

RAJASEKHAR ANGULURI

Postdoctoral Researcher

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Google Scholar

EDUCATION

- Sep 14- Dec 19 **Ph.D. in Mechanical Engineering**, University of California Riverside, USA
Dissertation: Security of Interconnected Stochastic Dynamical Systems
Advisor: Prof. Fabio Pasqualetti
- Jul 17- Jul 19 **M.S. in Statistics**, University of California Riverside, USA
Coursework: *Probability and Statistical Theory, Statistical Data Mining, Statistical Computing, Analysis and Design of Experiments, Stochastic Process, and Bayesian Analysis*
- Aug 08- Mar 12 **B.Tech. in Electrical Engineering**, National Institute of Technology Warangal, India
Thesis: Design of Damping Controllers for Regulating Stability in Energy Systems

ACADEMIC APPOINTMENTS

- Jun 20- present **Postdoctoral Researcher**, Arizona State University, USA
Supervisors: Prof. Lalitha Sankar, Prof. Oliver Kosut, and Prof. Gautam Dasarathy

RESEARCH MOTTO

My research identifies situations where **learning**, **control**, and **security** problems in engineered network systems (e.g., autonomous, energy, manufacturing, and cyber-physical systems) can be solved using data science, signal processing, and statistical machine learning algorithms with theoretical guarantees.

Areas of Expertise: estimation & control, optimization, data science, statistical learning, cyber-physical sys.

Google Scholar Citations: *total citations: 850; h-index: 15; i10-index: 17*

HIGHLIGHTS

- **2022-2023 Mistletoe Research Fellowship award** (unfettered research grant of \$10000)
- Served as a **co-principal investigator** on a recently funded grant proposal by the EPCN program in NSF.
- **Best student paper finalist** at the 2011 IEEE Conf. on Systems, Man, and Cybernetics, Anchorage, AK.
- **Instructor on record** for an undergraduate/graduate on-line course on statistical inference at University at Buffalo; and lab instructor for a project-based design course at the University of California, Riverside.
- Mentored five graduate and two undergraduate students with diverse cultural and educational backgrounds at ASU, including one student from the summer research initiative (SURI) program.

HONORS & AWARDS

- 2022 **Mistletoe Research Fellowship award:** The Momental Foundation, Redwood, CA, USA.
- 2022 **Registration Support:** PSERC Transformation Summer School, Arizona, USA.
- 2022 **Registration Support:** NSF-sponsored US-European Workshop, Split, Croatia (virtual).
- 2018 **Travel Award:** Asia Signal Processing Society-Annual Summit Conf., Honolulu, HI, USA.
- 2018 **Travel Award:** Random Matrices and Free Probability Workshop, UCLA, CA, USA.
- 2016 **Travel Award:** IEEE American Control Conference, Boston, MA, USA.
- 2016 **Travel Award:** IEEE Conference on Decision and Control, Las Vegas, NV, USA.
- 2014 **Graduate Studies Fellowship:** Dean's Distinguished Fellowship, UC Riverside, CA, USA.
- 2011 **Best Student Paper Finalist:** Systems Man and Cybern., Anchorage, AK, USA.
- 2010-12 **Gold Medal** for research excellence as an undergraduate student, NIT Warangal, India.
- 2010 **Best (second) Paper** at M.V. Chauhan Student Paper Contest, IEEE India Council.

RESEARCH GRANTS

- 2022 Exploiting Physical and Dynamical Structures for Real-time Inference in Power Systems (**Funded**)
Funding Agency: National Science Foundation (NSF)
PI: Lalitha Sankar, co-PI: Oliver Kosut and **Rajasekhar Anguluri**
- 2022 Structured Learning for Aggregate Estimation and Hierarchical Control of Grid Edge Resources (**Not Funded**)*
Funding Agency: Power Systems Engineering Research Center (PSERC)
PI: Lalitha Sankar, co-PIs: Oliver Kosut, Lang Tong, and Anamika Dubey
- 2022 Cybersecurity Technology for Critical Power Infrastructure: AI-Based Centralized Defense and Edge Resilience (**Funded**)*
Funding Agency: U.S. DOE-Israel Energy Center
PI: Yang Weng, co-PIs: Lalitha Sankar, Rami Puzis et.al.
- 2021 High-Dimensional Spatio-Temporal Data Science for a Resilient Power Grid: Towards Real-Time Integration of Synchrophasor Data (Phase-II) (**Not funded**)*
Funding Agency: National Science Foundation (NSF)
PI: Lalitha Sankar, co-PIs: Oliver Kosut, Anamitra Pal, Gautam Dasarathy et.al.

