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Google Scholar Link:

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Research Focus:

Analysis of 1-D/M-D signal using Algebraic Structures, Probability theories & Machine Learning methods, and Optimized Design of these techniques for Embedded Systems (Digital Hardware Accelerator and Processor) realization. The long term goals are to-

- Develop graph representations of signal/image processing techniques and their optimization for realizing embedded computer system
- Understand the symmetries in representation of data and its processing for human-computer interaction
- Synthesise, test, refine the signal & image processing structures using real-world experiments and archival data sets for improved efficacy

Skill Set:

- Teaching Algebraic methods for Signal/Image Processing, Random Signal Processing & Embedded Hardware Design (11 years' experience)
- **VHDL & Verilog** programming for developing hardware architecture for signal & image Processing techniques targeted for **Zynq 7000 AP SoC in Vivado IDE**
- **MATLAB programming** for signal and image hardware interface, analysis and processing, computer vision, **Graphical User Interface**, deployment of the software as installer package
- **C/C++ programming with OpenCv** library for Computer Vision applications.
- **Python Programming for Signal Processing & Machine Learning**
- **Assembly & Embedded C** language programming for 8051 microcontroller, **ARM Cortex M4**
- Designing experiments for human machine interaction.
- Latex for document and presentation slide preparation.

Education:

Indian Institute of Technology Kharagpur Ph.D. from Electrical Engineering Department Advisor/Supervisor: Prof. Aurobinda Routray & Prof. Anirban Mukherjee Thesis Title: Eye Image-based Algorithms to Estimate Percentage Closure of Eye and Saccadic Ratio for Alertness Detection Examiners: Prof. Bjarne Kjær Ersbøll, DTU, Denmark; Prof. Govind Sharma, Indian Institute of Technology Kanpur, India	Kharagpur, India, May 2013
Jadavpur University M. E. E. in Electrical Engineering (Specialization in Measurement & Instrumentation) Advisor/Supervisor: Prof. Anjan Rakshit & Prof. Palash K. Kundu Thesis Title: Development of 8051 microcontroller-based PID controller	Jadavpur, Kolkata July 2004
Jadavpur University B. E. E. in Electrical Engineering Advisor/Supervisor: Prof. Amitava Chatterjee Thesis Title: Development of Graphical User Interface for Fuzzy Logic Controller Design	Jadavpur, Kolkata July 2002

Other Academic Experiences:

- Accomplished online course “*Writing in Sciences*” from Stanford Online course instructed by Prof. Kristin L. Sainani, Stanford University
- Accomplished online course with distinction “*Image and video processing: From Mars to Hollywood with a stop at the hospital*” from Coursera instructed by Prof. Guillermo Sapiro, Duke University
- Accomplished online course “*Neural Networks and Deep Learning*” from Coursera instructed by Prof. Andrew Ng, Stanford University
- Accomplished online course “*Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization*” from Coursera instructed by Prof. Andrew Ng, Stanford University

Work Experience:

National Institute of Technology Rourkela Associate Professor	Rourkela, India, Mar. 2023 - Present
National Institute of Technology Rourkela Assistant Professor Grade-I	Rourkela, India, Feb. 2018 – Mar. 2023
National Institute of Technology Rourkela Assistant Professor Grade-II	Rourkela, India, July 2011 – Jan. 2018
Indian Institute of Technology Kharagpur Electrical Engineering Department Image Processing Algorithm Developer Project: Development of Real Time Algorithms for Detection of Fatigue in Human Drivers Investigator: Prof. Aurobinda Routray	Kharagpur, India July 2007 – July 2009
Indian Institute of Technology Kharagpur Electrical Engineering Department Teaching Assistant	Kharagpur, India July 2006 – Jun. 2011
Electrosoft Consultant Technical Consultant	STEP, IIT, Kharagpur 2007 - 2008
Megatherm Electronics Private Ltd. Research & Development Officer	Saltlake, Kolkata, India July 2004 – Jun. 2006

Sponsored Projects (Ongoing / Completed):

