wireless Sensor Networks", In "Modelling, Estimation and Control of Networked Complex Systems", part of the series "Understanding Complex Systems", pp. 127-142, Springer Verlag, 2009.

4. E. Garone, B. Sinopoli and A. Casavola, "On the effect of packet acknowledgment on the stability and performance of Networked Control Systems", In "Modelling, Estimation and Control of Networked Complex Systems", part of the series "Understanding Complex Systems", pp. 191-206, Springer Verlag, 2009.

Archival Papers in Journals Critically Reviewed Before Publication

1. X. Liu, S. Pequito, S. Kar, B. Sinopoli, and A. P. Aguiar, "Minimum Sensor Placement for Robust Observability of Structured Complex Networks," *IEEE Transactions on Network Science and Engineering,* under review.

2. E. Bou-Harb, W. Lucia, N. Forti, S. Weerakkody, N. Ghani, and B. Sinopoli, "Cyber Meets Control: A Novel Federated Approach for Resilient CPS Leveraging Real Cyber Threat Intelligence," *IEEE Communications Magazine,* In press.

3. D. Bajovic, J. M. F. Moura, J. Xavier, and B. Sinopoli, "Distributed inference over directed networks: Performance limits and optimal design," IEEE Transactions on Signal Processing, vol. 64, no. 13, pp. 3308-3323, July, 2016.

4. S. Weerakkody, X. Liu, S. H. Son, and B. Sinopoli, "A Graph Theoretic Characterization of Perfect Attackability for the Secure Design of Distributed Control Systems," *IEEE Transactions on Control of Network Systems,* in press.

5. S. Weerakkody, Y. Mo, B. Sinopoli, D. Han, and L. Shi, "Multi-Sensor Scheduling for State Estimation with Event-Based Stochastic Triggers," *IEEE Transactions on Automatic Control,* vol. 61, no. 9, pp. 2695-2701, Sept. 2016.

6. S. Zejnilovic, D. Mitsche, J. Gomes, and B. Sinopoli, "Extending the metric dimension to graphs with missing edges," *Theoretical Computer Science*, vol. 609, no. Part 2, pp. 384-394, 2016.

7. Y. Mo and B. Sinopoli, "Secure Estimation in the Presence of Integrity Attacks," *IEEE Transactions on Automatic Control*, vol. 60, no. 4, pp. 1145- 1151, 2015.

8. Y. Mo, S. Weerakkody, and B. Sinopoli, "Physical Authentication of Control Systems: Designing Watermarked Control Inputs to Detect Counterfeit Sensor Outputs," *IEEE Control Systems Magazine*, vol. 35, no. 1, pp. 93-109, 2015.

9. Y. Mo and B. Sinopoli, "On the Performance Degradation of Cyber-Physical Systems under Stealthy Integrity Attacks," *IEEE Transactions on Automatic Control*, vol. PP, no.99, pp. 6, 2015.

10. D. Han, Y. Mo, J. Wu, S. Weerakkody, B. Sinopoli, and L. Shi, "Stochastic Event-Triggered Sensor Schedule for Remote State Estimation," *IEEE Transactions on Automatic Control*, vol. 60, no. 10, pp. 2661 - 2675, 2015.

11. S. Zejnilovic, J. Xavier, J. Gomes, and B. Sinopoli, "Selecting observers for source localization via error exponents," *IEEE International Symposium on Information Theory*, pp. 6, 2015.

12. Y. Mo, R. Chabukswar, and B. Sinopoli, "Detecting Integrity Attacks on SCADA Systems," *IEEE Transactions on Control Systems Technology*, vol. 22, no. 4, pp. 1396-1407, 2014.

13. K.G. Vamvoudakis, J.P. Hespanha, B. Sinopoli, and Y. Mo, "Detection in Adversarial

Environments," *IEEE Transactions on Automatic Control*, vol. 59, no. 12, pp. 3209-3223, 2014.

14. Y. Mo, E. Garone, and B. Sinopoli, "On infinite-horizon sensor scheduling," *Systems & Control Letters*, vol. 67, pp. 65 - 70, 2014.

15. Y. Mo, J.P. Hespanha, and B. Sinopoli, "Resilient Detection in the Presence of Integrity Attacks," *IEEE Transactions on Signal Processing*, vol. 62, no. 1, pp. 31-43, 2014.

16. *D. Bajovic, J. Xavier, J. M. F. Moura, and B. Sinopoli, "Consensus and Products of Random Stochastic Matrices: Exact Rate for Convergence in Probability," *IEEE Transactions on Signal Processing*, vol. 61, no. 10, pp. 2557-2571, 2013.

17. D. Bajovic, D. Jakovetic, J. M. F. Moura, J. Xavier, and B. Sinopoli, "Large Deviations Performance of Consensus + Innovations Distributed detection with non-Gaussian Observations," *IEEE Transactions on Signal Processing*, vol. 60, no. 11, pp. 5987-6002, 2012.

18. J. Weimer, B. Krogh, M. J. Small, and B. Sinopoli, "An approach to leak detection using wireless sensor networks at carbon sequestration sites," *International Journal of Greenhouse Gas Control*, vol. 9, pp. 243-253, 2012.

19. Y. Mo and B. Sinopoli, "Kalman Filtering With Intermittent Observations: Tail Distribution and Critical Value," *IEEE Transactions on Automatic Control*, vol. 57, no. 3, pp. 677-689, 2012.

20. Q. Jia, L. Shi, Y. Mo, and B. Sinopoli, "On Optimal Partial Broadcasting of Wireless Sensor Networks for Kalman Filtering," *IEEE Transactions on Automatic Control*, vol. 57, no. 3, pp. 715-721, 2012.

21. E. Garone, B. Sinopoli, A. Goldsmith, and A. Casavola, "LQG Control for MIMO Systems Over Multiple Erasure Channels With Perfect Acknowledgment," *IEEE Transactions on Automatic Control*, vol. 57, no. 2, pp. 450-456, 2012.

22. 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*, vol. 57, no. 2, pp. 405-420, 2012.

23. L. Parolini, B. Sinopoli, B. Krogh, and Z. Wang, "A Cyber–Physical Systems Approach to Data Center Modeling and Control for Energy Efficiency," *Proceedings of the IEEE*, vol. 100, no. 1, pp. 254-268, 2012.

24. Y. Mo, T.-J. Kim, K. Brancik, D. Dickinson, H. Lee, A. Perrig, and B. Sinopoli, "Cyber-Physical Security of a Smart Grid Infrastructure," *Proceedings of the IEEE*, vol. 100, no. 1, pp. 195-209, 2012

25. D. Bajovic, D. Jakovetic, J. Xavier, B. Sinopoli, and J. M. F. Moura, "Asymptotic Performance of Distributed Detection over Random Networks," *ICASSP: International Conference on Acoustics, Speech and Signal Processing*, vol. 36th, pp. 3008-3011, 2011.

26. L. Xie, Y. Mo, and B. Sinopoli, "Integrity Data Attacks in Power Market Operations, IEEE Transactions on Smart Grid, Volume 2, Issue 4, Dec 2011, Pages 659-666," *IEEE Transactions on Smart Grid*, vol. 2, no. 4, pp. 659-666, 2011.