Note: * indicates that I supported to the writing and many technical ideas, but I am not a PI or co-PI.

PUBLICATIONS

Journals and Journal-Style Computer Science Articles

- [J1] A.C. Varghese, **R. Anguluri**, L. Sankar, and A. Pal, “Simultaneous Instrument Transformers Calibration and Line Parameter Estimation via Constrained Non-linear Least Squares,” *IEEE Transactions on Power Delivery*, 2023 (**in preparation**).
- [J2] J. Mathais, **R. Anguluri**, O. Kosut, and L. Sankar, “A Model Predictive Singular Optimal Control approach for Dispatching Distributed Energy Resources,” *IEEE Control Systems Letters*, 2023 (**submitted**).
- [J3] A. Rayas, J. Cheng, **R. Anguluri**, and G. Dasarathy, “Learning Networked Systems that Obey Conservation Laws from Stationary Processes,” *Neural Information Processing Systems (NeurIPS)*, 2023 (**submitted**).
- [J4] A. Zhahin, **R. Anguluri**, and G. Dasarathy, “Robust Model Selection of Non Tree-Structured Gaussian Graphical Models,” *Journal of Machine Learning Research*, 2023 (**submitted**, [arXiv:2211.05690](https://arxiv.org/abs/2211.05690)).
- [J5] N. Ghoroghchian, **R. Anguluri**, G. Dasarathy, and S. Draper, “Controllability of coarsely characterized linear network dynamics,” *International Journal of Adaptive Control and Signal Processing*, 2023 (**submitted**, [arXiv:2206.10569](https://arxiv.org/abs/2206.10569)).
- [J6] **R. Anguluri**, L. Sankar, and O. Kosut, “Localization and estimation of forced inputs: A group LASSO approach,” *IEEE Transactions on Control of Network Systems*, 2023 (**in press**, [arXiv:2201.07907](https://arxiv.org/abs/2201.07907)).
- [J7] A. Rayas, **R. Anguluri**, and G. Dasarathy, “Learning the structure of large networked systems obeying conservation,” *Neural Information Processing Systems (NeurIPS)*, vol. 35, pp. 14637–14650, 2022.
- [J8] **R. Anguluri**, G. Dasarathy, O. Kosut and L. Sankar, “Grid topology identification with hidden nodes via structured norm minimization,” *IEEE Control Systems Letters*, vol. 6, pp. 1244-1249, 2022.
- [J9] **R. Anguluri**, V. Katewa, S. Roy, and F. Pasqualetti, “Network theoretic analysis of maximum a posteriori detectors for optimal input detection,” *Automatica*, Elsevier, vol. 141, pp. 110227, 2022.
- [J10] V. Katewa, **R. Anguluri**, and F. Pasqualetti, “On a security vs privacy trade-off in interconnected dynamical systems,” *Automatica*, Elsevier, vol. 125, pp. 109426, 2021.
- [J11] **R. Anguluri**, V. Katewa, and F. Pasqualetti, “Centralized vs decentralized detection of attacks in stochastic interconnected systems,” *IEEE Transactions on Automatic Control*, vol. 65, no. 9, pp. 3903-3910, 2020.
- [J12] B. Zheng, P. Deng, **R. Anguluri**, Q. Zhu, and F. Pasqualetti, “Cross-layer codesign for secure CPS,” *IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems*, vol. 5, pp. 699-711, 2016.
- [J13] **R. Anguluri**, N. Lynn, S. Das and PN. Suganthan, “Computing with the collective intelligence of honey bees – a survey,” *Swarm and Evolutionary Computation*, Elsevier, vol. 32, pp. 25-48, 2017.
- [J14] **R. Anguluri**, R.K. Jatoth and A. Abraham, “Design of intelligent PID/PI^λD^μ speed controller for chopper fed DC motor drive using ABC algorithm,” *Engg. Applications of A.I.*, Elsevier, vol. 29, pp. 13-32, 2014.

