Gyanajyoti Routray

Ph.D Research Scholar
Electrical Engineering
IIT, Kanpur
India 208016

✉ groutray@iitk.ac.in
✉ gyanajyotiroutray@gmail.com
☎ +91 9776090990
🌐 http://home.iitk.ac.in/~groutray

EDUCATION

- **Indian Institute of Technology, Kanpur, India** — July 2018 -present
  Ph.D in Electrical Engineering (Continuing) — CPI 8.0/10
  Topic: Spatial Audio
  Advisor: Prof. Rajesh M Hegde

- **Biju Patnaik University of Technology, Rourkela, India** — 2010
  M.Tech in Electronics and Telecommunication Engineering — CPI 8.94/10
  Topic: Genetic Algorithm based Framework for RNN Based MIMO Channel Estimation
  Advisor: Prof. Priyadarshi Kanungo

- **Biju Patnaik University of Technology, Rourkela, India** — 2005
  Bachelor of Technology — Percentage 82%
  First Class with Honours in Electronics and Communication Engineering.

- **Council of Higher Secondary Education, Odisha, India** — 1999
  12th Standard (Science), Government College, Phulbani, Odisha. — Percentage 84.55 %

- **Board of Secondary Education, Odisha, Odisha, India** — 1997
  10th Standard, A.J. O. High School,Phulbani, Odisha. — Percentage 83 %

RESEARCH INTERESTS

General research interests are in the areas of *spherical harmonics* and its application in *spatial audio recording and reproduction*. Current research topics include *Sparsity based methods for spatial sound reproduction in free space and over rigid sphere*, *Upscaling the Ambisonics*, and *Binaural reproduction of HOA signal*.

EXPERIENCE

Teaching Experience

- **Indian Institute of Technology, Kanpur, India**
  Teaching Assistance, July 2016-present

  - EE602 Statistical Signal Processing
  - EE627 Speech Signal Processing

- **C. V. Raman College of Engineering, Bhubaneswar**
  Assistant Professor Feb 2010 - July 2016
  Lecturer Sept 2008 - Feb 2010

  - Signal and System
  - Analog and Digital Communication Techniques
  - Satellite Communication

- **Jagannath Institute of Technology and Management, Paralakhemundi**
  Lecturer Aug 2005 - Nov 2005

  - Digital Signal Processing

Industry Experience

- **Ericsson India Pvt. Ltd.**
  O & M Engineer Dec 2005 - Aug 2008

  - Operation and Maintenance of BTS and BSC
  - Monitoring the GSM Network

PUBLICATIONS

1. Gyanajyoti Routray and Rajesh M. Hegde. " Sparse Framework for NFC-HOA", 54th Asilomar Conference on Signals, Systems, and Computers, California, 2020.

2. Raj Gohil, Aditya Raikar, Gyanajyoti Routray, and Rajesh M. Hegde. "Learning Based DOA Estimation in Adverse Acoustic Environment using Co-prime Circular Microphone Array." In 2020 Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC), pp. 437-442. IEEE, 2020.

3. G. Routray and R. M. Hegde, "Sparse Plane-wave Decomposition for Upscaling Ambisonic Signals," 2020 International Conference on Signal Processing and Communications (SPCOM), Bangalore, India, 2020, pp. 1-5, DOI: 10.1109/SPCOM50965.2020.9179569.

4. A. Srivastava, G. Routray and R. M. Hegde, "Spatial HRTF Interpolation using Spectral Phase Constraints," 2020 International Conference on Signal Processing and Communications (SPCOM), Bangalore, India, 2020, pp. 1-5, DOI: 10.1109/SPCOM50965.2020.9179623.(Selected for Best Student Paper Award)

5. Gyanajyoti Routray, Sourya Basu, Pranay Baldev, Rajesh M. Hegde," Deep-sound field analysis for upscaling ambisonic signals," EAA Spatial Audio Signal Processing Symposium, Sep 2019, Paris, France. pp.1-6. DOI: 10.25836/sasp.2019.14

6. G. Routray and R. M. Hegde, "Sparsity Based Framework for Spatial Sound Reproduction in Spherical Harmonic Domain," 2018 26th European Signal Processing Conference (EUSIPCO), Rome, 2018, pp. 2190-2194, DOI: 10.23919/EUSIPCO.2018.8553209.

7. G. Routray, P. Kanungo, "Genetic Algorithm Based RNN Structure for Rayleigh Fading MIMO Channel Estimation," *Procedia Engineering*, vol. 30, pp. 77-84, 2012,
DOI: https://doi.org/10.1016/j.proeng.2012.01.836.

