

Aranya Chakraborty

CONTACT INFORMATION

Electrical & Computer Engineering Department,
North Carolina State University,
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RESEARCH INTERESTS

Power system dynamics, stability analysis, and control using Synchrophasors; Distributed optimization for wide-area monitoring and control; Cyber-physical designs and security of wide-area communication; Wind energy systems; Control of distribution-level power system using Solid-State Transformers.

EMPLOYMENT

2015-present, **Associate Professor**
Department of Electrical and Computer Engineering,
NORTH CAROLINA STATE UNIVERSITY, Raleigh, NC.

2010-2015, **Assistant Professor**
Department of Electrical and Computer Engineering,
NORTH CAROLINA STATE UNIVERSITY, Raleigh, NC.

2009-2010, **Assistant Professor**
Department of Electrical and Computer Engineering,
TEXAS TECH UNIVERSITY, Lubbock, TX.

VISITING POSITIONS

August 2016 & June 2017, **Visiting Researcher**
Host: Dr. Jun-ichi Imura
TOKYO INSTITUTE OF TECHNOLOGY, Tokyo, Japan.

2016-2017, **Visiting Researcher**
Coordinated Science Laboratory (CSL),
Host: Dr. Nitin Vaidya
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN, IL.

EDUCATION & TRAINING

2008 - 2009, **Post-doctoral Research Associate**
Aeronautics and Astronautics Department,
Supervisor: Dr. Mehran Mesbahi,
UNIVERSITY OF WASHINGTON, Seattle, WA.

2005 - 2008, **Ph.D, Electrical Engineering**
RENSELAEER POLYTECHNIC INSTITUTE, Troy, New York
Advisors: Dr. Joe H. Chow, Dr. Murat Arcak
Thesis: *Estimation, Analysis and Control Methods for Large-Scale Electric Power Systems using Synchronized Phasor Measurements*
GPA - 4.0/4.0

2004 - 2005, **M.S, Electrical Engineering**
RENSELAEER POLYTECHNIC INSTITUTE, Troy, New York
Advisor: Dr. Murat Arcak
Thesis: *Study of Nonlinear Control of Membrane Humidity in PEM Fuel Cell Systems*
GPA - 4.0/4.0

2000 - 2004, **B.E, Electrical Engineering**
JADAVPUR UNIVERSITY, Calcutta, India
Specialization: Control Systems (Advisor: Dr. T. K. Ghoshal)

Senior Thesis: *Robust Control of Aerospace Systems*
GPA - 4.7/5.0

RESEARCH
EXPERIENCE

2010-present, ECE Department,
NC State University, Raleigh, NC,
– *Conduct research and advise graduate students in the context of several projects related to power system dynamics and controls. Specific topics of research include:*

1. Modeling, analysis and control designs for large-scale electric power system networks via concepts of inverse problems using Wide-area Phasor Measurement technology.
2. Extensive PMU data analysis methods for investigating mechanisms of disturbance propagation in power system networks.
3. Cyber-physical modeling and control, intrusion detection and cyber-security of power transmission and distribution systems.
4. Nonlinear control of distribution level power systems integrated with high penetration of distributed energy resources, storage, and solid-state transformers.

2009-2010, ECE Department,
Texas Tech University, Lubbock, TX
– *Conducted research on modeling, data analysis and sensor placement problems in large power systems using Synchrophasors.*

2008-2009, Distributed Space Systems Laboratory (DSSL),
Aeronautics and Astronautics Department,
University of Washington, Seattle, WA
– *Conducted research and assisted graduate students in the context of several projects with the Boeing Energy and Electrical Systems Group. Specific topics of research include:*

1. Optimization based algorithms for power generation and load management in aircraft power systems.
2. Nonlinear control of coupled oscillators under dynamic topological constraints involving FACTS devices.

2004 -2008, Nonlinear and Adaptive Control Laboratory,
Electrical, Computer and Systems Engineering Department,
Rensselaer Polytechnic Institute, Troy, NY

1. **Estimation in Electric Power Systems:** *Developed mathematical tools for parameter estimation and transient stability analysis in dynamic models of two-area power systems based on synchronized phasor measurements. Spatial variation of phasor variables are primarily exploited for devising these methods.*
2. **Robust Nonlinear Control:** *Developed a novel time-scale separation control design for stabilization and transient performance recovery of different classes of uncertain nonlinear systems. Applications include safety critical systems like aircrafts, autonomous water vehicles, faulted power systems, visual servoing with uncalibrated camera etc.*
3. **Modeling of Fuel Cells:** *Developed a singular perturbation based model order reduction method for the humidification system of PEM (Proton Exchange Membrane) fuel cells and validated it with simulation results. Subsequent research included the application of adaptive control tools for membrane humidity regulation.*

2003 - 2004, Undergraduate Research Student,
Center for Knowledge Based Systems,
Electrical Engineering Department,
Jadavpur University, Calcutta, India.
– *Conducted undergraduate research focussed on controller and observer designs for pitch attitude control of an F-16 fighter aircraft.*

Summer 2003, Undergraduate Research Intern Student,
Electrical Engineering Department,
Indian Institute of Technology, Kharagpur, India.
– *Conducted research studies and simulations on canonical quadratic distance optimization problems (CQDP) for uncertain linear time-invariant (LTI) systems.*

TEACHING
EXPERIENCE

2010-present, NC State University, Raleigh, NC
1. ECE 451 Power Systems Analysis - Fall 2012-2013
2. ECE 736 Power Systems Stability & Control - Spring 2010-present
3. ECE 726 Advanced Feedback Control - Fall 2014-present (odd years)
4. ECE 792 Adaptive Control and Estimation - Fall 2018-present (even years)

2009-2010, Texas Tech University, Lubbock, TX
1. EE 5332 Power Systems Dynamics and Stability - Fall 2009
2. EE 5332 Wind Power Modeling and Simulation - Spring 2010

2004 - 2006, Graduate Teaching Assistant,
ECSE department, Rensselaer Polytechnic Institute, Troy, NY
- *Served as the TA for the senior level undergraduate course on Discrete Time Systems and the junior level laboratory course on Introduction to Engineering Electronics.*

FUNDED
RESEARCH

18. National Science Foundation
Title: Retrofit Control: A New, Modular Gyration Control Approach for Integrating Large-Scale Renewable Power
PI: Aranya Chakraborty
Award Amount: \$323,873
Project Period: Sep 2017 - Aug. 2020

17. National Science Foundation
Title: EAGER: Collaborative Research: Spatially Continuous Modeling of Power System Oscillations with Renewable Energy Penetration
PI: Aranya Chakraborty
Award Amount: \$75,000
Project Period: Jan 2018 - April. 2019

16. National Science Foundation
Title: CREDENCE: Collaborative Research on Decentralization, Electrification, Communications and Economics
PI: Aranya Chakraborty, co-PI: Iqbal Husain
Award Amount: \$277,603
Project Period: Jan 2017 - Dec. 2018

15. National Science Foundation
Title: CPS: TTP Option: Synergy: Collaborative Research: Hardening Network Infrastructures for Fast, Resilient and Cost-Optimal Wide-Area Control of Power Systems
PI: Aranya Chakraborty,
co-PI: Alexandra Duel-Hallen
Award Amount: \$600,000
Project Period: Sep. 2015 - Aug. 2018

14. National Science Foundation
Title: US Ignite: Track 1: Collaborative Research: DISTINCT: A Distributed Multi-Loop Networked System for Wide-Area Control of Large Power Grids
PI: Aranya Chakraborty
Award Amount: \$250,000
Project Period: Sep. 2015 - Aug. 2018

13. National Science Foundation
Title: Collaborative Research: Computational Methods for Stability Assessment of Power Systems With High Penetration of Clean Renewable Energy
PI: Aranya Chakrabortty
Award Amount: \$170,038
Project Period: Sept. 2015 - Aug. 2017
12. UK-USA-India Research Partnership Grant, British Council
Title: SITARA : Smart grid that harness Satellite based Virtual Power Plants for energy sustenance
Lead Institution: University of Bradford, UK
NCSU PI: Aranya Chakrabortty
Award Amount: \$20,000
Project Period: Sept. 2015 - Aug. 2017
11. National Science Foundation
Title: CPS Synergy: Collaborative Research: Distributed Asynchronous Algorithms and Software Systems for Wide-Area Monitoring of Large power Systems
PI: Aranya Chakrabortty, co-PI: Frank Mueller
Award Amount: \$400,000
Project Period: Sept. 2013 - Aug. 2016
10. US Department of Energy (NETL)
Title: Development of a Multi-User Network Testbed for Wide-Area Monitoring and Control of Power Systems Using Distributed Synchrophasors
PI: Aranya Chakrabortty
Award Amount: \$250,000
Project Period: Sept. 2013 - Aug. 2015
9. ABB Corporate Research,
Title: Faster than Real Time Simulation of Electro-mechanical Process of Large Scale Electrical Power Grids
PI: Paul Franzon, co-PI: Aranya Chakrabortty
Award Amount: \$80,000
Project Period: Dec. 2014 - Dec. 2015
8. ABB Corporate Research,
Title: Distributed Data-Centric Algorithms for Next-Generation Transmission Network Management Systems
PI: Aranya Chakrabortty
Award Amount: \$74,000
Project Period: Sep. 2013 - Aug. 2014
7. Renaissance Computing Institute (RENCI),
Faculty Engagement Program 2013,
Title: Adaptive Visualization-in-the-Loop Algorithms for Modeling and Control of Smart Power Systems Using Real-Time Synchrophasors
PI: Aranya Chakrabortty
Award Amount: \$12,000
Project Period: Jan. 2013 - Dec. 2013
6. National Science Foundation,
ECCS-1230848: Collaborative Research: Integrating Heterogeneous Energy Resources for Sustainable Power Networks - A Systems Approach
PI: Aranya Chakrabortty
Award amount: \$360,000
Lead PI and Organization: Dennice Gayme, Johns Hopkins University
Project Period: 2012 - 2016.