- [J15] **R. Anguluri**, A. Abraham and M. Pant, “A hybrid differential artificial bee colony algorithm based tuning of fractional order controller for permanent magnet synchronous motor drive,” *International Journal of Machine Learning and Cybernetics*, Springer, vol. 5, pp. 327-337, 2014.

Peer-reviewed Conference Articles

- [C1] G. Bianchin and **R. Anguluri**, “Data-Driven Controllability Tests For Second-Order Models,” *American Control Conference*, 2024 (**in preparation**).
- [C2] **R. Anguluri**, M. Malu, J. Cheng, and G. Dasarathy, “Learning Toeplitz Networks that obey Conservation Laws,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, COEX, Seoul, Korea, 2024 (**submitted**).
- [C3] **R. Anguluri**, N. Taghipourbazargani, O. Kosut and L. Sankar, “Source Localization in Linear Dynamical Systems using Subspace Model Identification,” *7th IEEE Conference on Control Technology and Applications (CCTA)*, Bridgetown, Barbados 2023 (**accepted**).
- [C4] A. Rayas, **R. Anguluri**, J. Cheng, and G. Dasarathy, “Differential analysis for networks obeying conservation Laws,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Rhode Island, Greece, 2023, pp. 1-5.
- [C5] **R. Anguluri**, L. Sankar, and O. Kosut, “Parameter estimation in ill-conditioned low-inertia power systems,” *IEEE North American Power Symposium (NAPS)*, Salt Lake City, 2022.
- [C6] **R. Anguluri**, N. Taghipourbazargani, O. Kosut and L. Sankar, “A complex-LASSO for localizing forced oscillations in power systems,” *IEEE Power & Energy Society General Meeting*, Denver, pp. 01-05, 2022.
- [C7] **R. Anguluri** and F. Pasqualetti, “Deflection-based Attack Detection for Network Systems,” *IEEE American Control Conference*, New Orleans, pp. 3254-3259, 2021 (**invited paper**).
- [C8] **R. Anguluri**, A. A. A. Makdah, V. Katewa and F. Pasqualetti, “On the robustness of data-driven controllers for linear systems,” *Learning for Dynamics and Control (L4DC)*, PMLR 120:404-412, 2020.
- [C9] **R. Anguluri**, V. Katewa, and F. Pasqualetti, “A probabilistic approach to design switching attacks against interconnected systems,” *IEEE American Control Conference (ACC)*, Philadelphia, pp. 4430-4435, 2019.
- [C10] **R. Anguluri**, V. Katewa, and F. Pasqualetti, “Attack detection in interconnected systems: centralized vs decentralized detectors,” *IEEE Conference on Decision and Control (CDC)*, Miami, pp. 4541-4546, 2018.
- [C11] **R. Anguluri**, V. Katewa, and F. Pasqualetti, “On the role of information sharing in the security of interconnected systems,” *IEEE Asia Pacific Signal and Information Processing Association (APSIPA)*, Honolulu, pp. 1168-1173, 2018.
- [C12] V. Katewa, **R. Anguluri**, A. Ganlath, and F. Pasqualetti, “Secure reference-tracking with resource-constrained UAV,” *IEEE Conference on Control Technology and Applications*, HI, pp. 1319-1325, 2017.
- [C13] **R. Anguluri**, R. Dhal, S. Roy, and F. Pasqualetti, “Network invariants for optimal input detection,” *IEEE American Control Conference (ACC)*, Boston, MA, pp. 3776-3781, 2016.
- [C14] **R. Anguluri**, V. Gupta, and F. Pasqualetti, “Periodic coordinated attacks against cyber-physical systems: detectability and performance bounds,” *Conference on Decision and Control*, NV, pp. 5079-5084, 2016.
- [C15] **R. Anguluri**, M. Pant, and A. Abraham, “Differential search algorithm based design of fractional order PID controller for hard disk drive read/write system,” *IEEE Conference on Systems, Man, and Cybernetics (SMC)*, Manchester, UK, pp. 2019-2025, 2013.
- [C16] B.S. Theja, **R. Anguluri**, and A. Abraham, “An optimal design of coordinate PI based PSS with TCSC controller using modified teaching learning based optimization,” *World Congress on Nature and biologically Inspired Computing*, Fargo, pp. 99-106, 2013.
- [C17] B.S. Theja, **R. Anguluri**, and D.P. Kothari, “An intelligent coordinate design of UPFC based power system stabilizer for dynamic stability enhancement of SMIB power system,” *IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES)*, Bengaluru, India, pp. 1-6, 2012.
- [C18] **R. Anguluri**, A. Abraham and M. Pant, “Levy mutated ABC algorithm for global optimization,” *IEEE Conference on Systems Man and Cybernetics (SMC)*, Anchorage, pp. 655-662, 2011 (**BEST STUDENT PAPER FINALIST**).