27. Y. Mo, E. Garone, A. Casavola, and B. Sinopoli, "Stochastic Sensor Scheduling for Energy Constrained Estimation in Multi-Hop Wireless Sensor Networks" *IEEE Transactions on Automatic Control*, Special Issue on Wireless Sensor and Actuator Networks, vol. 56, no. 10, pp. 2489-2495, 2011.

28. D. Bajovic, J. Xavier, and B. Sinopoli, "Sensor Selection for Event Detection in Wireless Sensor Networks," *IEEE Transactions on Signal Processing*, vol. 59, no. 10, pp. 4938-4953, 2011.

29. D. Bajovic, D. Jakovetic, J. Xavier, B. Sinopoli, and J. M. F. Moura, "Distributed Detection over Random Networks: Large Deviations Performance Analysis", *IEEE Transactions on Signal Processing*, vol. 59, no. 9, pp. 4381-4396, 2011.

30. Y. Mo, R. Ambrosino, and B. Sinopoli, "Sensor selection strategies for state estimation in energy constrained wireless sensor networks", *Automatica*, vol. 47, no. 7, pp. 1330-1338, 2011.

31. L. Shi, Q. S. Jia, Y. Mo, and B. Sinopoli, "Sensor Scheduling over a Packet-delaying Network" *Automatica*, vol. 47, no. 5, pp. 1089-1092, 2011.

32. E. Garone, B. Sinopoli, and A. Casavola, "LQG Control Over Lossy TCP-like Networks with Probabilistic Packet Acknowledgment", *International Journal of Systems, Control and Communications*, Special Issue on Networked Control, vol. 2, no. 1/2/3, pp. 55-81, 2010.

33. L. Parolini, N. Tolia, B. Sinopoli, and B. Krogh, "A Cyber-Physical Systems Approach to Energy Management in Data Centers" *International Conference on Cyber-Physical Systems*, pp. 168-177, 2010.

34. J. Weimer, B. Sinopoli, and B. Krogh, "Multiple Source Detection and Localization in Advection-Diffusion Processes Using Wireless Sensor Networks," *30th IEEE Real-Time Systems Symposium, 2009, RTSS 2009.*, pp. 333-342, 2009.

35. A. Giani, G. Karsai, T. Roosta, A. Shah, B. Sinopoli, and J. Wiley, "A testbed for secure and robust SCADA systems," *Real-time and Embedded Technology and Applications Symposium (RTAS)*, vol. 5, no. 2, pp. 4, 2008.

36. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S. Sastry, "Optimal linear LQG control over lossy networks without packet acknowledgment," *Asian Journal of Control*, Special Issue on “Networked Embedded Hybrid Control Systems” vol. 10, no. 1, 2008.

37. L. Schenato, B. Sinopoli, M. Franceschetti, K. Poolla, and S. Shankar Sastry, "Foundations of control and estimation over lossy networks," *Proceedings of the IEEE*, vol. 95, no. 1, pp. 163-187, 2007.

38. X. Nguyen, M. I. Jordan, and B. Sinopoli, "A Kernel-Based Learning Approach to Ad Hoc Sensor Network Localization," *ACM Transactions on Sensor Networks*, vol. 1, no. 1, 2005.

39. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, M. Jordan, and S. Sastry, "Kalman filtering with intermittent observations," *IEEE Transactions on Automatic Control*, vol. 49, no. 9, pp. 1453-1464, 2004.

40. X. Nguyen, M.I. Jordan, and B. Sinopoli, "A kernel-based learning approach to ad hoc sensor network localization. In Proc. AAAI-2004 Workshop on Sensor Networks," *AAAI Conference on Artificial Intelligence/IAAI: Innovative Applications of Artificial Intelligence Conference*, 2004.

41. B. Sinopoli, C. Sharp, L. Schenato, S. Schaffert, and S. Sastry, "Distributed control applications within sensor networks," *Proceedings of the IEEE*, vol. 91, no. 8, pp. 1235-1246, 2003.

Conference Proceedings

1. J. Costanzo, D. Materassi, B. Sinopoli, "Using Viterbi and Kalman to Detect Topological Changes in Dynamic Networks, " American Control Conference, 2017, under review.

2. W. Lucia, B. Sinopoli, G. Franze', "Networked Constrained Cyber-Physical Systems subject to malicious attacks: a resilient set-theoretic control approach", American Control Conference, 2017, under review.

3. X. Yin, M. Bartulovic, V. Sekar, B. Sinopoli, "On the Efficiency and Fairness of Multiplayer HTTP-based Adaptive Video Streaming", American Control Conference, 2017, under review.

4. N. Forti, G. Battistelli, L. Chisci, B. Sinopoli, "Secure state estimation of cyber-physical systems under switching attacks", IFAC World Congress, 2017, under review.

5. N. Forti, G. Battistelli, L. Chisci, and B. Sinopoli, "A Bayesian approach to joint attack detection and resilient state estimation," *IEEE Conference on Decision and Control, 2016*, to appear.

6. S. Weerakkody, B. Sinopoli, S. Kar, and A. Datta, "Information Flow for Security in Control Systems," *IEEE Conference on Decision and Control, 2016*, to appear.

7. X. Liu, S. Weerakkody, and B. Sinopoli, "Sensor Placement for Reliable Observability: a Structured Systems Approach," *IEEE Conference on Decision and Control, 2016*, to appear.

5. S. Weerakkody, X. Liu, S. H. Son, and B. Sinopoli, "A Graph Theoretic Characterization of Perfect Attackability and Detection in Distributed Control Systems," *American Control Conference (ACC)*, pp. 6, 2016.

6. Y. Sun, X. Yin, J. Jiang, V. Sekar, F. Lin, N. Wang, T. Liu, and B. Sinopoli, "CS2P: Improving Video Bitrate Selection and Adaptation with Data-Driven Throughput Prediction," *ACM SIGCOMM Conference Proceedings*, pp. 14, August 2016.

7. S. Weerakkody and B. Sinopoli, "Detecting integrity attacks on control systems using a moving target approach," *IEEE Conference on Decision and Control*, pp. 5820 - 5826, 2015.

8. S. Zejnilovic, J. Gomes, and B. Sinopoli, "Sequential observer selection for source localization," *IEEE Global Conference on Signal and Information Processing*, pp. 1220 - 1224, 2015.

9. X. Yin, M. Ilic, and B. Sinopoli, "Toward Design of Risk-Based Real-Time Dispatch at Value," *IEEE Innovative Smart Grid Technologies Conference (ISGT)*, pp. 5, 2015.

10. M. M. Nicotra, M. Bartulovic, E. Garone, and B. Sinopoli, "A Distributed Explicit Reference Governor for Constrained Control of Multiple UAVs," *IFAC Workshop on Estimation and Control of Networked Systems*, vol. 48, no. 22, pp. 156-161, 2015.

11. R. Chabukswar and B. Sinopoli, "Secure Detection with Correlated Binary Sensors," *American Control Conference (ACC)*, pp. 3874 - 3879, 2015.