5. Southern California Edison,
Title: Wide-Area Monitoring and Control of WECC Transfer Paths Using Real-Time Digital Simulations
Award amount: \$228,726
PI: Aranya Chakrabortty, co-PI: Subhasish Bhattacharya
Project Period: 2011-2013.

4. National Science Foundation,
ECCS-1054394: CAREER - Wide-Area Control of Large Power Systems Using Distributed Synchronphasors: Where Network Theory Meets Power System Dynamics
Award amount: \$400,000
PI: Aranya Chakrabortty
Project Period: 2011 - 2016.

3. National Science Foundation,
ECCS-1001845: A Measurement-based Framework for Dynamic Equivalencing of Large-Scale Power Systems using Synchronphasors
Award amount: \$297,763
REU Supplement: \$11,250
PI: Aranya Chakrabortty
Project Period: 2010 - 2015.

2. NCSU Strategic Research Initiative Program
Title: Workshop on 'Cyber-Physical Challenges for Distributed Monitoring and Control of Smart Power Systems'
Award amount: \$5,000
PI: Aranya Chakrabortty
Period: February 2011.

1. NCSU Undergraduate Research Grants
- *Awarded to Jennifer Felder, Joel Anderson and Dr. Aranya Chakrabortty (faculty mentor)*
Project Title: Building a Campus-wide Smart Energy Monitoring Network with Data Logging and Visualization
Award amount: \$3,000
Periods: Fall 2010, Summer 2011, Spring 2012.

HONORS AND AWARDS

Thank a Teacher recognition for teaching,
NC State University Office of Faculty Development, Spring 2016

Best Internet Application in Energy Award, US Ignite, 2013 and 2014

NSF CAREER Award, 2011

Allen B. Dumont Prize, 2009
ECSE Department, Rensselaer Polytechnic Institute,
Awarded in recognition for the best doctoral thesis by an Electrical Engineering PhD graduate

Best Graduate TA Award, 2006
Eta Kappa Nu Honor Society and ECSE Department, Rensselaer Polytechnic Institute.

Vice-chancellor's silver medal for ranking 2nd with First Class Honors in Bachelor of Electrical Engineering, class of 2004, Jadavpur University, Calcutta, India, 2005.

PUBLICATIONS

Books and Edited Volumes:

E1. A. Chakrabortty and M. D. Ilić (Eds.), *Control & Optimization Methods for Electric Smart Grids*, Springer, MA, Jan. 2012.

E2. C. L. Phillips, H. T. Nagle, and A. Chakrabortty, *Digital Control System Analysis and*

Design, Prentice Hall, Feb. 2014.

Book Chapters:

B5. A. Chakraborty. Wide-Area Communications and Control: A Cyber-Physical Perspective. *Smart Grid Control: Opportunities and Research Challenges*, Eds: Anuradha Annaswamy and Jakob Stoustrup, Springer, 2017.

B4. S. Nabavi, J. Zhang, and A. Chakraborty. Distributed Algorithms for Wide-Area Monitoring in Power Systems: A Cyber-Physical Perspective. *Invited Chapter for Cyber-Physical-Social Systems and Constructs in Electric Power Engineering*, Eds: Siddharth Suryanarayanan, Robin Roche and Timothy M. Hansen, IET, 2016.

B3. A. Chakraborty and J. H. Chow. Measurement-based Methods for Model Reduction of Power Systems using Synchrophasors, *Invited Chapter for Coherency and Model Reduction of Large Power Systems*, Springer, MA, 2013.

B2. A. Chakraborty. A Model Reference Approach for Interarea Modal Damping in Large Power Systems, *Control & Optimization Theory for Electric Smart Grids*, Springer, MA, 2012.

B1. A. Chakraborty. Transient Stability Assessment Using Synchronized Phasor Measurements, *Invited Chapter for Electric Power Engineering Handbook*, CRC Press, 2011.

Journal Publications:

J36. S. Mukherjee and A. Chakraborty. Impact of High Wind Power Penetration on Coherency Property of Power System Dynamics. *submitted to IEEE Transactions on Power Systems*, 2017.

J35. A. Jain, A. Chakraborty, and E. Biyik. Distributed Damping Control of Power System Oscillations under Communication Constraints. *submitted to IFAC Control Engineering Practice*, 2017.

J34. S. Chandra, D. Mehta, and A. Chakraborty. Locating Power Flow Solution Space Boundaries: A Numerical Polynomial Homotopy Approach. *submitted to International Journal of Electric Power and Energy Systems*, 2017.

J33. N. Xue and A. Chakraborty. Optimal Control of Large-Scale Networks using Clustering Based Projections. *submitted to IEEE Transactions on Automatic Control*, Aug. 2016.

J32. T. Sadamoto, A. Chakraborty, T. Ishizaki, and J. Imura. Retrofit Control of Wind-Integrated Power Systems. *submitted to IEEE Transactions on Power Systems*, 2017.

J31. M. Liao and A. Chakraborty. Optimization Algorithms for Catching Data-Manipulators in Power System Estimation Loops. *submitted to IEEE Transactions on Control System Technology*, 2016.

J30. A. Chakraborty and A. Bose. Smart Grid Simulations and Their Supporting Implementation Methods. *Proceedings of the IEEE*, Dec. 2017.

J29. A. Milani, M. T. Khan, A. Chakraborty, and I. Husain. Equilibrium Point Analysis and Power Sharing in Distribution Systems Driven by Solid-State Transformers. *IEEE Transactions on Power Systems*, July. 2017.

J28. G. Chavan, M. Weiss, A. Chakraborty, S. Bhattacharya, A. Salazar, and F. Ashrafi, "Real-Time Identification and Predictive Analysis of a Multi-Area WECC Power System Model Using Synchrophasors," *IEEE Transactions on Smart Grid*, vol. 8(4), pp. 1977-1986, 2017.

J27. D. Soudbakhsh, A. Chakraborty, and A. M. Annaswamy. A Delay-Aware Cyber-Physical Architecture for Wide-Area Control of Power Systems. *IFAC Control Engineering Practice*, vol.

60, pp. 171-182, Mar. 2017.

J26. S. Nabavi and A. Chakrabortty. Identification of Reduced-Order Models of Power Systems in a Differential-Algebraic Form. *IEEE Transactions on Power Systems*, vol. 31(1), pp. 198-207, 2017.

J25. F. Lian, A. Chakrabortty, and A. Duel-Hallen. Game-Theoretic Multi-Agent Control and Network Cost Allocation under Communication Constraints. *IEEE Journal on Selected Areas in Communications* (Special issue on Game Theory for Networks), 2017.

J24. J. Zhang, S. Nabavi, A. Chakrabortty, and Y. Xin. ADMM Optimization Strategies for Wide-Area Oscillation Monitoring in Power Systems under Asynchronous Communication Delays. *IEEE Transactions on Smart Grid*, vol. 7(4), pp. 2123-2133, 2016.

J23. S. Chandra, D. F. Gayme, and A. Chakrabortty. Time-Scale Modeling of Wind-Integrated Power Systems. *IEEE Transactions on Power Systems*, vol. 31(6), pp. 4712-4721, Nov. 2016.

J22. N. Xue and A. Chakrabortty. Parallel Identification of Power System Dynamic Models Under Scheduling Constraints, *IEEE Transactions on Power Systems*, vol. 31(6), pp. 4584-4594, Nov. 2016.

J21. M. Caramanis, E. Ntakou, W. Hogan, A. Chakrabortty, and J. Schoene. Co-Optimization of Power and Reserves in Dynamic T&D Power Markets with Non-dispatchable Renewable Generation and Distributed Energy Resources, *Proceedings of the IEEE*, vol. 104(4), pp. 807-836, 2016.

J20. A. Chakrabortty. Distributed Cyber-Physical Algorithms for Wide-Area Monitoring of Power Systems. *invited article in the the Journal of the Society of Instrument and Control Engineers (SICE) of Japan*, Special issue on Design of Cooperative Distributed Energy Management Systems (Editors: T. Namerikawa and M. Fujita), 2016.

J19. S. Nabavi and A. Chakrabortty. A Graph-Theoretic Condition for Global Identifiability of Weighted Consensus Networks, *IEEE Transactions on Automatic Control*, vol. 61(2), pp. 497-502, 2016.

J18. M. Weiss, B. N. Abu-Jaradeh, A. Chakrabortty, A. Jamehbozorg, F. Ashrafi, and A. Salazar. A Wide-Area SVC Controller Design for Inter-Area Oscillation Damping in WECC based on a Structured Dynamic Equivalent Model, *Electric Power System Research*, vol. 133, pp. 1-11, Apr. 2016.

J17. S. Nabavi, J. Zhang, and A. Chakrabortty. Distributed Optimization Algorithms for Wide-Area Oscillation Monitoring in Power Systems Using Inter-Regional PMU-PDC Architectures. *IEEE Transactions on Smart Grid* (special issue on Cyber-Physical Applications in Smart Grids), vol. 6(5), pp. 2529-2538, Sep. 2015.