Project Title:	Design, development and prototyping of state of the art Hybrid Energy Storage System (HESS) based high power high speed Electric Vehicle (EV) drive train for a Multi Utility Vehicle (MUV)
Role:	Co-Investigator
Sponsoring Agency:	DST, Govt. of India
Duration:	Mar. 2019 – Feb. 2022
Project Title:	Reconfigurable Hardware to Detect Drowsy Operator from Eye Image under Spectacles
Role:	Principal Investigator
Sponsoring Agency:	Board of Research in Nuclear Sciences (BRNS), Govt. of India
Duration:	Apr. 2016 – Mar. 2019

Publications:

Patents:

- **S. Gupta** and A. Routray, **Patent No. 389086, Granted on 14 Feb. 2022**, Real-time On Board Driver Drowsiness Monitoring System, Appl. No. 660/Kol/2010, Published on 16 Nov. 2012, Pub. No. 46/2012, Patent Office, Govt. of India, Patentee: Indian Institute of Technology Kharagpur

Journal Publications:

Domain: Hardware Accelerated Image & Signal Processing

- N. Panda and **S. Gupta**, “Design and Implementation of Face Detection Architecture for Heterogeneous System on Chip (SoC)”, *Journal of Circuits, Systems, and Computers*, World Scientific, <https://doi.org/10.1142/S0218126623500214>, 13th Aug. 2022

Domain: Digital Image & Signal Processing

- S. K. Panigrahi and **S. Gupta**, “Phase Preserved Curvelet Thresholding for Image Denoising”, *Journal of The Institution of Engineers (India): Series B, J. Inst. Eng. India Ser. B* (2022). <https://doi.org/10.1007/s40031-022-00780-0>, 16th Aug 2022
- **S. Gupta**, M. Z. Lazarus, N. Panda, and Sh. Gupta, “Measuring human alertness from histogram of response time to audio-visual stimuli”, in *Chronobiology International, Taylor and Francis*, vol. 36, no. 10, pp. 1447-1453, Aug. 2019
- M. Z. Lazarus and **S Gupta**, “Spectacle problem removal from facial images based on detail preserving filtering schemes”, in *Journal of Intelligent & Fuzzy Systems*, vol. 36, no. 3, Jan. 2019
- S. K. Panigrahi, **S. Gupta**, and P. K. Sahu, “Curvelet based Multiscale Denoising using Nonlocal Means & Guided Image Filter”, in *IET Image Processing*, vol. 12, no. 6, pp. 909-918, May 2018
- **S. Gupta** and S. K. Panigrahi, “Joint Bilateral Filter for Signal Recovery from Phase Preserved Curvelet Coefficients for Image Denoising” in *arXiv preprint arXiv:1804.05512*, 2018
- S. K. Panigrahi, **S. Gupta**, and S. V. Krishna, “Quantitative evaluation of different thresholding methods using automatic reference image creation via PCA”, in *Int. Journal of Computers and Applications, Taylor & Francis*, 2019, doi.org/10.1080/1206212X.2019.1615175

- S. K. Panigrahi, **S. Gupta**, “Automatic ranking of image thresholding techniques using consensus of ground truth”, in *Traitement du Signal*, vol. 35, no. 2, pp. 121-136, 2018
- **S. Gupta**, A. Routray, and A. Mukherjee, “A New Method for Edge Extraction in Images using Local Form Factors”, in *Int. J. Comput. Application (IJCA)*, vol. 21, no. 2, pp. 15-22, May, 2011.

Domain: Experiments and Digital Image Database

- **S Gupta**, M. Z. Lazarus and Nidhi Panda, “A human video database for facial feature detection under spectacles with varying alertness levels: A baseline study”, in *Journal of Cognitive Computation and Systems, IET*, vol. 2, no. 3, pp. 97-104, Sep. 2020, doi: 10.1049/ccs.2019.0014

Domain: Human Emotion Perception Modelling

- Sh. Gupta, R. Biswal, and **S. Gupta**, “Towards Computational Model of Emotion from Individual Difference in Perceiving Facial Expressions”, in *Psychological Studies*, vol. 63, no. 3, pp. 266-275, Sep. 2018

Conference:

Domain: Hardware Accelerated Image & Signal Processing

- N. Panda and **S. Gupta**, “A Hardware Architecture Design for Area Constrained Integral Image Generation for Face Detection Application”, 7th International Conference on ‘Microelectronics, Circuits and Systems’, Micro2020, Jul. 2020.