12. P. Lazik, N. Rajagopal, B. Sinopoli, and A. Rowe, "Ultrasonic Time Synchronization and Ranging on Smartphones," *Real-time and Embedded Technology and Applications Symposium (RTAS)*, pp. 108-118, 2015.

13. P. Lazik, N. Rajagopal, O. Shih, B. Sinopoli, and A. Rowe, "Demo: ALPS--The Acoustic Location Processing System," *SenSys: Proceedings of the International Conference on Embedded Networked Sensor Systems*, pp. 491-492, 2015.

14. P. Lazik, N. Rajagopal, O. Shih, B. Sinopoli, and A. Rowe, "ALPS: A Bluetooth and Ultrasound Platform for Mapping and Localization," *SenSys: Proceedings of the International Conference on Embedded Networked Sensor Systems*, pp. 73-84, 2015.

15. B. Debruhl, S. Weerakkody, B. Sinopoli, and P. D. Tague, "Is Your Commute Driving you Crazy? A Study of Misbehavior in Vehicular Platoons," *WiSec: Proceedings of the ACM Conference on Wireless Network Security*, pp. 11, 2015.

16. X. Yin, A. Jindal, V. Sekar, and B. Sinopoli, "A Control-Theoretic Approach for Dynamic Adaptive Video Streaming over HTTP," *ACM SIGCOMM Conference Proceedings*, pp. 325-338, 2015.

17. X. Yin and B. Sinopoli, "Adaptive robust optimization for coordinated capacity and load control in data centers," *IEEE Conference on Decision and Control*, pp. 5674-5679, 2014.

18. S. Weerakkody, Y. Mo, and B. Sinopoli, "Detecting integrity attacks on control systems using robust physical watermarking," *IEEE Conference on Decision and Control*, pp. 3757-3764, 2014.

19. S. Zejnilovic, D. Mitsche, J. Gomes, and B. Sinopoli, "Network observability for source localization in graphs with unobserved edges," *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, pp. 857-861, 2014.

20. H. Cam, P. Mouallem, Y. Mo, B. Sinopoli, and B. Nkrumah, "Modeling impact of attacks, recovery, and attackability conditions for situational awareness," *Cognitive Methods in Situation Awareness and Decision Support (CogSIMA), 2014 IEEE International*, pp. 181-187, 2014.

21. X. Yin, V. Sekar, and B. Sinopoli, "Toward a principled framework to design dynamic adaptive streaming algorithms over HTTP," *HOTNETS: ACM Workshop on Hot Topics in Networks*, pp. 9 pages, 2014.

22. S. Zejnilovic, J. Gomes, and B. Sinopoli, "Network observability and localization of sources of diffusion in tree networks with missing edges," *European Signal Processing Conference (EUSIPCO)*, pp. 2345-2349, 2014.

23. Y. Mo and B. Sinopoli, "Robust estimation in the presence of integrity attacks," *IEEE Conference on Decision and Control*, pp. 6085-6090, 2013.

24. D. Han, Y. Mo, J. Wu, B. Sinopoli, and L. Shi, "Stochastic event-triggered sensor scheduling for remote state estimation," *IEEE Conference on Decision and Control*, pp. 6079-6084, 2013.

25. S. Zejnilovic, J. P. Gomes, and B. Sinopoli, "Network observability and localization of the source of diffusion based on a subset of nodes," *Annual Allerton Conference on Communication, Control and Computing*, pp. 847-852, 2013.

26. S. Zejnilovic, J. Gomes, and B. Sinopoli, "Network observability and localization of the source of diffusion based on a subset of nodes," *Annual Allerton Conference on Communication, Control and Computing*, pp. 847-852, 2013.

27. S. Weerakkody, Y. Mo, B. Sinopoli, D. Han, and L. Shi, "Multi-Sensor Scheduling for State Estimation with Event-Based, Stochastic Triggers," *IFAC Workshop on Estimation and Control of Networked Systems*, vol. 4, no. 1, pp. 15-22, 2013.

28. R. Chabukswar, Y. Mo, and B. Sinopoli, "Secure Detection Using Binary Sensors," *IFAC Workshop on Estimation and Control of Networked Systems*, vol. 4, no. 1, pp. 160-167, 2013.

29. X. Liu, S. Pequito, S. Kar, Y. Mo, B. Sinopoli, and A. P. Aguiar, "Minimum robust sensor placement for large scale linear time-invariant systems: a structured systems approach," *IFAC Workshop on Estimation and Control of Networked Systems*, pp. 815- 820, 2013.

30. Y. Mo, E. Garone, and B. Sinopoli, "LQG control with Markovian packet loss," *European Control Conference (ECC)*, pp. 2380-2385, 2013.

31. S. Bopardikar, A. Speranzon, S. Zhang, and B. Sinopoli, "Performance analysis of linear estimators with unknown changes in sensors characteristics," *American Control Conference (ACC)*, pp. 3117 - 3122, 2013.

32. K.G. Vamvoudakis, J.P. Hespanha, B. Sinopoli, and Y. Mo, "Adversarial detection as a zero-sum game," *IEEE Conference on Decision and Control*, pp. 7133-7138, 2012.

33. D. Bajovic, J. Xavier, J. M. F. Moura, and B. Sinopoli, "Exact Rate for Convergence in Probability of Averaging Processes via Generalized Min-Cut," *IEEE Conference on Decision and Control*, pp. 2715-2725, 2012.

34. Y. Mo, E. Garone, L. Shi, and B. Sinopoli, "Infinite-Horizon Sensor Scheduling for Estimation over Lossy Networks," *IEEE Conference on Decision and Control*, pp. 3317- 3322, 2012.

35. D. Bajovic, J. Xavier, and B. Sinopoli, "Products of stochastic matrices: Exact rate for convergence in probability for directed networks," *Telecommunications Forum (TELFOR) 2012 20th*, pp. 883-886, 2012.

36. D. Bajovic, J. Xavier, and B. Sinopoli, "Products of stochastic matrices: Large deviation rate for Markov chain temporal dependencies," *Annual Allerton Conference on Communication, Control and Computing*, pp. 724-729, 2012.

37. S. Zejnilovic, J. P. Gomes, and B. Sinopoli, "Collaborative diffusive source localization in wireless sensor networks," *European Signal Processing Conference (EUSIPCO)*, pp. 704-708, 2012.

38. Y. Mo, J. Hespanha, and B. Sinopoli, "Robust detection in the presence of integrity attacks," *American Control Conference (ACC)*, pp. 3541-3546, 2012.

39. Y. Mo, E. Garone, A. Casavola, and B. Sinopoli, "Stochastic Sensor Scheduling in Wireless Sensor Networks with General Graph Topology," *American Control Conference (ACC)*, pp. 2048- 2053, 2012.

40. Y. Mo and B. Sinopoli, "Integrity Attacks on Cyber-Physical Systems," *Conference on High Confidence Networked Systems*, CPSweek, pp. 47-54, 2012.

41. S. Zejnilovic, J.P. Gomes, and B. Sinopoli, "Collaborative sequential-based detection in wireless sensor networks," *Asilomar Conference on Signals, Systems and Computers*, pp. 67-71, 2011.