J16. T. R. Nudell, S. Nabavi, and A. Chakrabortty. A Real-Time Attack Localization Algorithm for Large Power System Networks Using Graph-Theoretic Techniques, *IEEE Transactions on Smart Grid* (special issue on Cyber-Physical Applications in Smart Grids), vol. 6(5), pp. 2551-2559, Sep. 2015.

J15. T. R. Nudell and A. Chakrabortty. Graph-Theoretic Methods for Measurement-Based Input Localization in Large Networked Dynamic Systems, *IEEE Transactions on Automatic Control*, vol. 60(8), pp. 2114-2128, Aug. 2015.

J14. A. Chakrabortty and C. F. Martin. Optimal Measurement Allocation Algorithms for Parametric Model Identification of Power Systems. *IEEE Transactions on Control Systems Technology*, vol. 22, no. 5, pp. 1801-1812, 2014.

J13. S. Chandra, D. Gayme, and A. Chakrabortty. Coordinating Wind Farms and Battery

Management Systems for Inter-Area Oscillation Damping Control: A Frequency-Domain Approach. *IEEE Transactions on Power Systems*, vol. 29, no. 3, pp. 1454-1462, May 2014.

J12. J. E. Anderson and A. Chakraborty. PMU Placement for Dynamic Equivalencing of Power Systems Under Flow Observability Constraints. *Journal of Electric Power Systems Research*, vol. 106, pp. 51-61, 2014.

J11. D. Gayme and A. Chakraborty. Using Wind Farm Siting and Control for Shaping Inter-area Oscillations in Large Power Systems. *IEEE Transactions on Control Systems Technology*, vol. 22, no. 4, pp. 1658-1665, May 2014.

J10. A. Chakraborty. Wide-Area Control of Large Power Systems Using Dynamic Clustering and TCSC-Based Redesigns, *IEEE Transactions on Smart Grid*, vol. 3(4), pp. 1503-1514, Nov. 2012.

J9. A. Chakraborty and C. F. Martin. Optimal Measurement Allocation for Parametric Model Identification of Electrical Networks. *Nonlinear Theory & Its Applications* (Invited Paper in Special Issue on Smart Energy Management), vol. 2, no. 3, pp. 302-219, July 2011.

J8. A. Chakraborty and A. Salazar. Building a Dynamic Electro-mechanical Model for the Pacific AC Intertie using Distributed Synchrophasor Measurements. *European Transactions on Electric Power, Special Issue: Power System Measurement Data and Their Applications*, (Editors: C. C. Liu, M. Crow, J. H. Chow), vol. 21(4), pp. 1657-1672, 2011.

J7. A. Chakraborty, J. H. Chow, and A. Salazar. A Measurement-based Framework for Dynamic Equivalencing of Power Systems using Wide-Area Phasor Measurements. *IEEE Transactions on Smart Grid*, vol. 2, no. 1, pp. 68-81, 2011.

J6. A. Chakraborty and E. Scholtz. Time-scale Separation Designs for Performance Recovery of Power Systems with Unknown Parameters and Faults. *IEEE Transactions on Control Systems Technology*, vol. 19, no. 2, pp. 382-390, March, 2011.

J5. A. Chakraborty, J. H. Chow, and A. Salazar. Interarea Model Estimation for Radial Power System Transfer Paths with Intermediate Voltage Control using Synchronized Phasor Measurements. *IEEE Transactions on Power Systems*, vol. 24, no. 3, pp. 1318-1326, Aug. 2009.

J4. A. Chakraborty and M. Arcak. Robust Stabilization and Performance Recovery of Nonlinear Systems with Unmodeled Dynamics. *IEEE Transactions on Automatic Control*, vol. 54, no. 6, pp. 1351-1356, 2009.

J3. A. Chakraborty and M. Arcak. Time-scale Separation Redesigns for Stabilization and Performance Recovery of Uncertain Nonlinear Systems. *Automatica*, vol. 45, pp.34-44, Jan. 2009.

J2. J. H. Chow, A. Chakraborty, L. Vanfretti, and M. Arcak. Estimation of Radial Power System Transfer Path Dynamic Parameters using Synchronized Phasor Data. *IEEE Transactions on Power Systems*, vol. 23, no. 2, pp. 564-571, May 2008.

J1. J. H. Chow, A. Chakraborty, M. Arcak, B. Bhargava, and A. Salazar. Synchronized Phasor Data Based Energy Function Analysis of Dominant Power Transfer Paths in Large Power Systems. *IEEE Transactions on Power Systems*, vol. 22, no. 2, pp. 727-734, May 2007.

Papers in Conference Proceedings:

C76. A. Chakraborty. Infusing Autonomy in Power Distribution Networks using Smart Transformers. *proceedings of the 1st IEEE Conference on Control Technology and Applications*, Hawaii, Aug. 2017.

- C75. M. Dibaji, Y. Yildiz, A. Annaswamy, and A. Chakrabortty. Delay-Aware Control of Wide-Area Power Networks. *in proceedings of the IFAC World Congress*, France, 2017.
- C74. N. Xue and A. Chakrabortty. LQG Control of Large Networks: A Clustering-Based Approach. *in proceedings of the American Control Conference*, Seattle, WA, 2017.
- C73. M. Liao and A. Chakrabortty. Identifying Data-Manipulators in Power System Mode Estimation Loops with Noisy Measurements. *in proceedings of the American Control Conference*, Seattle, WA, 2017.
- C72. T. Sadamoto, A. Chakrabortty, T. Ishizaki, and J. Imura. Retrofit Control of Wind-Integrated Power Systems *in proceedings of the American Control Conference*, Seattle, WA, 2017.
- C71. A. Jain, A. Chakrabortty, and E. Biyik. An Online Structurally Constrained LQR Design for Damping Oscillations in Power System Networks. *in proceedings of the American Control Conference*, Seattle, WA, 2017.
- C70. M. D. Weiss, J. Zhang, and A. Chakrabortty. Wide-Area Control of Power Systems using Cloud-in-the-Loop Feedback. *invited paper at IEEE Global Conference on Signal and Information Processing*, (GlobalSIP), Washington DC, Dec. 2016.
- C69. M. Liao and A. Chakrabortty. Identifying Covert Data-Manipulators in Power System Estimation Loops. *proceedings of 57th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 2016.
- C68. N. Xue and A. Chakrabortty. H_2 -Clustering of Closed-loop Consensus Networks under Generalized LQR Designs. *proceedings of 57th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 2016.
- C67. A. Milani, M. T. Khan, A. Chakrabortty, and I. Husain. Comprehensive Dynamic Modeling of a Solid-state Transformer Based Microgrid System. *IEEE Energy Conversion Congress and Exposition*, Milwaukee, WI, Sep. 2016.
- C66. T. Jiang, J. Zhang, F. Mueller, A. Chakrabortty, and Y. Xin. A Resilient Software Infrastructure for Wide-Area Measurement Systems. *in proceedings of IEEE PES General Meeting*, Boston, 2016.
- C65. Y. Wang and A. Chakrabortty. Distributed Monitoring of Wide-Area Oscillations in the Presence of GPS Spoofing Attacks. *in proceedings of IEEE PES General Meeting*, Boston, 2016.
- C64. N. Chockalingam, A. Chakrabortty, and A. Hussain. Mitigating Denial-of-Service Attacks in Wide-Area LQR Control. *in proceedings of IEEE PES General Meeting*, Boston, 2016.
- C63. F. Lian, A. Duel-Hallen, and A. Chakrabortty. Ensuring Economic Fairness in Wide-Area Control for Power Systems via Game Theory. *in proceedings of American Control Conference*, 2016.
- C62. A. Annaswamy, A. Hussain, A. Chakrabortty, and M. Cvetkovic. Foundations of Infrastructure CPS. *in proceedings of American Control Conference*, 2016.
- C61. M. Liao and A. Chakrabortty. A Round-Robin ADMM Algorithm for Identifying Data-Manipulators in Power System Estimation. *in proceedings of American Control Conference*, 2016.
- C60. N. Xue and A. Chakrabortty. H_2 -Clustering of Closed-loop Consensus Networks under a Class of LQR Design. *in proceedings of American Control Conference*, 2016.