STUDENT MENTORING EXPERIENCE

Theory:

- 2022 Jiajun Cheng, Undergraduate student, Arizona State University, USA (summer program)
Project: Differential analysis for networks obeying conservation laws
- 2022 Anirudh Rayas, Graduate student, Arizona State University, USA
Project: Structure learning in large networked systems obeying conservation laws
- 2022 Vineet Sunil Gattani, Graduate student, Arizona State University, USA
Project: On non-stochastic sparse control problems
- 2021 Nafiseh Ghoroghchian, Graduate student, University of Toronto, Canada
Project: Coarse controllability in brain networks
- 2021 Abrar Zahin, Graduate student, Arizona State University, USA
Project: Structure learning in robust graphical models

Applications:

- 2022 Obai Bahwal, Graduate student, Arizona State University, USA
Project: Robust machine-learning detectors for event mimicking attacks in power systems
- 2021 Nima Taghipourbazargani, Graduate student, Arizona State University, USA
Project: Model-based machine learning for event identification in power systems

TEACHING EXPERIENCE

Guest Lecturer at Arizona State University:

- Fall 2022 EE 350 – Random Signal Analysis (**undergraduate** class)

Instructor on record at University at Buffalo:

- Spring 2020 MTH 512 – Introduction to Statistical Inference (**graduate/undergraduate** class)

Teaching Assistant at University of California Riverside:

- Summer 19 STAT 100A – Introduction to Statistics (undergraduate class)
- Summer 19 ME 120 – Introduction to Linear Systems (undergraduate class)
- Winter 18 ME 133 – Mechatronics (undergraduate class; lab instructor)
- Winter 19 ME 133 – Mechatronics (undergraduate class; lab instructor)
- Spring 16 ME 223 – Secure and Reliable Control Systems (**graduate** class)

SELECTED TALKS

- Sept 2023 Indian Institute of Technology, Bombay.
Title: *“Riccati Equations in Sparse Gaussian Graphical Models”*
- Aug 2023 2023, IEEE Conference on Control Technology and Applications, Bridgetown, Barbados
Title: *“Source Localization using Subspace Identification”*
- May 2023 Indian Institute of Technology, Bombay.
Title: *“Data Science 2.0 for Complex Engineered Systems”*
- April 2023 Indian Institute of Technology, Gandhinagar.
Title: *“Data Science 2.0 for Complex Engineered Systems”*
- April 2023 University of Maryland, Baltimore County, MD, USA (academic job talk)
Title: *“Data Science 2.0 for Renewable Energy Systems”*
- October 2022 2022 IEEE North American Power Symposium, Salt Lake, UT, USA
Title: *“Parameter Estimation in Ill-conditioned Low-inertia Power Systems”*
- July 2022 2022 IEEE PES General Meeting, Denver, CO, USA
Title: *“A Complex-LASSO Approach for Localizing Forced Oscillations in Power Systems”*
- May 2022 NSF-Sponsored Joint US-European Workshop 2022, Split, Croatia (online)
Title: *“Grid at the Edge: Towards the zero-carbon Power Grid with Improved Visibility”*