42. L. Xie, Y. Mo, and B. Sinopoli, "Malicious Data Attacks in Power Market Operations," *IEEE International Conference on Smart Grid Communications (SmartGridComm)*, pp. 659 - 666, 2011.

43. S. Pequito, A.P. Aguiar, B. Sinopoli, and D.A. Gomes, "Nonlinear estimation using Mean Field Games," *Annual Allerton Conference on Communication, Control and Computing*, pp. 5, 2011.

44. D. Bajovic, D. Jakovetic, J. M. F. Moura, J. Xavier, and B. Sinopoli, "Large Deviations Analysis of Consensus+Innovations Distributed Detection over Random Networks," *Annual Allerton Conference on Communication, Control and Computing*, no. Invited paper, pp. 151-155, 2011.

45. S. Pequito, A.P. Aguiar, B. Sinopoli, and D.A. Gomes, "Unsupervised learning of finite mixture models using mean field games," *Annual Allerton Conference on Communication, Control and Computing*, pp. 321-328, 2011.

46. Y. Mo and B. Sinopoli, "Kalman Filtering with Intermittent Observations: Critical Value for Second Order System," *IFAC World Congress*, pp. 6592-6597, 2011.

47. J. Weimer, B. Sinopoli, and B. Krogh, "Large-scale Source Localization with Application to CO2 Sequestration Site Monitoring," *IFAC World Congress*, pp. 4278-4283, 2011.

48. L. Parolini, B. Sinopoli, and B. Krogh, "Model Predictive Control of Data Centers in the Smart Grid Scenario," *IFAC World Congress*, pp. 10505-10510, 2011.

49. R. Chabukswar, Y. Mo, and B. Sinopoli, "Detecting Integrity Attacks on SCADA Systems," *IFAC World Congress*, pp. 11239-11244, 2011.

50. Y. Mo and B. Sinopoli, "Secure Data Transmission Protocol in Multi-Hop Sensor Networks, Workshop on Foundations of Dependable and Secure Cyber-Physical Systems,," *Workshop on Foundations of Dependable and Secure Cyber-Physical Systems, CPS Week, Chicago, USA, 2011*, vol. Hicons, pp. 6, 2011.

51. L. Parolini, E. Garone, B. Sinopoli, and B. Krogh, "A Hierarchical Approach to Energy Management in Data Centers 49th IEEE Conference on Decision and Control. December 2010, Atlanta, GA," *IEEE Conference on Decision and Control*, pp. 1065 - 1070, 2010.

52. M. Aghajani, L. Parolini, and B. Sinopoli, "Dynamic Power Allocation in Server Farms: a Real Time Optimization Approach," *IEEE Conference on Decision and Control*, pp. 3790-3795, 2010.

53. Y. Mo, E. Garone, A. Casavola, and B. Sinopoli, "False data injection attacks against state estimation in wireless sensor networks," *IEEE Conference on Decision and Control*, pp. 5967-5972, 2010.

54. Y. Mo, E. Garone, A. Casavola, and B. Sinopoli, "Sensor scheduling for energy constrained estimation in multi-hop Wireless Sensor Networks," *IEEE Conference on Decision and Control*, pp. 1348-1353, 2010.

55. L. Xie, Y. Mo, and B. Sinopoli, "False Data Injection Attacks in Electricity Markets," *IEEE International Conference on Smart Grid Communications (SmartGridComm)*, pp. 226-231, 2010.

56. D. Bajovic, D. Jakovetic, J. Xavier, B. Sinopoli, and J. M. F. Moura, "Distributed detection over time varying networks: Large deviations analysis," *Annual Allerton Conference on Communication, Control and Computing*, pp. 302-309, 2010.

57. Y. Mo and B. Sinopoli, "Communication Complexity and Energy Efficient Consensus Algorithm," *IFAC Workshop on Estimation and Control of Networked Systems*, pp. 209-214, 2010.

58. S. Kar, B. Sinopoli, and J. M. F. Moura, "A Random Dynamical Systems Approach to Filtering in Large-Scale Networks," *American Control Conference (ACC)*, pp. 1027-1034, 2010.

59. R. Chabukswar, B. Sinopoli, G. Karsai, A. Giani, H. Neema, and A. Davis, "Simulation of Network Attacks on SCADA Systems," *Workshop on Secure Control Systems (SCS)*, pp. 6, 2010.

60. Y. Mo and B. Sinopoli, "False Data Injection Attacks in Control Systems," *Workshop on Secure Control Systems (SCS)*, pp. 6, 2010.

61. D. Bajovic, B. Sinopoli, and J. Xavier, "Sensor selection for hypothesis testing in wireless sensor networks: a Kullback-Leibler based approach," *IEEE Conference on Decision and Control*, pp. 1659-1664, 2009.

62. Y. Mo, R. Ambrosino, and B. Sinopoli, "A convex optimization approach of multi-step sensor selection under correlated noise," *Annual Allerton Conference on Communication, Control and Computing*, pp. 186-193, 2009.

63. Y. Mo, R. Ambrosino, and B. Sinopoli, "Network energy minimization via sensor selection and topology control," *IFAC Workshop on Estimation and Control of Networked Systems*, vol. 1, no. 1, pp. 174-179, 2009.

64. D. Bajovic, B. Sinopoli, and J. Xavier, "Robust linear dimensionality reduction for hypothesis testing with application to sensor selection," *Annual Allerton Conference on Communication, Control and Computing*, pp. 363-370, 2009.

65. Y. Mo and B. Sinopoli, "Secure control against replay attacks," *Annual Allerton Conference on Communication, Control and Computing*, pp. 911-918, 2009.

66. Y. Mo, L. Shi, R. Ambrosino, and B. Sinopoli, "Network lifetime maximization via sensor selection," *Asian Control Conference (ASCC)*, pp. 441-446, 2009.

67. A. Cardenas, S. Amin, B. Sinopoli, A. Giani, A. Perrig, and S.S. Sastry, “Challenges for securing cyber physical systems”, *Workshop on future directions in cyber-physical systems security*, pp. 7, 2009.

68. L. Parolini, B. Sinopoli, and B. Krogh, "A unified thermal-computational approach to data center energy management," *FeBID: International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks*, pp. 8, 2009.

69. Y. Mo and B. Sinopoli, "A characterization of the critical value for Kalman filtering with intermittent observations," *IEEE Conference on Decision and Control*, pp. 2692-2697, 2008.

70. E. Garone, B. Sinopoli, and A. Casavola, "LQG control over lossy TCP-like networks with probabilistic packet acknowledgements," *IEEE Conference on Decision and Control*, pp. 2686-2691, 2008.

71. L. Parolini, B. Sinopoli, and B. Krogh, "Reducing data center energy consumption via coordinated cooling and load management," *HotPower: Workshop on power aware computing and systems*, pp. 5, 2008.

72. U.A. Khan, S. Kar, B. Sinopoli, and J. M. F. Moura, "Distributed sensor localization in Euclidean spaces: Dynamic environments," *Annual Allerton Conference on Communication, Control and Computing*, pp. 361-366, 2008.