Domain: Digital Image Processing

- S. K. Panigrahi, **S. Gupta** and P. K. Sahu, “Curvelet Thresholding with Multiscale NLM Filtering for Color Image Denoising”, Region 10 Conference (TENCON), 2017 IEEE., IEEE, Penang, Malaysia. Nov., 2017.
- M. Z. Lazarus, and **S. Gupta**, “A low rank Model based Improved Eye Detection under Spectacles”, in *7th IEEE Annual Proc. Int. Conf. on Ubiquitous Computing, Electronics & Mobile Communication Conference*, UEMCON 2016, New York, USA Oct. 2016.

- S. K. Panigrahi, **S. Gupta** and P. K. Sahu, "Phases Under Gaussian Additive Noise," in *IEEE Proc. Int. Conf. on Communication and Signal Processing (ICCSP)*, Chennai Apr. 2016.
- S. K. Panigrahi, and **S. Gupta**, "Quantitative Evaluation of Image Information Retention by Relative Phase", in *IEEE Proc. 2nd Students' Conf. on Engineering & System (SCES), 2013*, MNNIT, Allahabad, Apr. 2013. **(Best paper award)**
- **S. Gupta**, and A. Routray, "Estimation of Saccadic Ratio from Eye Image Sequences to Detect Human Alertness", in *IEEE 4th Int. Conf. on Intelligent Human Computer Interaction (IHCI 2012)*, Kharagpur, India, Dec. 2012.
- **S. Gupta**, A. Dasgupta, and A. Routray, "Analysis of Training Parameters for Classifiers Based on Haar-like Features to Detect Human Faces", in *Proc. Int. Conf. on Image Information Processing*, Shimla, India, Nov. 2011
- T. Pradhan T., A. Routray, and **S. Gupta**, "Fast and Fixed-Point SVD Algorithm for Face and Eye Tracking", in *Matrix Information Geometry, Indo-French Seminar*, Feb. 2011.
- **S. Gupta**, R. Vignesh, and A. Routray, "Form Factor: A New Technique for automated center of pupil detection", in *1st International Conference on Emerging Trends in Signal Processing and VLSI Design*, Jun. 2010.
- **S. Gupta**, A. Routray, and A. Mukherjee, "Correlation Filter Based Method for Measurement of Eyelid Movement", in *2nd Int. Conference on Multimedia and Content Based Information Retrieval*, Bangalore, India, Jul., 2010.
- S. Dhar, T. Pradhan, **S. Gupta**, and A. Routray, "Implementation of Real Time Visual Attention Monitoring Algorithm of Human Drivers on an Embedded Platform", in *IEEE symposium, Techsym*, Kharagpur, India, Apr. 2010. **(Best Paper Award)**
- A. N. Bagaria, **S. Gupta**, and A. Routray, "Detection of Slow Eyelid Closure Using Eigen-eyes", in *5th Int. Conference on Industrial and Information System*, Jul-Aug. 2010.
- **S. Gupta**, A. Mukherjee, A. Routray, and S. Sharma, "A Comparative Assessment of Background Subtraction Methods for Face Extraction under Variable Illumination", in *National Conference on Information Science and Security*, Chennai, India, Mar. 2010.

Domain: Experiments and Digital Image Database

- M. Z. Lazarus, **S. Gupta**, and N. Panda, “An Indian facial database highlighting the spectacle problems”, in *IEEE Proc. International Conference on Innovative Technologies in Engineering (ICITE OU) 2018*, Hyderabad, Apr. 2018
- **S. Gupta**, S. Kar, S. Gupta, and A. Routray, “Fatigue in Human Drivers: A Study Using Ocular, Psychometric, Physiological Signals”, in *IEEE symposium, Techsym*, Kharagpur, India, Apr. 2010.
- **S. Gupta**, S. Kar, S. Naik, A. Routray, and A. Mukherjee, “Multidimensional Approach for Detection of Human Fatigue”, in *1st Indo-Japan Conference on Science and Technology of Facial Expression Analysis*, CDAC, Kolkata, India, Mar. 2009.