- Dec 2021 2021 IEEE Control Control Conference, Austin, TX, USA (online)
Title: *“Grid Topology Identification with Hidden Nodes”*
- May 2021 2021 IEEE American Control Conference, Philadelphia, PA, USA (online)
Title: *“Deflection based Attack Detectors”*
- Apr 2021 22020 LIONS Seminar, Arizona State University, Tempe, USA (online)
Title: *“Network Analysis of MAP Detectors for Sensor Design”*
- Feb 2020 2020 Applied Mathematics Seminar, UB-SUNY, NY, USA
Title: *“Network Analysis of MAP Detectors for Sensor Design”*
- Jul 2019 2019 IEEE American Control Conference, Philadelphia, PA, USA
Title: *“Design of Stochastic Switching Attacks against Interconnected Systems”*
- Dec 2018 2018 IEEE Conference on Decision and Control, Miami, FL, USA
Title: *“Centralized vs Decentralized Attack Detection Schemes in Interconnected Systems”*
- Nov 2018 2018 APSIPA Annual Summit Conference, Honolulu, HI, USA
Title: *“Role of Information Sharing in the Security of Interconnected Systems”*
- May 2018 35th Southern California Workshop, University of California, Riverside, USA
Title: *“Local vs Centralized Security of Cyber Physical Systems”*
- Dec 2016 2016 IEEE Conference on Decision and Control, Las Vegas, NV, USA
Title: *“Periodic Attacks on Cyber Physical Systems”*

CONFERENCES, WORKSHOPS, AND SUMMER SCHOOLS PARTICIPATION

- Jan 2024 Joint Mathematical Meetings, American Mathematical Society, SF, USA
- Jan 2023 Grid Science Winter School and Conference, Los Alamos National Laboratory
- Jul 2022 Advanced Training: PSERC Transformative Summer School, Arizona State University
- May 2018 35th Southern California Control Workshop, UC Riverside
- Apr 2017 29th Southern California Control Workshop, Caltech
- May 2019 27th Southern California Control Workshop, University of Southern California
- Nov 2017 Random Matrices: Theory and Applications, UC Riverside, USA

PROFESSIONAL AFFILIATIONS

- 2015 - Present Institute for Electrical and Electronics Engineers (IEEE) • IEEE Control Systems Society
• IEEE Power Engineering Society
- 2023 - Present American Mathematical Society (AMS)
- 2023 - Present International Linear Algebra Society (ILAS)

PROFESSIONAL SERVICE

Conference participation:

- 2022 Session Chair, North American Power Systems Symposium (NAPS), USA
- 2020 Volunteer, IEEE Conference on SmartGridComm, Arizona State University, USA
- 2020 Logistics Chair, Third Northeast Regional Conf. on Complex Systems, Buffalo, NY, USA
- 2016 Volunteer, IEEE Conference on Decision and Control, Las Vegas, NV, USA
- 2011 Volunteer, IEEE Conference on Systems, Man and Cybernetics, Anchorage, AK, USA

Outreach:

- 2017 Taught high-school math to Nivedita Kanrar, K12-student, Riverside STEM Academy, USA. **Current status:** B.S. in Caltech and Ph.D. in Princeton (yet to start)

Reviewer:

Journals: IEEE Transactions on Automatic Control • IEEE Transactions on Control of Network Systems • IEEE Transactions on Signal and Information Processing over Networks • IEEE Transactions on Power Systems • IEEE Transactions on Network Science and Engineering • IEEE Control Systems Letters • IEEE Open Journal of Control Systems • Elsevier (Automatica, Information Sciences, and Systems & Control Letters)

Conferences: IEEE Conference on Decision and Control • American Control Conference • Indian Control Conference • Neural Information Processing Systems (NeurIPS) • Artificial Intelligence and Statistics (AISTATS) • AAAI • IEEE Power Systems General Meeting • IFAC Symposium on Large Scale Complex Systems • IEEE/RSJ International Conference on Intelligent Robots and Systems • IEEE Modeling, Estimation and Control Conference