- C59. A. Boker, C. Yuan, F. Wu, and A. Chakraborty. Aggregate Control of Clustered Consensus Networks with Inter-Cluster Time Delays. *in proceedings of American Control Conference*, 2016.
- C58. S. Nabavi and A. Chakraborty. An Attack Resilient Distributed Optimization Algorithm for Modal Estimation in Power Systems. *in proceedings of 56th IEEE Conference on Decision and Control*, Osaka, Japan, Dec. 2015.
- C57. J. Zhang, S. Nabavi, A. Chakraborty, and Y. Xin. Convergence Analysis of ADMM-Based Power System Mode Estimation Under Asynchronous Wide-Area Communication Delays. *in proceedings of IEEE PES General Meeting*, Denver, CO, Jul. 2015.
- C56. S. Chandra, D. Mehta, and A. Chakraborty. Equilibria Analysis of Power Systems Using a Numerical Homotopy Method. *in proceedings of IEEE PES General Meeting*, Denver, CO, Jul. 2015.
- C55. M. D. Weiss, A. Chakraborty, F. Ashrafi, A. Jamehbozorg, and B. N. Abu-Jaradeh. A Wide-Area SVC Controller Design Using a Dynamic Equivalent Model of WECC. *in proceedings of IEEE PES General Meeting*, Denver, CO, Jul. 2015.
- C54. S. Chandra, D. Mehta, and A. Chakraborty. Exploring the Impact of Wind Penetration on Power System Equilibrium Using a Numerical Continuation Approach. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C53. A. Jain, E. Biyik, and A. Chakraborty. A Model Predictive Control Design for Selective Modal Damping in Power Systems. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C52. V. Katewa, A. Chakraborty, and V. Gupta. Protecting Privacy of Topology in Consensus Networks. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C51. A. Boker, T. R. Nudell, and A. Chakraborty. On Aggregate Control of Clustered Consensus Networks. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C50. T. R. Nudell, A. Chakraborty, and A. Chakraborty. Ensuring Localizability of Node Attacks in Consensus Networks via Feedback Graph Design. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C49. S. Nabavi, A. Chakraborty, and P. Khargonekar. A Global Identifiability Condition for Consensus Networks Defined Over Tree Graphs. *in proceedings of the American Control Conference*, Chicago, IL, June. 2015.
- C48. J. Zhang, P. Jaipuria, A. Hussain, and A. Chakraborty. Attack-Resilient Estimation of Power System Oscillation Modes using Distributed and Parallel Optimization: Theoretical and Experimental Methods. *in proceedings of the Conference on Decision and Game Theory for Security (Gamesec)*, 2014.
- C47. D. Soudbaksh, A. Chakraborty, and A. Annaswamy. Computational Co-Designs for Wide-Area Control of Power Grids. *in proceedings of the 55th IEEE Conference on Decision and Control*, Los Angeles, CA, Dec. 2014.
- C46. F. Lian, A. Duel-Hallen, and A. Chakraborty. Cost Allocation Strategies for Wide-Area Control of Power Systems Using Nash Bargaining Solution. *in proceedings of the 55th IEEE Conference on Decision and Control*, Los Angeles, CA, Dec. 2014.
- C45. J. Zhang, A. Chakraborty, and Y. Xin. Distributed Implementation of Wide-Area Monitoring Algorithms for Power Systems Using a US-Wide ExoGENI-WAMS Testbed. *invited paper for the 1st International Workshop on Trustworthiness of Smart Grids (ToSG 2014)*,

(organizers: Dave Bakken and Neeraj Suri), Atlanta, GA, June, 2014.

C44. T. Qian, A. Chakrabortty, F. Mueller, and Y. Xin. A Real-time Distributed Storage System for Multi-Resolution Virtual Synchronphasor, *in proceedings of the IEEE Power & Energy Society General Meeting*, 2014.

C43. S. Chandra, M. D. Weiss, A. Chakrabortty, and D. F. Gayme. Impact Analysis of Wind Power Injection on Time-Scale Separation of Power System Oscillations, *in proceedings of the IEEE Power & Energy Society General Meeting*, 2014.

C42. S. Nabavi and A. Chakrabortty. Distributed Estimation of Inter-area Oscillation Modes in Large Power Systems Using Alternating Direction Multiplier Method, *in proceedings of the IEEE Power & Energy Society General Meeting*, 2014.

C41. A. Chakrabortty. Distributed Optimization Methods for Wide-Area Damping Control of Power System Oscillations, *in proceedings of the IFAC World Congress*, Cape Town, Aug. 2014.

C40. A. Chakrabortty and T. Khan. Spatio-Temporal Oscillation Monitoring in Spatially Distributed Power System Networks Using Energy Functions, *in proceedings of the American Control Conference*, Portland, OR, 2014.

C39. S. Nabavi and A. Chakrabortty. A Real-Time Distributed Prony-Based Algorithm for Modal Estimation of Power System Oscillations, *in proceedings of the American Control Conference*, Portland, OR, 2014.

C38. T. R. Nudell and A. Chakrabortty. A Graph-Theoretic Algorithm for Localization of Forced Harmonic Oscillation Inputs in Power System Networks, *in proceedings of the American Control Conference*, Portland, OR, 2014.

C37. Y. Xin and A. Chakrabortty. A Study on Group Communication in Distributed Wide-Area Measurement System Networks in Large Power Systems, *invited paper in IEEE Global Conference on Signal and Information Processing*, Austin, TX, Dec. 2013.

C36. M. D. Weiss, Y. Xin, and A. Chakrabortty. A Multi-User Network Testbed for Wide-Area Monitoring & Control of Power Systems Using Distributed Synchronphasors. *proceedings of ACM e-Energy Conference*, UC Berkeley, June 2013.

C35. A. Chakrabortty and Y. Xin. Hardware-in-the-Loop Simulations and Verifications of Smart Power Systems Over an Exo-GENI Testbed, *proceedings of 2nd GENI Research and Educational Experiment Workshop*, GREE2013, Utah, Mar. 2013.

C34. S. Thakur and A. Chakrabortty. Multi-Dimensional Wide-Area Visualization of Power System Dynamics Using Synchronphasors, *IEEE PES General Meeting*, Vancouver, Canada, 2013.

C33. S. Chandra, D. Gayme, and A. Chakrabortty. Using Battery Management Systems to Augment Inter-area Oscillation Control in Wind-Integrated Power Systems, *in proceedings of the American Control Conference*, DC, 2013.

C32. S. Nabavi and A. Chakrabortty. Topology Identification for Dynamic Equivalent Models of Large Power System Networks, *in proceedings of the American Control Conference*, DC, 2013.

C31. T. R. Nudell and A. Chakrabortty. A Graph-Theoretic Algorithm for Disturbance Localization in Large Power Grids Using Residue Estimation, *in proceedings of the American Control Conference*, DC, 2013.

C30. A. Chakrabortty and P. Khargonekar. Introduction to Wide-Area Control of Power

Systems, *in proceedings of the American Control Conference*, DC, 2013.

C29. J. Felder and A. Chakrabortty. Evaluating the Computation Times of Real-Time Algorithms for Power System Modeling and State Prediction. *in proceedings of the 53rd IEEE Conference on Smart Grid Communications (SmartgridComm)*, Taiwan, Oct. 2012.

C28. J. E. Anderson and A. Chakrabortty. Graph-Theoretic Algorithms for PMU Placement in Power Systems Under Measurement Observability Constraints. *in proceedings of 3rd IEEE Conference on Smart Grid Communications (SmartgridComm)*, Taiwan, Oct. 2012.

C27. A. Chakrabortty, G. Michailidis, and Y. Xin. A Decentralized ID Algorithm for Detecting Slow-Fast Oscillations in Power Systems from Overwhelming Volumes of Phasor Data. *in proceedings of 51st IEEE Conference on Decision & Control*, Maui, HI, Dec. 2012.

C26. A. Chakrabortty and T. Khan. Graph-Theoretic Modeling and Analysis of Oscillation Propagation in Large Power System Networks. *in proceedings of 51st IEEE Conference on Decision & Control*, Maui, HI, Dec. 2012.

C25. D. F. Gayme and A. Chakrabortty. Shaping Power System Inter-area Oscillations through Control Loops of Grid Integrated Wind Farms. *in proceedings of 51st IEEE Conference on Decision & Control*, Maui, HI, Dec. 2012.

C24. A. Chakrabortty. Wide-Area Damping Control of Power Systems Using Inversion Techniques: A TCSC-Based Model Reference Approach. *in proceedings of IEEE PES General Meeting*, San Diego, CA, 2012.

C23. J. E. Anderson and A. Chakrabortty. A Minimum Cover Algorithm for PMU Placement in Power System Networks Under Line Observability Constraints. *in proceedings of IEEE PES General Meeting*, San Diego, CA, 2012.

C22. D. F. Gayme and A. Chakrabortty. Impact of Wind Farm Placement on Inter-area Oscillations in Large Power Systems. *in proceedings of the American Control Conference*, Montreal, CA, 2012.

C21. A. Chakrabortty. Wide-Area Damping Control of Power Systems Using Clustering and FACTS-Based Redesigns. *in proceedings of the American Control Conference*, Montreal, CA, 2012.

C20. Y. Xin, I. Baldine, J. Chase, T. Beyene, and A. Chakrabortty. Virtual Smart Grid Architecture and Control Framework. *in proceedings of the 2nd IEEE Conference on Smart Grid Communications (SmartgridComm)*, Brussels, Oct. 2011.

C19. A. Chakrabortty. Wide-Area Damping Control of Large Power Systems Using a Model Reference Approach. *in Proceedings of the 50th IEEE Conference on Decision & Control*, Orlando, FL, Dec. 2011.

C18. A. Chakrabortty and T. R. Khan. Modeling and Analysis of Oscillation Propagation in Complex Power System Networks. *in proceedings of the IEEE Power & Energy Society General Meeting*, Detroit, MI, Jul. 2011.

C17. A. Chakrabortty. Optimal Sensor Placement for Parametric Identification of Electrical Networks Using Mixed Phasor Measurements. *in proceedings of the American Control Conference*, San Francisco, CA, Jul. 2011.

C16. A. Chakrabortty and C. F. Martin. Optimal Sensor Placement for Parametric Model Identification of Electrical Networks, Part II: Estimation under Output Feedback. *in Proceedings of 49th IEEE Conference on Decision and Control*, Atlanta, GA, Dec. 2010.