73. R. Ambrosino, B. Sinopoli, K. Poolla, and S. Sastry, "Optimal sensor density for remote estimation over Wireless Sensor Networks," *Annual Allerton Conference on Communication, Control and Computing*, pp. 599-606, 2008.

74. J.E. Weimer, B. Sinopoli, and B. Krogh, "A Relaxation Approach to Dynamic Sensor Selection in Large-Scale Wireless Networks," *ICDCS: IEEE Conference on Distributed Computing Systems*, pp. 501-506, 2008.

75. A. Shah, A. Perrig, and B. Sinopoli, "Mechanisms to provide integrity in SCADA and PCS devices," *Proceedings of the International Workshop on Cyber-Physical Systems-Challenges and Applications (CPS-CA)*, pp. 7, 2008.

76. E. Garone, B. Sinopoli, and A. Casavola, "LQG control for distributed systems over TCP-like erasure channels," *IEEE Conference on Decision and Control*, pp. 44-49, 2007.

77. E. Garone, B. Sinopoli, and A. Casavola, "Communication protocols for optimal control over lossy networks," *Annual Allerton Conference on Communication, Control and Computing*, pp. 8, 2007.

78. L. Shi, M. Epstein, B. Sinopoli, and R. Murray, "Effective Sensor Scheduling Schemes in a Sensor Network by Employing Feedback in the Communication Loop," *IEEE International Conference on Control Applications*, pp. 1006- 1011, 2007.

79. B. Zhu, B. Sinopoli, K. Poolla, and S. Sastry, "Estimation over Wireless Sensor Networks," *American Control Conference (ACC)*, pp. 2732-2737, 2007.

80. S. Adlakha, B. Sinopoli, and A. Goldsmith, "Optimal Sensing Rate for Estimation over Shared Communication Links," *American Control Conference (ACC)*, pp. 5043-5045, 2007.

81. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S. Sastry, "Optimal Linear LQG Control Over Lossy Networks Without Packet Acknowledgment," *IEEE Conference on Decision and Control*, pp. 392-397, 2006.

82. V. Gupta, B. Sinopoli, S. Adlakha, A. Goldsmith, and R. Murray, "Receding horizon networked control," *Annual Allerton Conference on Communication, Control and Computing*, pp. 169-176, 2006.

83. P. Chen, S. Oh, M. Manzo, B. Sinopoli, C. Sharp, K. Whitehouse, O. Tolle, J. Jeong, P. Dutta, J. Hui, S. Schaffert, S. Kim, J. Taneja, B. Zhu, T. Roosta, M. Howard, D. Culler, and S. Sastry, "Instrumenting wireless sensor networks for real-time surveillance," *IEEE International Conference on Robotics and Automation*, pp. 3128-3133, 2006.

84. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S. Sastry, "An LQG Optimal Linear Controller for Control Systems with Packet Losses," *IEEE Conference on Decision and Control and European Control Conference (CDC-ECC)*, pp. 458-463, 2005.

85. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S.S. Sastry, "Estimation and Control over Lossy Networks," *Annual Allerton Conference on Communication, Control and Computing*, pp. 8, 2005.

86. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S.S. Sastry, "LQG control with missing observation and control packets", *IFAC World Congress*, pp. 8, 2005

87. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S.S. Sastry, "Optimal control with unreliable communication: the TCP case," *American Control Conference (ACC)*, pp. 3354-3359, 2005.

88. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, and S.S. Sastry, "Time varying optimal control with packet losses," *IEEE Conference on Decision and Control*, vol. 2, pp. 1938-1943, 2004.

89. B. Sinopoli, L. Schenato, M. Franceschetti, K. Poolla, M.I. Jordan, and S.S. Sastry, "Kalman filtering with intermittent observations," *IEEE Conference on Decision and Control*, vol. 1, pp. 701-708 Vol.1, 2003.

90. B. Sinopoli, M. Micheli, G. Donato, and T.J. Koo, "Vision based navigation for an unmanned aerial vehicle," *IEEE International Conference on Robotics and Automation*, vol. 2, pp. 1757-1764, 2001.

91. J. Liu, X. Liu, T.-K. J.Koo, B. Sinopoli, S. Sastry, and E.A. Lee, "A hierarchical hybrid system model and its simulation," *IEEE Conference on Decision and Control*, vol. 4, pp. 3508-3513, 1999.

92. T.J. Koo, B. Sinopoli, A. Sangiovanni-Vincentelli, and S. Sastry, "A formal approach to reactive system design: unmanned aerial vehicle flight management system design example," *Proceedings of the 1999 IEEE International Symposium on Computer Aided Control System Design, 1999.*, pp. 522-527, 1999.

Other Writings (Technical Reports and Testimony)

1. X. Yin, J. Jiang, V. Sekar, and B. Sinopoli, "Understanding Throughput Stability and Predictability to Enable Better Video Quality of Experience," in *Workshop on Tracking Quality of Experience in the Internet*, 2015.

2. Y. Sun, X. Yin, N. Wang, J. Jiang, V. Sekar, Y. Jin, and B. Sinopoli, "Analyzing TCP Throughput Stability and Predictability with Implications for Adaptive Video Streaming," in *arXiv preprint arXiv:1506.05541*, 2015.

3. Bruno Sinopoli, Antonio Rizzo, "Transformative Computing Platforms: Android, Linux, Arduino in an Open Hardware Mini PC", In-Q-tel quarterly magazine, Vol. 5, No. 3, 2014.

4. Bruno Sinopoli, "Cyber-Physical Security: A Whole New Ballgame", Smart Grid Newsletter, November 2012. http://smartgrid.ieee.org/newsletters/november-2012/197-cyber-physical-security-a-whole-new-ballgame.

5. Bruno Sinopoli, "Vuoi sapere come stai? O se c'e' traffico? E' semplice con WSN" (Would you like to know how you are feeling? If whether there is traffic? It's simple with WSN), Il Riformista (Italian newspaper), 6/12/2012.

Selected Presentations Given

1. "A Control-Theoretic Approach for Dynamic Adaptive Video Streaming over HTTP," ***Keynote*** at the Feedback Computing Workshop at ACM International Conference on Autonomic Computing (ICAC), Wurzburg, Germany, July 2016.

2. "A set-theoretic approach for secure and resilient control of Cyber-Physical Systems," CPSweek 2016, workshop on Science od CPS security, Vienna, Austria, April 2016.

3. "A Graph Theoretic Characterization of Perfect Attackability for the Secure Design of Distributed Control Systems," INFORMATION THEORY AND APPLICATIONS, UC San Diego, San Diego, CA, February 2016.

4. "A Graph Theoretic Characterization of Perfect Attackability for the Secure Design of Distributed Control Systems," invited talk at workshop, IEEE Conference on Decision and Control, Osaka, Japan, December 2015.

5. "On the Security of Cyber-Physical Systems," 10th International Conference on Semantic Technology for Intelligence, Defense, and Security (STIDS 2015), George Mason University, November 2015.

6. "On the Security of Cyber-Physical Systems," University of Southern California, Los Angeles, CA, October 2015.

