Rajasekhar Anguluri

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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., manufacturing, power, transportation, and autonomous networks; and healthcare) can be solved using data science, signal processing, and statistical machine learning algorithms with theoretical guarantees.

Areas of Expertise: control theory, dynamics, data science, and statistical machine learning

Google Scholar Citations: *total citations: 700+*; *h-index: 14*; *i10-index*: 17

Highlights

- Won the prestigious **2022-2023 Mistletoe Research Fellowship award** (32 selected among 420 participants) and received an unfettered research grant of $10000.
- Served as a **co-principal investigator** on a recent grant proposal submitted to 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 undergraduate/graduate on-line course on statistical inference at University at Buffalo; 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.

Publications

Journals and Journal-Style Computer Science Articles

[J1] A. Zhahin, **R. Anguluri**, and G. Dasarathy, "Robust Model Selection of Non Tree-Structured Gaussian Graphical Models,"*Artificial Intelligence and Statistics (AISTATS)*, 2023 (**submitted**).

[J2] N. Ghoroghchian, **R. Anguluri**, G. Dasarathy, and S. Draper, "Controllability of coarsely characterized linear network dynamics,"*IEEE Transactions on Automatic Control*, 2022 (**submitted**).

[J3] A. Rayas, **R. Anguluri**, and G. Dasarathy, "Learning the structure of large networked systems obeying conservation,"*Neural Information Processing Systems (NeuRIPS)*, 2022 (**accepted**, arXiv: 2206.07083).

[J4] **R. Anguluri**, L. Sankar, and O. Kosut, "Localization and estimation of forced inputs: A group LASSO approach,"*IEEE Transactions on Control of Network Systems*, 2022 (**accepted**, arXiv:2201.07907).

[J5] **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.

[J6] **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.

[J7] 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.

[J8] **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.

[J9] 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.

[J10] **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.

[J11] **R. Anguluri**, R.K. Jatoth and A. Abraham, "Design of intelligent PID/PI$^{\lambda}$D$^{\mu}$ speed controller for chopper fed DC motor drive using ABC algorithm,"*Engg. Applications of A.I.*, Elsevier, vol. 29, pp. 13-32, 2014.

[J12] **R. Anguluri**, A. Abraham and M. Pant, "A hybrid differential artificial bee colony algorithm based tuning of fractional order controller for permananent magnet synchronous motor drive,"*International Journal of Machine Learning and Cybernetics*, Springer, vol. 5, pp. 327-337, 2014.

Peer-reviewed Conference Articles

[C1] 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 (**submitted**).

[C2] **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.

[C3] **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.

[C4] **R. Anguluri** and F. Pasqualetti, "Deflection-based Attack Detection for Network Systems,"*IEEE American Control Conference*, New Orleans, pp. 3254-3259, 2021 (**invited paper**).

[C5] **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.

[C6] **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.

[C7] **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.

[C8] **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.

[C9] 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.

[C10] **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.

[C11] **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.

[C12] **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)*, Machester, UK, pp. 2019-2025, 2013.

[C13] 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 Natue and biologically Inspired Computing*, Fargo, pp. 99-106, 2013.

[C14] B.S. Theja, **R. Anguluri**, and D.P. Kothari, "An intelligent coordinate design of UPFC based power system stabilizer for dynamic stability enhacement of SMIB power system,"*IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES)*, Bengaluru, India, pp. 1-6, 2012.

[C15] **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**).

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.

Proposal Writing Experience

2022 Exploiting Physical and Dynamical Structures for Real-time Inference in Power Systems (**Submitted**)
Funding Agency: National Science Foundation (NSF)
PI: Lalitha Sankar, co-PI: Oliver Kosut and **Rajasekhar Anguluri**

Note: I contributed to the writing and several ideas in the following proposals:

2022 Structured Learning for Aggregate Estimation and Hierarchical Control of Grid Edge Resources (**Submitted**)
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.

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)
Winter 19	ME 133 – Mechatronics (undergraduate class)
Spring 16	ME 223 – Secure and Reliable Control Systems (**graduate** class)

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	Kinjal Gosh, Graduate student, Arizona State University, USA Project: LASSO-NET for feature selection and classification of events in power systems
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

Talks

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-Europen 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"*

Professional Affiliations

2015 - Present	Institute for Electrical and Electronics Engineers (IEEE)
	IEEE Control Systems Society • IEEE Power Engineering Society

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
2012	Co-organizer, Workshop on Automatic Control using Matlab, NIT-Warangal, India
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; Control of Network Systems; Signal and Information Processing over Networks; Power Systems; 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 • 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 • Neural Information Processing Systems (NeuRIPS) • Artificial Inelligence and Statistics (AISTATS) • AAAI

Conferences, Workshops, and Summer Schools Participation

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	35^{th} Southern California Control Workshop, UC Riverside
Apr 2017	29^{th} Southern California Control Workshop, Caltech
May 2019	27^{th} Southern California Control Workshop, University of Southern California
Nov 2017	Random Matrices: Theory and Applications, UC Riverside, USA
Jul 2015	Games and Contracts for Cyber-Physical Security, Summer School, IPAM, UCLA

References

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