Domain: Human Factor in Context

- Sh. Gupta, R. Biswal, and **S. Gupta**, “Emotion Perception Time Analysis for Variable Facial Expression”, in *Proc. National Academy of Psychology 2018*, Sep. 2018
- S. Gupta, “Active Learning, Active Living: An Insight under Pandemic”, in proceedings of AICTE sponsored national conference entitled as Impact of Post COVID-19 on Technical Education: Challenges & Opportunities (IPCTE-2022), Feb. 2022

Book Chapters:

- M. Z. Lazarus, **S. Gupta**, and N. Panda, “A Literature Survey on Eye Corner Detection Techniques in Real-Life Scenarios,” in *Advances in Computing and Data Sciences*, M. Singh, P. Gupta, V. Tyagi, J. Flusser, T. Oren, and R. Kashyap, Eds. Singapore: Springer Singapore, 2019, pp. 597-608. Link: https://link.springer.com/chapter/10.1007/978-981-13-9942-8_56
- Nygel Thomas, M. Z. Lazarus, and S. Gupta, “Separation of Diffuse and Specular Reflection Components from Real-World Color Images Captured Under Flash Imaging Conditions”, in *Energy Systems, Drives and Automations*, Singapore: Springer Singapore, 2020, pp. 265-275. Link: https://link.springer.com/chapter/10.1007/978-981-15-5089-8_25

Book:

- S. Gupta, “Ocular Motion from Facial Image Sequence to Detect Human Alertness”, Scholar Press, 2014

Ph.D. and M. Tech. Theses Supervised

Ph.D.		
Student's Name	Title	Year of Completion
Dr. S. K. Panigrahi	Image Denoising By Edge Preserved Curvelet Thresholding	2019
Dr. M. Z. Lazarus	Ocular Feature Detection Under Spectacles	2021
Ms. N. Panda	Optimized Face Detector on System-On-Chip for Alertness Detection	Continuing
M. Tech.		
Mr. S. Kumar	Programmable Logic Array Realization of Singular Value Decomposition Technique	2016
Ms. S. Mudiyalala	Programmable Logic Circuit for Face Detection	2017
Mr. U. S. Naga Raju	Development of Edge Detector Architecture on SoC	2017
Ms. Athira A	Hardware Simulation for Face Detection	2018
Mr. A. Yadav	An FPGA based Hardware Architecture Development for Matrix Inversion by SVD	2018
Mr. N. G. Thomas	A Fine Grained Approach for Separation of Reflection Components from Real-World Saturated image	2019
Mr. Sangeeth P	Hardware Realization of Face Detection Module	2019
Mr. H. Patel	Digital Architecture for SIFT Processor	2019
Mr. N. Yadav	Digital Architecture for Motion Estimation	2019

Talks:

Invited Talks

- **"Convolutional Neural Network with SoC for Face Detection"**, in the short term training program entitled "Artificial Intelligence for Computer Vision Applications - AICVA 2022" organized by Department of Computing Technologies, School of Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai during 25th - 30th July 2022
- **"Face Detection on System-On-Chip (SoC)"**, in 5 Day Faculty Development Program on Applications of Artificial Intelligence in Instrumentation, Control, and Image Processing, organized by Dept. of Instrumentation & Dept. of Control and

Automation School of Electrical Engineering Vellore Institute of Technology, Vellore, HCL Technologies, and ISA VIT Engineering Minds during 4th - 8th July, 2022