7. "Detection of Integrity Attacks Cyber-Physical Systems," Cylab Partners Conference, Pittsburgh, PA, September 2015.

8. "Models and Control Strategies for Adaptive Video Streaming," 7th Cloud Control Workshop, Sweden, June 2015.

9. "On the Security of Cyber-Physical Systems," SCy-Phy Systems Week 2015, Singapore, June 2015.

10. "Cyber-Physical Systems: Performance, Robustness and Security," IBM Research, New York, NY, May 2015.

11. "On the Security of Cyber-Physical Systems," Cylab Seminar, Carnegie Mellon University, March 2015.

12. "Toward a Principled Framework to the Design of Dynamic Adaptive Streaming Algorithms over HTTP," Information Theory and Applications, San Diego, CA, February 2015.

13. "On the security of Cyber-Physical Systems," Daegu Gyeongbuk Institute of Science and Technology, Daegu, S. Korea, November 2014.

14. "The Concept of Physical Authentication as a Tool for Intrusion Detection in Cyber-Physical Systems," Cylab Partners' Conference, Pittsburgh, PA, October 2014.

15. "On the security of Cyber-Physical Systems," MPE 2013+ Workshop of Data-aware Energy Use, UC San Diego, San Diego, CA, October 1, 2014.

16. "On the security of Cyber-Physical Systems," University of Toronto, Toronto, Ontario, September 2014.

17. "On the security of Cyber-Physical Systems," Midwest Control Workshop, Ohio State University, Columbus, OH, April 2014.

18. "On the security of Cyber-Physical Systems," IBM, Washington, DC, March 2014.

19. "Physical Authentication of Control Systems via the design of watermarked control inputs," Information Theory and Applications workshop, UC San Diego, San Diego, CA, February 2014.

20. "On the security of Cyber-Physical Systems," Free University of Brussels, Brussels, Belgium, January 2014.

21. "On the Security of Smart Infrastructure," 25th Information Technology Study Group (ITSG) Workshop, Atlanta, GA, November 2013.

22. "Network observability and localization of the source of diffusion based on a subset of nodes," 51st Annual Allerton Conference on Communication, Control, and Computing (Allerton), 2013, Allerton Park, IL, October 2013.

23. "On the Security of Cyber-Physical Systems," Singapore University of Technology and Design, Singapore, October 2013.

24. "On the security of cyber-physical systems," European Control Conference, Zurich,

Switzerland, July 2013.

25. "On the security of Cyber-Physical Systems," University of Siena, Siena, Italy, June 2013.

26. "On the Security of Cyber-Physical Systems," Cylab Seminar, CMU, Carnegie Mello, January 2013.

27. "Secure control of Cyber-Physical Systems," Army Research Laboratory, ARL, washington, DC, December 2012.

28. "Secure Control of Cyber-Physical Systems," Hong Kong University of Science and Technology (HKUST), Hong Kong, HK, April 2012.

29. "Robust Detection in the Presence of Integrity Attacks," Information Theory and Applications workshop, UC San Diego, San Diego, CA, February 2012.

30. "Models and Control Strategies for Data Centers in the Smart Grid," Lund University, Lund, Sweden, December 5, 2011.

31. "Secure Detection in the Presence of Integrity Attacks," TRUST FAll conference, November 3, 2011.

32. "Large Deviations Analysis of Consensus+Innovations Detection in Random Networks," 49th Annual Allerton Conference on Communication, Control, and Computing, Monticello, IL, September 30, 2011.

33. "Energy Efficient Control of Data Centers," HP Labs, Palo Alto, CA, June 28, 2011.

34. "Secure Cyber-Physical Systems," CPS summer school, Georgia Tech, June 27, 2011.

35. "Secure Control of Cyber-Physical Systems," UIUC, TCIPG seminar, April 1, 2011.

36. "A mean field games approach to nonlinear estimation," Information Theory and Applications (ITA), February 2011.

37. "Secure Control of Cyber-Physical Systems," Carnegie Mellon University, January 20, 2011.

38. "Detection of Attacks on control systems," Northrop Grumann Research Consortium Symposium, November 2010.

39. "Secure Control Against Replay Attacks," UC Berkeley, October 2010.

40. "On the Effect of False Data Injection Attacks on Control Systems," Cylab Partners conferenece, September 2010.

41. "A Random Dynamical Systems Approach to Filtering in Large-Scale Networks," American Control Conference (ACC), June 30, 2010.

42. "Secure control against replay attacks," Information Theory and Applications (ITA), February 2010.

43. "Cyber-Physical Systems: a few results, a new direction and an application," UC Santa Barbara, February 2010.

44. "Networked Control Systems", a tutorial presented at the 1st IFAC workshop on Distributed Estimation and Control in Networked Systems, Venice, Italy, September 2009.

45. "Securing Cyber-Physical Systems: A Case Study", ARO workshop on CPS security, University of Washington, Seattle, WA, August 2009.

46. "Sensing, Estimation and Control of Cyber-Physical Systems", Cylab Seminar, Carnegie Mellon, May 2009.

47. "Sensing, Estimation and Control of Cyber-Physical Systems", Departmental seminar, UT Austin, April 2009.

48. "Robust, Secure, Efficient Cyber-Physical Systems (CPS)", Idaho National Lab, April 2009.

49. "A Random Dynamical Systems Approach to Networked Control Systems", Information Theory and Applications workshop, UC San Diego, February 2009.

50. "Random Dynamical Systems: from Networked Estimation to Cyber-Physical Models for Energy Efficiency in Data Centers", UC Berkeley, October 2008.

51. "Closing the Loop Around Networks of Embedded Devices", Instituto Superior Tecnico, Lisbon, Portugal, July 2008.

52. "Closing the Loop Around Networks of Embedded Devices", UC Santa Barbara, June 2008.

53. "Networked Embedded Control Systems", Grasp Lab Seminar, University of Pennsylvania, October 2007.

54. "Estimation and Control over Networks of Embedded Devices", Cylab seminar, Carnegie Mellon, August 2007.

55. "Networked Feedback Systems", Universita' della Magna Graecia, Catanzaro, Italy, July 2007.

56. "Estimation and Control over Wireless Sensor Networks", keynote given at the Honeywell technical conference, Phoenix, AZ, May 2007.

Patents

1. Rowe, A., Lazik, P., Rajagopal, N., Shih, O., Sinopoli, B., "METHOD AND APPARATUS FOR LOCATING A MOBILE", United States Patent Application Filed, June 3, 2016

2. Sinopoli, B., Sekar, V., Yin, X., "SYSTEM AND METHOD FOR DYNAMIC ADAPTIVE VIDEO STREAMING USING MODEL PREDICTIVE CONTROL", United States Provisional Patent Application Filed 15082444, March 28, 2016

3. Sinopoli, B., Krogh, B., Parolini, L., Tolia, N., "MANAGING COOLING DEVICES AND COMPUTING NODES IN AN INFRASTRUCTURE", United States Regular Patent Awarded US8539059 B2, September 17, 2013

Contracts, Grants and Sponsored Research

Principal Investigator

1. Bruno Sinopoli, Anthony Rowe, Yuvraj Agarwal, "Resilience Analysis and Design of IoT-based

Smart Infrastructures", Risk and Regulatory Services Innovation Center, sponsored by PWC, September 1, 2016- June 30, 2017, $199,732.

