Saurabh Khanna

Contact Information

Dept. of Electronics and Communication Engg.
Indian Institute of Technology Roorkee
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Research Interests

Compressive sensing, structured signal processing, inference and learning using deep generative models, estimation & detection theory, radar signal processing and wireless communication.

Current Position

Indian Institute of Technology Roorkee
Assistant Professor in Dept. of Electronics and Coommunication Engineering (since Sept 2020)

Professional Experiences

National University of Singapore
Research Fellow in Dept. of Electrical and Computer Engineering (July 2018- Aug. 2020)

- Supervisor: Prof. Vincent Y. F. Tan

Texas Instruments India Pvt. Ltd
Design Engineer in Wireless Connectivity Group (July 2007- Apr. 2016)

Education

Indian Institute of Science, Bangalore
PhD in Electrical Communication Engineering (July 2012 - June 2018)

- Thesis topic: "Bayesian Techniques for Joint Sparse Signal Recovery: Theory and Algorithms"
- Advisor: Prof. Chandra R. Murthy
- CGPA = 7.1/8.0

Indian Institute of Technology, Kanpur
B.Tech in Electrical Engineering (2003 - 2007)

- CGPA = 8.7/10.0

Journal Publications

S. Khanna and C. R. Murthy, "Sparse Recovery From Multiple Measurement Vectors Using Exponentiated Gradient Updates," in IEEE Signal Processing Letters, vol. 25, no. 10, pp. 1485-1489, Oct. 2018.

S. Khanna and C. R. Murthy, "On the Restricted Isometry of Column-wise Khatri-Rao Product", IEEE Transactions on Signal Processing, vol. 66, no. 5, pp. 1170-1183, Dec. 2017.

S. Khanna and C. R. Murthy, "Communication Efficient Decentralized Sparse Bayesian Learning of Joint Sparse Signals", IEEE Transactions on Signal and Information Processing over Networks, vol. 3, no. 3, pp. 617–630, Nov. 2016.

S. Khanna and C. R. Murthy, "Decentralized Joint-Sparse Signal Recovery: A Sparse Bayesian Learning Approach", IEEE Transactions on Signal and Information Processing over Networks, vol. 3, no. 1, pp. 29–45, Sept. 2016.

Preprints/ Under Review

S. Khanna and C. R. Murthy, "On the Support Recovery of Jointly Sparse Gaussian Sources using Sparse Bayesian Learning", submitted to IEEE Transactions on Information Theory (available at: https://arxiv.org/abs/1703.04930).

Conference Proceedings

S. Khanna and V. Y. F. Tan, "Economy Statistical Recurrent Units for Inferring Nonlinear Granger Causality", International Conference on Learning Representations (ICLR), 2020, Addis Ababa

S. Khanna and C. R. Murthy, "Rényi Divergence Based Covariance Matching Pursuit of Joint Sparse Support", IEEE 18th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2017, Sapporo, pp. 1-5.

S. Khanna and C. R. Murthy, "Decentralized Bayesian learning of jointly sparse signals", IEEE GLOBECOM Conference, Austin, TX, 2014, pp. 3103-3108.

J. Tangudu, K. Ramasubramanian, K. Subburaj, S. Khanna and S. Chomal, "Techniques to enhance GNSS signal acquisition and tracking sensitivity", International Conference on Indoor Positioning and Indoor Navigation, Montbeliard-Belfort, 2013, pp. 1-10.

H. Snoussi and S. Khanna and D. Hewson and J. Duchene, "Number of Sources Uncertainty in Blind Source Separation", 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Lyon, 2007, pp. 6515-6518.

Industry Articles

S. Khanna and S. Rao. "A robust converted measurements based tracking filter for automotive radars", *TI Tech Journal*, Volume 1, Special Issue, 2015.

S. Rao and S. Khanna. "An angle resolution algorithm for the nano-radar", *TI Tech Journal*, Volume 1, Issue 2, 2015.

Patents

"Switching between transmit and receive modes in a wireless transceiver", Saurabh Khanna, Sarma Gunturi, Vijaya Sarathy B. P., USPTO Publication No. US9484979B2.

"Techniques for angle resolution in radar", Sandeep Rao and Saurabh Khanna, USPTO Publication No. US9759807B2

"Dynamic Programming of Chirps in a Frequency Modulated Continuous Wave (FMCW) Radar System", Chethan Kumar Y. B., Saurabh Khanna and Vijay Rentala, USPTO Publication No. US9853365B2

"Method and Apparatus for GNSS Signal Tracking", Karthik Subburaj, Jawaharlal Tangudu and Saurabh Khanna, USPTO Publication No. US20150097729A1

"Angle Resolution in Radar", Sandeep Rao and Saurabh Khanna, WIPO-PCT WO2015060997A1

Talks & Posters

Poster on "Economy Statistical Recurrent Units for Inferring Nonlinear Granger Causality" in Bombay Information Theory Seminar (BITS), 2020 at IIT Bombay.

Joint tutorial talk with Prof. Chandra R. Murthy on "The surprising effectiveness of hierarchical Bayesian methods for sparse signal recovery" in Workshop on Stochastic Optimization in Networks and Related Topics, 2018 at IIT Bombay.

Invited poster on "Covariance Matching Techniques for Joint Sparse Support Recovery" in JTG Summer School on Signal processing, Communications and Networks, 2017 at IIT Bombay.

Talk on "Covariance Matching Techniques for Joint Sparse Support Recovery" in EECS Research Students Symposium - 2017 at IISc, Bangalore.

Talk on "Covariance Matching Techniques for Sparsity Pattern Recovery from Compressive Measurements" ECE Student Seminar Series, 2017 at IISc, Bangalore.

Industry Experience

Texas Instruments, India

Radio Firmware Engineer — July, 2007 - December 2009

- Developed firmware for control and configuration of RF and PHY layers of mobile-WLAN radios.

- Developed firmware for RF & analog/digital baseband calibrations such as IQMM correction, LO DC offset correction, IF filter tuning, ADC/gain corrections, PLL bandwidth tuning etc.

GNSS Software Engineer — January, 2010 - July, 2012

- Design and implementation of hybrid state machines for simultaneous acquisition and tracking of GPS and GLONASS satellites.
- Implemented GNSS features like hybrid GPS-Glonass satellite search strategies, soft data decoding for GLONASS, high sensitivity tracking using ultra long coherent integration, GPS-GLONASS time synchronization and maintenance etc.
- Design and implementation of high sensitivity satellite tracking algorithms for urban scenarios.

System Software Engineer — May 2013 - April 2016

- Design and implementation of algorithms for direction of arrival estimation and object association in mm-wave FMCW radars.
- Control/configuration and calibration software for RF & analog/digital IF portions of FMCW radar frontend.
- Contributed to DSP library for typical radar signal processing operations.

Professional Activities

Journal reviewing:
IEEE Transactions on Signal Processing, IEEE Transactions on Signal and Information Processing over Networks, IEEE Transactions on Wireless Communications, IEEE Transactions on Communications, IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE JSAC Special Issue on Machine Learning in Wireless Communication, IEEE Signal Processing Letters, IEEE Communication Letters, Signal Processing (Elsevier), Digital Signal Processing (Elsevier), EURASIP Journal on Advances in Signal Processing.

Conference reviewing:
IEEE WCNC (2018), IEEE ICASSP (2016-17), IEEE SPAWC (2014-17, 2019), IEEE GLOBECOM (2015), IEEE International Conference on Signal Processing and Communications (2014, 2016, 2018), IEEE Consumer Communications & Networking Conference (2018).

Computer Skills

MATLAB, C, LaTeX, Python, Pytorch.