8. G. Routray, P. Kanungo, "Rayleigh Fading MIMO Channel Prediction Using RNN with Genetic Algorithm," In: Das V.V., Thankachan N. (eds) Computational Intelligence and Information Technology. CIIT 2011. Communications in Computer and Information Science, vol 250. Springer, Berlin, Heidelberg.
DOI: https://doi.org/10.1007/978-3-642-25734-6_4

Journals in Preparation

1. Gyanajyoti Routray and Rajesh M Hegde, "Development of Sparsity Based Methods for Spatial Reproduction of Sound Field in Free Space and Over Rigid Sphere", *to be submitted*

COURSES IN PHD

Introduction to signal analysis
Mathematical methods for signal processing
Speech signal processing
Statistical signal processing
Convex optimization in SP/COM

ACADEMIC PROJECTS

- **Synthesis of Unequally Spaced Array by Genetic Algorithm and Convex Optimization** (Jan-April 2017) *Term paper for Course EE609, Convex Optimization for Signal Processing and Communication.* **Instructor: Ketan Rajawat**. In an unequally spaced antenna array the side lobes become significant. In order to increase the performance the side lobes must be reduced. In this term project a hybrid algorithm was proposed, in which genetic algorithm and convex optimization are combined to optimize the position and weight coefficient of the antenna array. The side lobe beam patter was reduced to -13.86 dB (as per the literature), for certain main lobe width.

- **Spatial Audio with the SoundScape Renderer** (Jan-April 2017) *Term Paper for Course EE627, Speech Signal Processing.* **Instructor: Rajesh M Hegde**. The SoundScape Renderer (SSR) is a versatile tool for realtime spatial audio reproduction, implementing a variety of headphone- and loudspeaker-based methods. Among others this includes Wave Field Synthesis, Higher Order Ambisonics and dynamic binaural synthesis. The SSR is free software licensed under the GNU General Public License. It uses the JACK audio framework and is currently available for Linux and Mac OS X. Interaction with the

program is possible using the built-in graphical user interface and via a network interface. For headphone reproduction native support for a number of head trackers is included. Sound sources including their position and other information are represented in a so-called spatial audio scene. Scenes can be loaded from and saved to XML files. The scene description is independent from the rendering method. For instance, a spatial audio scene can be authored in a studio with headphones, using the binaural renderer. Later on, the scene can be performed in a different venue using loudspeakers, using Wave Field Synthesis.

- **Sensor-Centric Data Reduction for Estimation With WSNs via Censoring and Quantization** (July-Nov 2016) *Term Paper for Course EE602, Statistical Signal Processing.***Instructor: Rajesh M Hegde**. In this project a wireless sensor network (WSN) was considered with a fusion center (FC) deployed to estimate signal parameters from noisy sensor measurements. As the WSN contains a large number of low-cost, battery-operated sensor nodes with limited transmission bandwidth, then conservation of transmission resources (power and bandwidth) become more important. In this work, a novel data reduction method was developed which requires no inter-sensor collaboration and results in only a subset of the sensor measurements transmitted to the FC. The performance of the estimators were measured using deterministic (via MLE) and random parameters (via MAP) for different censoring methodology. Cramer-Rao bound analysis for the different censor-estimators and censor-quantizer estimators is also provided to benchmark and facilitate MSE-based performance comparisons. Numerical simulations corroborate the analytical findings and demonstrate that the proposed censoring estimation approach performs competitively with alternative methods, under different sensing conditions, while having lower computational complexity.

CURRICULAR ACTIVITIES AND HONORS

- Attended the 2nd IEEE Winter School on Fog/Edge Computing 2020, Virtual School organized by IIT Kanpur India, December 2020.

- Presented the paper in 54th Asilomar Conference on Signals, Systems, and Computers, California, 2020 virtually.

- The paper "Spatial HRTF Interpolation using Spectral Phase Constraints" is nominated for Best Paper Award in 2020 International Conference on Signal Processing and Communications (SPCOM), Bangalore, India.

- Presented two paper in 2020 International Conference on Signal Processing and Communications (SPCOM), Bangalore, India, 2020 virtually.

- Attended and presented a paper in EAA Spatial Audio Signal Processing Symposium, Sep 2019, Paris, France

- Attended and presented a paper in *2018 26th European Signal Processing Conference* (EUSIPCO 2018), Rome, Italy, Sep-2018.

- Attended the Winter School on Speech and Audio Processing (WISSAP-2017) at IISC, Bengaluru.

- MHRD fellowship from Government of India for Ph.D 2016 - Present.

- Served as publicity chair for the International Conference on Man and Machine Interfacing MAMI 2015, technically co sponsored by IEEE.

- Member of the organizing committee for National conference on VLSI Signal Processing and Trends in Telecommunication(VSATT)-2013 and 2014.

- Attended and presented a paper in International Conference on Communication Technology and System Design- ICCTSD 2011, Coimbatore.

- Attended and presented a paper in International Conference on Computational Intelligence and Information Technology CIIT 2011, Pune

- Served as member of the organizing committee for Symposium on Where is Intelligent Computing SWIC-2011.

- Attended the MHRD/AICTE sponsored Short Term Course on Telecommunication Networks with State-of-the-art hands-on-Experiment offered by IIT, Kharagpure, 2010

- Secured university second rank in B. Tech. in Electronics and Telecommunication Engineering, Biju Patnaik University of Technology, Rourkela, India, 2005.

REFERENCES

- Professor Rajesh M. Hegde
  Professor
  Electrical Engineering
  Indian Institute of Technology
  Kanpur, India 208016
  Phone: 0512-259-6248
  Email: rhegde@iitk.ac.in

- Professor Pradip Sircar
  Professor
  Electrical Engineering
  Indian Institute of Technology
  Kanpur, India 208016
  Phone: 0512-259-7063
  Email: sircar@iitk.ac.in