2. Bruno Sinopoli, Soummya Kar, Anupam Datta, "CPS: Synergy: Information Flow Analysis for Cyber-Physical System Security", NSF, September 1, 2016- August 31, 2019, $1,000,000.

3. Bruno Sinopoli, "Information Flow Analysis for Cyber-Physical System Security", DAEGU YEONGBUK INSTITUTE OF SCIENCE AND TECHNOLOGY, July 2016 - July 2017, $36,000.

4. Bruno Sinopoli, Marija Ilic, "Machine-Intelligence for Advanced Notification of Threats and Energy-Grid Survivable Situational Awareness (MANTESSA) ", DARPA/APPLIED COMMUNICATION SYSTEMS, July 2016- July 2020, $914,998.

5. Bruno Sinopoli, Marija Ilic, Soummya Kar, "Integratable, Composable, and Evolvable Cybersecurity in Energy Delivery Systems", DOE/UNIVERSITY OF ARKANSAS, September 2015 - September 2020, $2,527,222.

6. Bruno Sinopoli, Anthony Rowe, Burcu Akinci, Anind Dey, "PFI: BIC: A Cost Effective Accurate and Resilient Indoor Positioning System", NSF, August 2015 - July 2018, $998,387.

7. Bruno Sinopoli, "Robust Energy-Efficient Data Center Control", CIRC, January 2015 - December 2016, $115,000.

8. Bruno Sinopoli, "Information Flow Analysis for Cyber-Physical System Security", DAEGU YEONGBUK INSTITUTE OF SCIENCE AND TECHNOLOGY, July 2015 - July 2016, $36,000.

9. Bruno Sinopoli, "Misbehavior Detection and Mitigation in Vehicular Networks", DAEGU YEONGBUK INSTITUTE OF SCIENCE AND TECHNOLOGY, December 2014- December 2016, $72,000.

10. Bruno Sinopoli, Matteo Pozzi, "Resilience of electric energy systems to extreme events: a sequential decision making perspective", Scott Institute ProSEED Grant, March 2016 - May 2016, $17,500.00

11. Bruno Sinopoli, "Sensor-based electronic guidance and control of an Automated People Mover (APM) ", PITA, January 2014 - May 2015, $91,875.00

12. Bruno Sinopoli, "Sensor-based electronic guidance and control of an Automated People Mover (APM) ", PITA, January 2013 - May 2014, $90,000.00

13. Bruno Sinopoli, "CPS: Synergy: Collaborative Research: Event-Based Information Acquisition, Learning, and Control in High-Dimensional Cyber-Physical Systems", NSF, October 2013 - October 2016, $333,333.

14. Bruno Sinopoli, "CPS: Medium: Collaborative Research: The Cyber-Physical Challenges of Transient Stability and Security in Power Grids", NSF, September 2011 - August 2014, $375,000.

15. Bruno Sinopoli, Bruce Krogh, "Supplement to GOALI: Models, Metrics, and Control Strategies for Energy Efficient Data Centers", NSF, September 2009 - September 2012, $6,000.

16. Bruno Sinopoli, Bruce Krogh, "GOALI: Models, Metrics, and Control Strategies for Energy Efficient Data Centers", NSF, September 2009 - September 2012, $489,999.

17. Bruno Sinopoli, "2009 Northeast Control Workshop", NSF, March 2009 - September 2009, $34,913.

18. Bruno Sinopoli, "CAREER: Efficient, Secure and Robust Control of Cyber Physical Systems", NSF, March 2010 - March 2015, $400,000.

19. Bruno Sinopoli, Joao Xavier, Miguel Rodrigues, "Novel information processing methodologies for intelligent sensor networks", Fundação para a Ciência e a Tecnologia (FCT), November 2010 - October 2013, $400,000.

20. Bruno Sinopoli, Metin Sitti, "NASA Summer Grant", NASA, June 2009 - September 2009, $30,000.

21. Bruno Sinopoli, Bruce Krogh, Greg Ganger, "Energy Management for Data Centers", PITA, January 2008-June 2009, $66,627.

22. Bruno Sinopoli, "Secure SCADA Through Robust Estimation, Control, Detection", BERKMANN FUND, January 2008-January 2009, $6,000.

23. Bruno Sinopoli, "Robust, Secure, Efficient Networked Embedded Control Systems", ARO/ CYLAB, September 2008 - September 2009, $75,000.

24. Bruno Sinopoli, "Robust, Secure, Efficient Networked Embedded Control Systems", ARO/ CYLAB, September 2007 - September 2008, $84,226.

Co-Principal Investigator

1. Matteo Pozzi, Bruno Sinopoli, "CRISP Type 1/Collaborative Research: Computational Approach for Integrated Network Resilience Analysis Under Extreme Events for Financial and Physical Infrastructures", NSF, November 1, 2016 – October 31, 2018, $350,000.

2. Vyas Sekar, Bruno Sinopoli, "A Control-Theoretic Approach for Adaptive Video Streaming over HTTP", CISCO RESEARCH, April 2015 - December 2016, $100,000.

3. Pulkit Grover, Bruno Sinopoli, Laurie Heller, "Echolocation for Visually Impaired Navigation", GOOGLE INC., November 2015 - November 2016, $70,000.

4. Anthony Rowe, Bruno Sinopoli, "A Cost-effective Accurate and Resilient Indoor Positioning System", PITA, January 2015 - December 2015, $62,000.

5. Burcu, Akinci, Mario Berges, Khee Poh Lam, Bruno Sinopoli, "Exploratory Study of Building Energy Management and Modeling Technologies", TOSHIBA, May 2014 - April 2015, $500,000.00

6. Mario Berges, Anthony Rowe, Burcu Akinci, Semiha Ergan, Hae Young Noh, Bruno Sinopoli, "A Fully Instrumented Building Laboratory for Energy Management and Control", CIT, April 2013 - July 2013, $90,000.00

7. Pei Zhang, Bruno Sinopoli, "Collaborative Mobile Sensor Network Control", Cylab/ARO, 2009 - 2010, $23,000.00

8. Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno Sinopoli, "TRUST year 10", NSF/ UC BERKELEY, November 2014- November 2015, $368,400.

9. Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno

Sinopoli, "TRUST year 9", NSF/ UC BERKELEY, November 2013- November 2014, $458,000.01.

10. Adrian Perrig, Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno Sinopoli, "TRUST year 8", NSF/ UC BERKELEY, November 2012- November 2013, $553,000.

11. Adrian Perrig, Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno Sinopoli, Jonathan McCune, Patrick Tague, "TRUST year 7", NSF/ UC BERKELEY, November 2011- November 2012, $552,999.

12. Adrian Perrig, Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno Sinopoli, "TRUST year 6", NSF/ UC BERKELEY, November 2010- November 2011, $553,000.

13. Adrian Perrig, Anupam Datta, Collin Jackson, Alessandro Acquisti, Nicolas Christin, Virgil Gligor, Bruno Sinopoli, "TRUST year 5", NSF/ UC BERKELEY, November 2009- November 2010, $571,225.