C15. A. Chakrabortty and C. F. Martin. Optimal Sensor Placement for Parametric Model

- Identification of Electrical Networks, Part I: Open Loop Estimation. *in Proceedings of 49th IEEE Conference on Decision and Control*, Atlanta, GA, Dec. 2010.
- C14. A. Chakraborty and J. H. Chow. Macroscopic Modeling of Large Power Systems using Distributed Dynamic Measurements with Dependence on Network Topology. *in Proceedings of 49th IEEE Conference on Decision and Control*, Atlanta, GA, Dec. 2010.
- C13. A. Chakraborty and A. Salazar. Building an Electromechanical Model for the Pacific AC Intertie using PMU Measurements. *in Proceedings of IEEE PES General Meeting*, Minneapolis, MN, Jul 2010.
- C12. A. Chakraborty and M. Szczodrak. Optimal Placement of PMUs for Identification of Power System Models using Noisy Measurement Data. *in Proceedings of IEEE PES General Meeting*, Minneapolis, MN, Jul 2010.
- C11. A. Chakraborty, J. H. Chow and A. Salazar. A Measurement-based Framework for Dynamic Equivalencing of Large Power Systems using WAMS. *in Proceedings of IEEE PES Conference on Innovative Smart Grid Technologies*, Washington, DC, Jan. 2010.
- C10. A. Chakraborty and M. Mesbahi. Performance Oriented High Gain Redesigns for FACTS-controlled SMIB Power Systems. *in Proceedings of the 48th IEEE Conference on Decision and Control*, Shanghai, China, 2009.
- C9. A. Chakraborty. Some New Results on the Identification of Two-machine Radial Power Systems with SVC Control. *in Proceedings of the American Control Conference*, St. Louis, MO, pp. 2216-2121, 2009.
- C8. A. Chakraborty and J. H. Chow. Synchronized Phasor Data Estimation of Dynamic Parameters for Radial Power System Transfer Path with Voltage Reinforcement. *11th Symposium of Specialists in Electric Operational and Expansion Planning (SEPOPE)*, Belem, Brazil, March, 2009.
- C7. A. Chakraborty and M. Arcak. Robust Stabilization and Performance Recovery of Non-linear Systems with Input Unmodeled Dynamics. *in Proceedings of the 47th IEEE Conference on Decision and Control*, Cancun, Mexico, 2008.
- C6. A. Chakraborty, M. Arcak, and P. Tsiotras. Robust Design of a Spacecraft Attitude Tracking Control System with Actuator Uncertainties. *in Proceedings of the 47th IEEE Conference on Decision and Control*, Cancun, Mexico, 2008.
- C5. A. Chakraborty and J. H. Chow. Interarea Model Estimation for Radial Power System Transfer Paths with Voltage Support using Synchronized Phasor Measurements. *in Proceedings of the IEEE Power Engineering Society General Meeting*, Pittsburgh, PA, July, 2008.
- C4. A. Chakraborty and M. Arcak. A Three-Time Scale Redesign for Robust Stabilization and Performance Recovery of Nonlinear Systems with Input Uncertainties. *in Proceedings of the 46th IEEE Conference on Decision and Control*, New Orleans, LA, 2007.
- C3. A. Chakraborty, E. Scholtz, and M. Arcak. Performance Recovery of Power Systems with Unknown Parameters and Faults. *in Proceedings of the 46th IEEE Conference on Decision and Control*, New Orleans, LA, 2007.
- C2. A. Chakraborty and M. Arcak. A Two-Time Scale Redesign for Robust Stabilization and Performance Recovery of Uncertain Nonlinear Systems. *in Proceedings of the American Control Conference*, New York, NY, 2007.
- C1. J. H. Chow, A. Chakraborty, M. Arcak, B. Bhargava, and A. Salazar. Synchronized Phasor Data Based Energy Function Analysis of Power Transfer Paths. *in Proceedings of the IEEE Power Engineering Society General Meeting*, Montreal, Quebec, Canada, June 2006.

STUDENT
SUPERVISION

1. Postdoctoral Researcher: Dr. Nilanjan RoyChowdhury (2017-), Dr. Rafael Montoya (co-advised with Dr. Iqbal Husain, 2016-), Dr. Muataz Boker (2014-2015)
2. PhD: Thomas Nudell (Fall 2014), Seyedbehzad Nabavi (Spring 2015), Souvik Chandra (Summer 2015), Matthew D. Weiss (Summer 2016), Jianhua Zhang (Summer 2016), Abhishek Jain, Mang Liao, Nan Xue, Sayak Mukherjee, Nandini Negi, Haoqi Ni, Prathistha Shukla, Rahul Chakrabarty
3. PhD co-supervision: Feier Lian, Alireza Milani, Tanvir Khan, Amirhassan F. Dizche
4. MS: Tim Gubitz, Nachiappan Chockalingam (Fall 2015), Sina Parhizi (Summer 2013), Shangmin Lin (Summer 2014), Kathleen Sico (Fall 2014)
5. BS: Afsana Chowdhury, Nathan Hansen, Maria Sable, Travis Tippens, Jose Zavala, Seyed Mohsin, Aaron Martin, Carlos Flores, Rusul Altaay, Lizbeth Chavez, Joel Anderson, Jennifer Felder, Brennan Keegan, Rinita Gulliani, Jerene Jacob (TTU), Andrew Bellingsley (TTU), Bilal Bissat (TTU)

VISITING
RESEARCHERS

1. Marta A. Szczodrak, Poland, 2009
2. Dr. Emrah Biyik, Turkey, 2013
3. Dr. Tomonori Sadamoto, Japan, 2017
4. Marcos Alfredo Hernandez, Mexico, 2017

POSTER
PRESENTATIONS

- P37. A. Milani, M. T. Khan, A. Chakraborty, and I. Husain. Decentralized Passivity-based PI Controller for Asymptotic Stability of a SST-based Power Distribution Network *FREEDM Annual Site Visit Conference*, NC State University, May 2017.
- P36. M. T. Khan, A. Milani, A. Chakraborty, and I. Husain. Feasibility Analysis and Power Sharing of Solid-State Transformers in Power Distribution System *FREEDM Annual Site Visit Conference*, NC State University, May 2017.
- P35. A. Milani, M. T. Khan, A. Chakraborty, and I. Husain. Feasibility Analysis of the FREEDM System Dynamic Models. *FREEDM Annual Site Visit Conference*, Florida State University, Tallahassee, FL, June, 2016.
- P34. A. Milani, M. T. Khan, A. Chakraborty, and I. Husain. Dynamic Analysis of the FREEDM System, Part I: Comprehensive State-Space Modeling. *FREEDM Annual Site Visit Conference*, May, 2015.
- P33. A. Milani, M. T. Khan, A. Chakraborty, and I. Husain. Dynamic Analysis of the FREEDM System, Part II: Existence, Uniqueness and Local Stability of Equilibria. *FREEDM Annual Site Visit Conference*, May, 2015.
- P32. A. Boker and A. Chakraborty. Aggregation-Based Wide-Area Control of Clustered Power System Networks. *FREEDM Annual Site Visit Conference*, May, 2015.
- P31. A. Jain, E. Biyik, and A. Chakraborty. A Model Predictive Control Technique for Selective Modal Damping in Power Systems. *FREEDM Annual Site Visit Conference*, May, 2015.
- P30. S. Chandra, D. Mehta, and A. Chakraborty. Equilibria Analysis of Power Systems Using a Numerical Homotopy Method. *FREEDM Annual Site Visit Conference*, May, 2015.
- P29. A. Boker and A. Chakraborty. Aggregation-Based Wide-Area Control of Clustered Cyber-Physical Systems. *4th NCSU Postdoc Research Symposium*, May, 2015.
- P28. G. Chavan, M. Weiss, A. Chakraborty, and S. Bhattacharya. Real-time Identification and Predictive Analysis of a Multi-Area WECC Power System Model Using Synchrophasors. *NASPI User Group Meeting*, San Mateo, CA, Mar. 2015.

- P27. S. Nabavi, J. Zhang, and A. Chakraborty. Distributed Algorithms for Wide-Area Oscillation Monitoring Using Interdependent PMU-PDC Architectures. *FREEDM Industry Conference*, Jan. 2015.
- P26. J. Zhang, A. Chakraborty, and Y. Xin. Distributed Implementation of Wide-Area Monitoring Algorithms for Power Systems Using a US-Wide ExoGENI-WAMS Testbed. *FREEDM Industry Conference*, Jan. 2015.
- P25. J. Zhang, P. Jaipuria, A. Chakraborty, and A. Hussain. Attack-Resilient Distributed Optimization for Wide-Area Oscillation Monitoring of Large Power Systems. *Conference on Decision and Game Theory for Security (Gamesec)*, Nov. 2014.
- P24. S. Mohsin, J. Zhang, and A. Chakraborty. Decoy Algorithms for Detection and Mitigation of Cyber Attacks on Wide-Area Monitoring Systems. *NCSU Undergraduate Research Symposium*, July 2014.
- P23. A. Hussain and A. Chakraborty. Design and Analysis of Wide-Area Resilient Control Algorithms for Large-Scale Power Systems: Theoretical and Experimental Methods. *Smart America Testbed Demonstration Event*, Washington DC, June 2014.
- P22. Y. Xin and A. Chakraborty. A Study on Group Communication in Distributed Wide-Area Measurement System Networks in Large Power Systems. *1st IEEE Global Conference on Signal & Information Processing*, Austin, TX, Dec. 2013.
- P21. A. Chakraborty, F. Mueller, R. Bobba, N. Vaidya, and Y. Xin. Distributed Asynchronous Algorithms and Software Systems for Wide-Area Monitoring of Power Systems Using Synchronphasors. *NSF Cyber-Physical System (CPS) PI Meeting*, Arlington, VA, Oct. 2013.
- P20. C. Flores and A. Chakraborty. Correlating Power System Responses with Notions of Electrical Distance: A Statistical Approach. *NCSU Undergraduate Research Symposium*, July 2013.
- P19. S. Thakur and A. Chakraborty. Multi-Dimensional Wide-Area Visualization of Power System Dynamics Using Synchronphasors. *IEEE PES General Meeting*, Jul. 2013
- P18. M. D. Weiss, Y. Xin, and A. Chakraborty. A Multi-User Network Testbed for Wide-Area Monitoring & Control of Power Systems Using Distributed Synchronphasors. *US Ignite Summit*, Chicago, Jun. 2013.
- P17. M. D. Weiss, Y. Xin, and A. Chakraborty. A Multi-User Network Testbed for Wide-Area Monitoring & Control of Power Systems Using Distributed Synchronphasors. *ACM e-Energy Conference*, UC Berkeley, 2013.
- P16. J. E. Anderson and A. Chakraborty. A Minimum Cover Algorithm for PMU Placement in Power System Networks Under Line Observability Constraints. *IEEE PES General Meeting Poster Session*, San Diego, CA, 2012.
- P15. T. R. Nudell and A. Chakraborty. Distance Characterization and Input Localization in Network Dynamic Systems. *NC State ECE Annual Graduate Symposium*, Apr. 2012.
- P14. J. Anderson and A. Chakraborty. Optimal Sensor Placement and Malicious Attack Detection in Power Systems. *NC State Undergraduate Symposium*, Apr. 2012.
- P13. J. K. Felder, R. Altay, and A. Chakraborty. Real-time Algorithms for Power System State Prediction. *NC State Undergraduate Symposium*, Apr. 2012.
- P12. T. R. Nudell and A. Chakraborty. Distances in Node- and Edge-Weighted Networked Dynamic Systems via the Asymmetric Graph Laplacian. *NC State Graduate Symposium*, Mar. 2012.

- P11. J. Anderson and A. Chakrabortty. A Visualization Interface Design for Wide-Area Monitoring of Electric Power Systems. *NASPI Working Group Research Meeting*, Orlando, FL, Feb. 2012.
- P10. M. Weiss, J. Anderson, and A. Chakrabortty. Synchrophasor Research at NC State University. *FREEDM Industry Review Meeting*, Jan. 2012.
- P9. B. Keegan, R. Gulliani, and A. Chakrabortty. Interactive Software Design for Visualization of Power System Disturbances. *NC State Undergraduate Symposium*, Aug. 2011.
- P8. J. Anderson, J. K. Felder, and A. Chakrabortty. A Visualization Interface Design for Wide-Area Monitoring of Electric Power Systems. *NC State Undergraduate Symposium*, Raleigh, NC, Apr. 2011.
- P7. J. Anderson, J. K. Felder, and A. Chakrabortty. A Visualization Interface Design for Wide-Area Monitoring of Electric Power Systems. *FREEDM Industry Review Meeting*, Raleigh, NC, Jan. 2011.
- P6. A. Chakrabortty and M. Mesbahi. Performance Oriented High Gain Redesigns for FACTS-controlled SMIB Power Systems. *48th IEEE Conference on Decision and Control*, Shanghai, China, 2009.
- P5. A. Chakrabortty. Some New Results on the Identification of Power System Models with SVC Control using Phasor Measurements. *Working Group Meeting of North American Synchrophasor Initiative (NASPI)*, Charlotte, North Carolina, October 2008.
- P4. A. Chakrabortty and J. H. Chow. Interarea Model Estimation for Two-machine Power Systems using Synchronized Phasor Measurements. *Center for Automation Technologies and Systems (CATS)*, Rensselaer Polytechnic Institute, NY, April 2008.
- P3. A. Chakrabortty, L. Vanfretti, J. H. Chow, and M. Arcaç. Synchronized Phasor Data Based Dynamic Model Estimation for Two-machine Power Systems. *Student poster presentation session, IEEE Power Engineering Society General Meeting*, Tampa, FL, June 2007.
- P2. A. Chakrabortty, J. H. Chow, M. Arcaç, B. Bhargava, and A. Salazar. An Energy Function Approach for the Monitoring of Power Systems Dynamics using Synchronized Phasor Data. *Student poster presentation session, IEEE Power Engineering Society General Meeting*, Montreal, Quebec, Canada, June 2006.
- P1. A. Chakrabortty, J. H. Chow, M. Arcaç, B. Bhargava, and A. Salazar. An Energy Function Approach for the Monitoring of Power Systems Dynamics using Synchronized Phasor Data. *Automation Open House Poster Session, Center for Automation Technologies and Systems (CATS)*, Rensselaer Polytechnic Institute, NY, May 2006.

INVITED TALKS &
PRESENTATIONS

60. Invited talk for panel session on ‘Big Data in Power Systems’ at IEEE PES General Meeting, Chicago, 2017
Organizer: Hamed Mohsenian-Rad and Ning Zhou
Title - Power System Identification Problems using Synchrophasor Measurements
59. Focus Period talk at Lund Center for Control of Complex Engineering Systems, Lund University, Sweden, June 2017
Organizer: Anders Rantzer and Pontus Gisselson
Title - Distributed Optimization Algorithms for Eigenvalue Estimation Problems in Power Systems
58. Invited talk for 2017 Joint JST-NSF-DFG Workshop on Distributed Energy Management Systems, Tokyo, June 2017
Organizer: Sairaj Dhople and Kishan Baheti
Title - Infusing Autonomy in Power Distribution Systems using Smart Transformers

57. Invited talk at SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2017
Organizer: Yoshihiko Susuki and Igor Mezic
Title - A Data-Driven Distributed Algorithm for Nonlinear Mode Estimation in Power Systems
56. Invited talk at Internet2 Global Summit, Washington DC, April 2017
Organizer: Florence Hudson
Title - A Testbed Demo of Cyber Attacks in Power Grids
55. Invited talk at Conference on Information Sciences and Systems, Baltimore, Maryland, March 2017
Organizer: Enrique Mallada and Dennice Gayme
Title - Distributed Cyber-Physical Algorithms for Wide-Area Control of Power Systems
54. Invited talk at Center for Cyber-Physical Systems and the Internet of Things, University of Southern California, 2017
Organizer: Paul Bogdan
Title - Cyber-Physical Monitoring and Control of Power Systems using Synchrophasors
53. Invited talk in Workshop on New Opportunities for Research in Systems and Control: A workshop to celebrate the 60th Birthday of Pramod Khargonekar, IEEE Conference on Decision and Control (CDC), 2016
Organizer: Kameshwar Poolla, Mario Rotea, Kishan Baheti
Title - New Research Directions in Power System Dynamics and Controls
52. Invited talk at Purdue University, 2016
Organizer: Shreyas Sundaram
Title - Distributed Algorithms for Wide-Area Monitoring of Power Systems
51. Coordinated Science Lab (CSL) Control Seminar, University of Illinois at Urbana Champaign, 2016
Organizer: Prashant Mehta
Title - Distributed Algorithms for Wide-Area Monitoring of Power Systems
50. Invited talk at Keio University, Japan, 2016
Organizer: Toru Namerikawa
Title - Distributed Algorithms for Wide-Area Monitoring of Power Systems
49. Tokyo Electric Power Company (TEPCO), Japan, 2016
Organizer: Teruo Ohno
Title - Introduction to Wide-Area Monitoring and Control of Power Systems
48. Tokyo Institute of technology, Japan, 2016
Organizer: Jun-ichi Imura
Title - A Tutorial on Wide-Area Monitoring and Control of Power Systems
47. Osaka Prefecture University, Japan, 2016
Organizer: Yoshihiko Susuki
Title - A Tutorial on Wide-Area Monitoring and Control of Power Systems
46. Invited talk and panelist for panel session on ‘Wide-Area Control of Power Systems’ at IEEE PES General Meeting, Boston, 2016
Organizer: Kevin Tomsovic (Univ. of Tennessee)
Title - Cyber-Physical Co-Designs for Wide-Area Control
45. Invited talk and panelist for panel session on ‘Synchrophasor Education’ at IEEE PES General Meeting, Boston, 2016
Organizer: Anurag Srivastava (Washington State Univ)
Title - ExoGENI-WAMS: A Cyber-Physical Testbed for Research and Education on Wide-Area