14. Adrian Perrig, Anupam Datta, Virgil Gligor, Bruno Sinopoli, "TRUST year 4", NSF/ UC BERKELEY, November 2008- November 2009, $383,233.

15. Mike Reiter, Adrian Perrig, Anupam Datta, Bruno Sinopoli, "TRUST year 3", NSF/ UC BERKELEY, November 2007- November 2008, $310,918.

16. Adrian Perrig, Bruno Sinopoli, Jonathan Mc Cune, Patrick Tague, "NGC Cybersecurity Research Consortium Year 3", NORTHROP GRUMMAN, September 2011- September 2012, $506,620.66.

17. Adrian Perrig, David Brumley, Bruno Sinopoli, Virgil Gligor, Jonathan Mc Cune, Patrick Tague, "NGC Cybersecurity Research Consortium Year 2", NORTHROP GRUMMAN, September 2010- September 2011, $846,722.43.

18. Adrian Perrig, David Brumley, Bruno Sinopoli, "NGC Cybersecurity Research Consortium Year 1", NORTHROP GRUMMAN, September 2010- September 2011, $599,585.06.

19. Bruce Krogh, David Garlan, Bruno Sinopoli, "CSR-EHCS(CPS), TM: Architectures, Abstractions and Algorithms for Cyber-Physical Networks", September 2008 - September 2010, $300,000.

20. Bruce Krogh, Bruno Sinopoli, " Carbon nanotube based sensor network for CO2 monitoring", NETL/IEAS, $310,013.

Editorial Roles/Major Activities in Professional Societies

1. Associate Editor, IEEE Transactions on Control of Network Systems, June 2014 - Present.

2. Associate Editor, IEEE Conference on Decision and Control, December 2012 - Present.

3. Guest Editor, IEEE Transactions on Control of Network Systems, special issue on "***Security of Cyber-Physical Systems***", September 2015 - Present.

4. Associate Editor, American Control Conference, June 2012 - Present.

5. Associate Editor, IEEE control systems society, April 2012 - Present.

6. **Co-organizer**, CPSweek 2017, Febraury 2016- April 2017.

7. Program Committee Member, IFAC Workshop on Networked Control Systems, January 2009 - present.

8. **Program Committee Co-Chair**, International Conference of Cyber-Physical Systems, April 2016 - April 2017.

9. **Committee Chair**, 35th IEEE International Conference on Distributed Computing Systems (ICDCS 2015), September 2014 - June 2015.

10. Program Committee Member, 22nd Mediterranean Conference on Control and Automation, November 2013 - June 2014.

11. Program Committee Member, 2014 American Control Conference, October 2013 - December 2013.

12. Program Committee Member, Conference on High Confidence Networked Systems (HiCoNS) at CPSWeek, October 2011 - October 2013.

13. **International Program Committee co-Chair**, "2013 European Control Conference," September 2012-July 2013.

14. Program Committee Member, 2013 American Control Conference, January 2013 - April 2013.

15. Program Committee Member, IEEE Real-Time and Embedded Technology and Applications Symposium, December 2012 - April 2013.

16. Program Committee Member, IEEE Real-Time Systems Symposium-Cyber-Physical Systems Track, July 2012 - December 2012.

17. Program Committee Member, American Control Conference, September 2011 - June 2012.

18. Technical Program Committee Member: IEEE SmartGridComm Symposium on Cyber and Physical Security and Privacy, Brussels, Belgium, January 2011 - October 2011

19. Technical Program Committee Member: IEEE SmartGridComm Symposium on Architectures and Models for the Smart Grid, Brussels, Belgium, January2011 - October 2011

20. Program Committee Member, Workshop on Foundations of Dependable and Secure Cyber-Physical Systems - CPSWeek 2011, December 2010 - April 2011.

21. Session Chair, IEEE Conference on Decision and Control, February 2010 - December 2010.

22. **Program Committee Chair**, 2nd IFAC Workshop on Networked Control Systems, January 2010 -September 2010.

23. Technical Program Committee Member: The 17th Mediterranean Conference on Control and Automation, 2011.

24. Co-organizer and chair of the invited session on secure control systems: IEEE Control and Decision Conference, 2010.

25. Co-organizer and chair of the invited session on energy efficient infrastructures: IEEE Control and Decision Conference, 2010.

26. Technical Program Committee Member: The 6th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS '10), Santa Barbara, CA June 2010.

27. Co-Organizer of the NSF sponsored "6th Northeast Control Workshop", held at Johns Hopkins University, April 2010.

28. Technical Program Committee: The 11th International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS), Lyon, France November 2009.

29. Co-organizer of the NSF sponsored "5th Northeast Control Workshop", held at CMU, April 2009.

30. Demonstrations Chair: Sixth International Conference on Networked Sensing Systems, Pittsburgh, PA June 2009.

31. Technical program committee member: IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), special Track on Cyber-Physical Systems, San Francisco, CA April 2009.

32. Technical program committee member: FeBID 2009, the 4th International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks, San Francisco, CA April 2009.

33. Technical program committee co-Chair: Second International Conference on Robot Communication and Coordination (ROBOCOMM), Odense, Denmark, March 31 - April 2 2009.

34. Technical Program Committee: IEEE Conference on Automation Science and Engineering (CASE), Washington, D.C. August 2008

35. Technical program committee member: Control over Communication Channels (CONCOMM), Limassol, Cyprus, April 2007.

36. Technical program committee member: Summer Computer Simulation Conference (SCSC'07), San Diego, CA June 2007.

37. Technical program committee member: First International Conference on Robot Communication and Coordination (ROBOCOMM), Athens, Greece, September 2007.

38. Technical program committee member: IEEE Real-Time Systems Symposium, Special Track on Cyber-Physical Systems, Barcelona, Spain, December 2007.

39. Co-organizer: Joint US-EU-TEKES Workshop: Long Term Challenges in High Confidence Composable Embedded Systems, June 21-22, 2006.

40. Co-organizer: Caltech-Stanford-Berkeley Workshop on Control, Communications and Sensing, Stanford University, April 6-7, 2006.

41. Co-organizer: Beyond SCADA: Networked Embedded Control Systems Workshop, Washington, DC, March 14-15, 2006.

42. Co-organizer: FUSE '03: invited workshop on fundamentals of sensor networks, environment sensing and large scale networks. Berkeley, CA. May 9 2003.

Other Activities

1. Co-founder, **UDOO**, (**www.udoo.org)**
   UDOO is a multi development platform solution for Android, Linux, Arduino™ and Google ADK 2012. The board is designed to provide a flexible environment that allows to explore the new frontiers of the Internet of Things. UDOO allows you to switch between Linux and Android in a few seconds, simply by replacing the Micro SD card and rebooting the system, April 2013.

Consulting Activities

1. SECO electronics, INC, Boston, MA. (December 2012 - Present).

2. United Technologies Research Center. (February 2011 - June 2012).

3. Draeger Safety INC. (March 2011 - May 2011).

4. Trilliant INC. (March 2013 - August 2013).