Monitoring and Control

44. Invited talk and panelist for pre-conference workshop on Smart Grid Controls at American Control Conference, Boston, 2016
Organizers: Jakob Stoustrup, Anu Annaswamy, Z. Qu, A. Farid, and U. Vaidya
Title - Co-designs for Wide-Area Control: A Cyber-Physical Perspective
43. Invited talk for 2016 Joint JST-NSF-DFG Workshop on Distributed Energy Management Systems, Heidelberg, May 2016
Organizer: Anil Pahwa (Univ of Kansas) and Kishan Baheti (NSF)
42. University of California San Diego, April 2016
Organizer: Sonia Martinez
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Power Systems using Synchronphasors
41. Invited talk at NSF workshop on Accesible Remote Testbeds, November 2015
Organizer: Magnus Egerstedt (Georgia Tech)
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Power Systems using Synchronphasors
40. Invited talk at Keio University for NSF-JST CREST workshop, November 2015
Organizer: Toru Namerikawa (Keio University)
Title - Oscillation Analysis in Power Systems with High Penetration of Wind Power
39. NSF CURENT ERC Seminar, University of Tennessee, November 2015
Organizer: Donatello Materessi
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Power Systems using Synchronphasors
38. Palo Alto Research Center (PARC), October 2015
Organizer: Anurag Ganguli (PARC)
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Power Systems using Synchronphasors
37. Stanford Energy Research Group, October 2015
Organizer: Ram Rajagopal (Stanford University)
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Power Systems using Synchronphasors
36. Invited presentation in the workshop 'Distributed optimization and control for power systems', 22nd International Symposium on Mathematical Programming (ISMP), July 2015
Organizer: Uday Shanbhag (Pennsylvania State University)
Title - Synchronous and Asynchronous ADMM Algorithms for Eigenvalue Estimation in Power Systems
35. Coordinated Systems Lab (CSL) at University of Illinois Urbana Champaign, June 2015
Organizer: Nitin Vaidya
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring of Power Systems using Synchronphasors
34. Invited talk at the 2015 Joint JST-NSF-DFG Workshop on Distributed Energy Management Systems, April 2015
Organizer: Kishan Baheti (NSF) and Kevin Tomsovic (University of Tennessee)
Title - Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control of Large power Systems
33. Invited talk at SIAM Computational Science and Engineering Mini-Symposium, Mar. 2015
Organizer- Mahantesh Halappanavar, Mani Venkatasubramanian, Alex Pothen

Title - *ADMM-Based Distributed Optimization Algorithms for Wide-Area Oscillation Monitoring*

32. Invited talk at Information Sciences Institute (ISI), University of Southern California, Nov. 2014

Organizer- Alefiya Hussain

Title - *Attack-Resilient Distributed Algorithms for Wide-Area Monitoring of Power Systems Using Synchrophasors*

31. Invited talk at CISE Seminar Series, Boston University, Oct. 2014

Organizer- Michael Caramanis

Title - *Distributed Algorithms for Wide-Area Monitoring of Power Systems Using Synchrophasors*

30. Invited talk at the 9th CMU Electricity Conference, Mar. 2014

Organizer- Marija Ilic

Title - *Wide-Area Control of Power Systems Using Arbitrated Communication Networks*

29. Invited panelist talk at Power System Conference, Clemson University, Mar. 2014

Title - *Exo-GENI WAMS: A Multi-User Network Testbed for Synchrophasor Research & Education*

28. Invited talk and panelist at IEEE Innovative Smart Grid Technologies (ISGT 2014) Conference, Feb. 2014

Organizer: Arnie De Castro

Title - *Creating Synchrophasor-based Predictive Dynamic Models for Wide-area Monitoring and Control*

27. Invited poster presentation at the 2014 Joint JST-NSF-DFG Workshop on Distributed Energy Management Systems, Jan 2014

Organizer: Kishan Baheti (NSF) and Anthony Kuh (University of Hawaii Manoa)

Title - *Distributed Asynchronous Algorithms and Software Systems for Wide-Area Monitoring of Large power Systems*

26. Invited talk at the IEEE GlobalSIP Symposium on Information Processing in the Smart Grid, Dec. 2013

Organizers: Lalitha Sankar and Shalinee Kishore

Title - *A Study on Group Communication in Distributed Wide-Area Measurement System Networks in Large Power Systems*

25. Invited Cyber-Physical System testbed discussion at the Smart America Challenge, US White House, Dec. 2013

Organizers: Geoff Mulligan and Sokwoo Rhee (NIST)

24. Florida International University, Nov. 2013

Organizer: Arif Islam

Title - *Wide-Area Control of Power Systems using Synchrophasors*

23. A. D. Patel Institute of Technology, Gujarat, India, Oct. 2013

Invited talk at International Workshop on Sensor Network and Wireless Communications

Organizer: Vishvjit Thakar

Title - *Cyber-Physical Algorithms for Distributed Estimation and Monitoring of Power Systems*

22. US Ignite Summit, June 2013

Organizer: Tsege Beyene, CISCO Systems

Title - *Multi-User Network Testbed for Wide-Area Monitoring of Power Systems*

21. Johns Hopkins University, February 2013

Organizer: Dennice F. Gayme

Talk title - *Decentralized Algorithms for Wide-area Monitoring and Control of Power Systems using Synchrophasors*

20. Southern California Edison, February 2013

Organizer: Frank Ashrafi

Talk title - *Wide-area Modeling of WECC Oscillations using Synchrophasor Data*

19. Carnegie Mellon University, January 2013

Organizer: Marija D. Ilic

Talk title - *Wide-area Modeling, Monitoring and Control of Large Power Systems using Synchrophasors*

18. University of California Santa Barbara, September 2012

Organizer: Francesco Bullo

Talk title - *Wide-area Modeling, Monitoring and Control of Large Power Systems using Synchrophasors: Theory, Experiments and Validation*

17. Loughborough University, United Kingdom, September 2012,

Organizer: John Thompson

Talk title - *Distributed Asynchronous Algorithms for Wide-Area Monitoring and Control Using Synchrophasors*

16. Indian Institute of Technology Kharagpur, India, June 2012

Organizer: Dheeman Chatterjee

Talk title - *Wide-area Modeling and Control of Large Power Systems using Distributed Synchrophasors*

15. Los Alamos National Laboratory, NM, Annual Seminar Series, May 2012

Organizer: Michael (Misha) Chertkov, Scott Backhaus, Russell Bent

Talk title - *Wide-area Modeling and Control of Large Power Systems via Real-Time Digital Simulations using Distributed Synchrophasors*

14. Invited talk at the 8th Annual Carnegie Mellon Conference on the Electricity Industry, March 2012

Organizer: Marija Ilic

Talk title - *Distributed Algorithms for PMU Data Processing*

13. Iowa State University, Ames, IA, Feb. 2012,

Organizer: Dionysios Aliprantis

Talk Title - *PMU Placement in Power System Networks Under Line Observability Constraints.*

12. IEEE Smart Grid Vision Meeting, Nov. 2011,

Organizer: Anuradha Annaswamy, Tariq Samad, Massoud Amin

11. Workshop on “The Science and Technology of Smart Grids in Russia and in the World,” Moscow, Russia, Nov. 2011,

Organizer: Konstantin Turitsyn, Skolkovo Foundation

Talk Title - *Next-Generation Monitoring and Control of Smart Grids Using Wide-Area Phasor Measurements*

10. University of Florida, Gainesville, FL

Organizer: Pramod Khargonekar, Nov. 2011,

Talk Title - *Control and Optimization for Electric Smart Grids*

9. SAMSI Smart Grid Workshop, Durham, NC, Oct. 2011,

Organizer: George Michailidis

Talk Title - *Wide-Area Control of Power Systems Using Synchrophasors: A Model Reference Approach*

8. TCIPG (Trustworthy Cyber Infrastructure for the Power Grid) Seminar, University of Illinois, Urbana-Champaign, IL, Oct. 2011,
Organizer: Rakesh Bobba
Talk Title - *Wide-Area Modeling, Monitoring and Control of Large Power Systems Using Phasor Measurement Technology*
7. Renaissance Computing Institute (RENCI), UNC Chapel Hill, July. 2011,
Organizer: Yufeng Xin
Talk Title - *Synchrophasor Research at NC State University*
6. 24th UM/Maine Section IEEE Haskell Smart Grid Conference, University of Maine, ME, Jun. 2011, *Organizer:* Mohamad Musavi
Talk title - *Wide-Area Modeling of Wind-Integrated Power Systems Using Phasor Measurement Technology*
5. SIAM Conference on Dynamical Systems, Minisymposium on Smart Grids, UT, May 2011,
Organizer: Konstantin Turitsyn (MIT)
Talk title - *Wide-Area Damping Control of Large Power Systems Using Distributed Synchrophasors: An Optimization Approach*
4. Royal Institute of Technology (KTH), Sweden, May 2011, *Organizer:* Luigi Vanfretti
Talk title - *Optimal Sensor Placement for Parametric Model Identification of Electrical Networks Using Mixed Phasor Measurements*
3. Lund University, Sweden, Workshop on Dynamics, Control and Pricing in Power Systems, May 2011, *Organizer:* Anders Rantzer
Talk title - *Model Reduction, Topology Identification and Distributed Control of Large Power Systems using Wide-Area Phasor Measurements*
2. Los Alamos National Laboratory, NM, Smart Grid Seminar Series, Jan 2011
Organizer: Michael (Misha) Chertkov
Talk title - *A Network-Theoretic Approach for Wide-area Modeling and Control of Large Power Systems using Distributed Synchrophasors*
1. Statistical and Applied Mathematical Sciences Institute (SAMSI), Durham, NC, Oct. 2010
Organizer: Taufiqar Khan
Talk Title - *Wide-area Modeling and Control of Large Power Systems using Distributed Synchrophasors*

Before 2010:

NC State University, University of Tennessee, Texas Tech University, Texas A&M University, Pacific Northwest National Laboratory, University of Washington, American Electric Power.

PUBLICITY AND
MEDIA

Science Daily, Smart Transformers, 2017
<https://www.sciencedaily.com/releases/2017/07/170705113105.htm>

NSF Discoveries, Smarter Smart Grids, 2015
http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=134487&WT.mc_id=USNSF_1

CSO Online, 2014
<http://www.csoonline.com/article/2307167/disaster-recovery/university-researchers-test-cyber-defense-for-nations-power-grid.html>

National Geographic, 2014
<http://energyblog.nationalgeographic.com/2014/01/02/wind-energy-needs-controls-to-minimize-instability-risk-on-the-grid-study-says/>

Triangle Business Journal, 2014
<http://www.bizjournals.com/triangle/news/2014/01/02/ncsu-and-johns-hopkins-team-up-to.html>

Triangle Business Journal, 2013
<http://www.bizjournals.com/triangle/news/2013/05/09/nc-state-bags-200k-grant-to-study.html>

Five to Watch, 2012
NC State Engineering Magazine, Fall 2012
<http://www.engr.ncsu.edu/magazine/fall2012/stars-p3.php>

A Hub for Smart Grid Research
<http://asiancorrespondent.com/72074/wms-smart-grid>

‘Handling Data Explosion in Future Power Systems’
IEEE Smart Grid Newsletter, Sep. 2011
<http://smartgrid.ieee.org/publications/smart-grid-newsletter>

‘Power Up! Checking the Grid’, Sep. 2011,
American Institute of Physics, Discoveries & Breakthroughs Inside Science
<http://www.aip.org/dbis/report8.html>

Sciencedaily - “New Approach to Modeling Power System Aims for Better Monitoring and Control of Blackouts,” Jan. 2011
<http://www.sciencedaily.com/releases/2011/01/110112110434.htm>

Arbiter Systems Newsletter, Jan. 2011
<http://www.arbiter.com/news/technology.php?id=13>

SYNERGISTIC
ACTIVITIES &
SERVICE

Associate Editor,
IEEE Transactions on Control Systems Technology, 2016-present

Associate Editor,
IEEE Control Systems Society (CSS) Conference Editorial Board, 2012-present

Conference Operating Committees:

1. Vice-Chair for Invited Sessions,
American Control Conference (ACC), Philadelphia, July 2019
2. Vice-Chair for Industry and Applications,
American Control Conference (ACC), Boston, July 2016
3. TPC Chair for the workshop “Communication Applications for Smart Grid”
7th International Conference on Wireless and Satellite Systems (WiSats 2015)
Hosted at University of Bradford, United Kingdom, July 2015.
4. Program Co-Chair,
2nd Virtual Control Conference (VCC) on Smart Power Systems, June 2013
Organizer: Jakob Stroustrup, Aalborg University
Program Chair: Anuradha Annaswamy, MIT

Technical Program Committee:

1. International Conference on Cyber-Physical Systems (ICCPS, CPS Week), 2013, 2016, 2017, 2018.
2. IEEE GlobalSIP 2015, 2016
3. IEEE Workshop on Smart Cities (Pre-cursor to CDC 2015), Osaka, Japan, 2015.
4. Indian Control Conference, 2016
5. IEEE GlobalSIP 2013
6. IEEE Smart Grid Comm, 2011, 2012, 2013
7. American Control Conference, 2013, 2015
8. IEEE Infocom, Workshop on Smart Energy Systems, 2013, 2014.

9. Workshop on Cyber-Physical Systems, Euromicro Conference on Digital System Design (DSD), 2013, 2014, 2015, 2016

Workshop Organization:

1. Mini-Course, *Composite Control of Networks Via Singular Perturbation Theory: New Results And Applications*,
22nd International Symposium on Mathematical Theory of Networks and Systems (MTNS 2016),
University Of Minnesota, MN, July 2016
Organizers - Muataz Boker, Tom Nudell, and Aranya Chakrabortty
2. Mini-course, *Role of Graph Theory in Power System Modeling, Monitoring and Control*,
21st International Symposium on Mathematical Theory of Networks and Systems (MTNS 2014),
University of Groningen, Netherlands, July 2014
Organizers - Aranya Chakrabortty, Thomas Nudell
3. *Joint NSF-EPSCRC Workshop on Enabling Technologies for the Smart Grid*, 2012
Loughborough University, UK
Co-Chairs - Sumit Roy, Aranya Chakrabortty
4. *Workshop on Cyber-Physical Applications in Smart Power Systems*, NC State University,
Feb. 2011.
Organizers - Aranya Chakrabortty, Frank Mueller

Conference Session Organization:

1. *Control of Infrastructure CPS* - Tutorial session in American Control Conference, Boston, MA 2016.
Organizers - Anu Annaswamy, Aranya Chakrabortty, and Alefiya Hussain
2. *Control Challenges for Smart Grids* - Tutorial session in American Control Conference, Boston, MA 2016.
Organizers - Anu Annaswamy, Jakob Stroustrup, Aranya Chakrabortty
3. *Wide-Area Monitoring and Control of Power Systems* - Tutorial session in American Control Conference, Washington DC, 2013.
Organizers - Aranya Chakrabortty and Pramod Khargonekar
4. *Symposium on Wide-Area, Monitoring, Protection and Control (WAMPAC)*,
IEEE Smart Grid Comm, Taiwan, 2012
Chairs - Dave Bakken, Aranya Chakrabortty and Jiann-Fuh Chen
5. *Applications of Control Theory in Modern Power Systems - A Tutorial Dedicated to Dr. Joe Chow's 60th Birthday* - Tutorial session in American Control Conference, San Francisco, CA, 2011.
Organizers - Aranya Chakrabortty, Massoud Amin
6. *Emerging Applications of Control Theory in Electric Smart Grids* - Invited session in 49th IEEE Conference on Decision & Control, Atlanta, GA, 2010.
Organizers - Aranya Chakrabortty, Joe H. Chow.
7. *Dynamic Models of Complex Network Systems* - Invited session in 49th IEEE Conference on Decision & Control, Atlanta, GA, 2010.
Organizers - Clyde F. Martin, Aranya Chakrabortty, Bijoy K. Ghosh.
8. 2009-present Serving as the Chair/Co-chair for various regular sessions in the American Control Conference and IEEE Conference on Decision and Control

Leadership in Research Demonstrations:

1. US Ignite Application Summit and Smart City Challenge 2017, Austin, TX
 - Collaborated with RENCi to demonstrate testbed experiments on the application of cloud computing in wide-area control of power systems
2. US Ignite Application Summit and Smart City Challenge 2016, Austin, TX

- Lead faculty from NC State
 - Collaborated with RENCI to demonstrate testbed experiments on the application of advanced computing techniques for wide-area control of power systems
3. US Ignite Application Summit 2015 , Washington, DC
 - Lead faculty from NC State
 - Collaborated with RENCI to demonstrate testbed experiments on the application of advanced computing techniques for power system monitoring and control
 4. US Ignite Application Summit 2014, Sunnyvale, CA
 - Lead faculty from NC State
 - Collaborated with UNC Chapel Hill to demonstrate testbed experiments on the application of cloud computing in power system monitoring and control
 - Won *Best Application in Energy Award 2014*
 5. Smart America Initiative 2014, Washington, DC
 - Lead faculty from NC State
 - Collaborated with University of Southern California, Iowa State University, Mitre Corporation, National Instruments and Scitor Corporation to demonstrate testbed experiments on cyber-security of power systems
 6. US Ignite Application Summit 2013, Chicago, IL
 - Lead faculty from NC State
 - Collaborated with UNC Chapel Hill and CISCO to demonstrate testbed experiments on the application of software defined networking for power system monitoring
 - Won *Best Application in Energy Award 2013*

Reviewing Activities:

2010-present, Panel Reviewer for National Science Foundation (NSF) in ENG and CISE divisions

Panel Reviewer for MIT-Skoltech Research Initiative.

Reviewer of Book Proposals for Springer, 2012, and Cambridge University Press, 2016.

2004- present, Reviewer for *IEEE Transactions on Automatic Control*, *IEEE Transactions on Power Systems*, *IEEE Transactions on Smart Grid*, *Automatica*, *IEEE Transactions on Control Systems Technology*, *IEEE Transactions on Control and Network Systems*, *IEEE Transactions on Circuits and Systems*, *IEEE Transactions on Distributed and Parallel Systems*, *International Journal of Robust Control*, *SIAM Journal on Control and Optimization*, *Journal of Process Control*, *IFAC Journal of Control Engineering Practice*, *International Journal of Hydrogen Energy*, *Mathematical Problems in Engineering*, *International Journal of Adaptive Control and Signal Processing*, *IEEE Conference on Decision and Control*, *American Control Conference*, *AIAA Conference on Guidance, Navigation and Control*, *IEEE PES General Meeting*, *Power System Computation Conference*.

Other:

2012-2016, Representative for Controls, Robotics and Mechatronics (CRM) group, Graduate Admissions Committee, ECE Department, NC State University

Committee member for IEEE Control Systems Society (CSS) Smart Grid Vision, *Organizer:* Anuradha Annaswamy, Tariq Samad, Massoud Amin

Committee member for IEEE Computer Systems Society (CS) Smart Grid Vision, *Organizer:* David Cartes, Dan McCaugherty

2010-2011, Technical Co-ordinator, FREEDM Systems Center, NC State University.

2009-present, Member of Research Initiative Task Team (RITT), North American Synchronphator Initiative (NASPI).

Attendee of *ONR-EPRI-NSF-AEP sponsored Weeklong Summer Workshop on Electric Energy Systems Course Education*, Corvallis, OR, July 2009.

Active Member of the *Power System Research Consortium* (Rensselaer, Virginia Tech, University of Wyoming), 2006-2008.

2015 - present, Senior Member, IEEE

2008-2014, Member, and 2005-2008, Student Member of IEEE, IEEE Control Systems Society (CSS) and IEEE Power and Energy Society (PES).