- **"Embedded Image Processing: Application to Face Detection"**, in AICTE Margdarshan Initiative Talk, organized by the EEE Department of C. V. Raman Global University, Bhubaneshwar, India on 30th March 2022.
- **"Active learning, active living: An Insight Under Pandemic"**, in AICTE Sponsored 2-Day National Conference on Impact of Post Covid-19 on Technical Education-Challenges & Opportunities (IPCTE-2022), organised by the Department of Electronics & Telecommunication Engineering, DRIEMS Autonomous Engineering College, Odisha, 11th Feb. 2022
- **"Signal Denoising: A General Perspective"**, in the Five-Day Webinar Series on SIGNAL PROCESSING AND MACHINE LEARNING APPROACHES FOR BIOMEDICAL SIGNALS (SPMLB - 2021), organised by the Department of Electrical Engineering, NIT Rourkela, Odisha, 25th Oct. 2021
- **"Face Detection from Feature Extraction to CNN"**, in ATAL FDP on "Artificial Intelligence in Image Processing", organized by the Indian Institute of Information Technology, Nagpur, India from 20th to 24th December 2021.
- **"Digital Filter Design and Its Implementation"**, in TQUIP-III Sponsored Webinar on Signal and Systems, organized by the Department of Electronics and Communication Engineering, Chaibasa Engineering College, Jharkhand, 8-12 Dec. 2020
- **"Embedded System"**, in Webinar Series on Signal and Systems, organized by the Department of Electronics and Communication Engineering, Chaibasa Engineering College, Jharkhand, 7-9 May 2020
- **"Introduction to IoT and Embedded System Design"**, in TEQIP-III BPUT Sponsored STTP on Introduction to IoT and Embedded System Design 2020, organised by the Department of Electronics & Telecommunication Engineering, DRIEMS Autonomous Engineering College, Odisha, 10th Feb. 2020
- **"Digital Signal Processing on Embedded System"**, in TQUIP-III Sponsored Seminar on Digital Signal Processing 2019, organized by the Department of Electronics and Communication Engineering, Chaibasa Engineering College, Jharkhand
- **"Digital Signal Modelling & Computation: Linking Theory with Implementation"**, in National Seminar On Recent Technological Advancement In Electrical Engineering (RTAEE-2018), 14th Mar. 2018, Synergy Institute of Engineering & Technology, Dhenkanal, India.
- **"Introduction to Mathematical Computations & Simulation"**, in National Workshop on Simulation using MATLAB, 5-7 Mar. 2016, SUIIT Sambalpur University, India.
- **"Digital Image Filtering: A Collage of Concepts & Theory"**, in National Symposium on Signal Processing, Image Processing & Communication System (NSSIC 2015), 23-27 June 2015, CEM Kolaghat, India.

Curriculum Development & Teaching Experiences:

Under Graduate Courses	
Embedded Systems	Spring, 2016-present
Embedded System Laboratory	Autumn, 2011- present
Network Analysis /Theory	Autumn, 2011- 2016
Digital Signal Processing	Spring, 2012
Signals & Systems	Spring, 2015
Basic Electrical Engineering	Autumn, 2011- 2013

Post Graduate Courses	
Advanced Signal Processing	Autumn, 2018-present
Adaptive Signal Processing	Autumn, 2014-2017
Embedded Computing System	Spring, 2012-Present
System Design using HDL	Spring, 2013-2014
Real-Time System Laboratory	Spring, 2012-Present

Professional Activities:

Articles Review for the

- IEEE Transaction on Intelligent Transportation Systems
- IEEE Transaction on Instrumentation & Measurement
- IEEE Access
- International Journal of Computational Vision and Robotics

Reviewed books for the

- Pearson Education Limited

Professional Membership:

- IEEE Member with membership no. 90807388.
- Member IEEE Signal Processing Society

References:

1. Prof. Aurobinda Routray
Department of Electrical Engineering,
Indian Institute of Technology Kharagpur
West Bengal – 721302
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Email ID: aroutray@ee.iitkgp.ac.in
2. Prof. Anirban Mukherjee
Department of Electrical Engineering,
Indian Institute of Technology Kharagpur
West Bengal – 721302
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3. Prof. Pranab Kumar Dutta
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Indian Institute of Technology Kharagpur
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4. Prof. Ashok Kumar Pradhan
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Indian Institute of Technology Kharagpur
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5. Prof. Amitava Chatterjee
Department of Electrical Engineering,
Jadavpur University, Kolkata
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Email ID: a chatterjee@ee.jdvu.ac.in
6. Prof. Ganapati Panda (Retd.)
K8/80, Kalinga Nagar,
Ghatikia (near SUM hospital)
Bhubaneswar - 751003
Phone No. – +91 9437048906
Email ID: gpanda@iitbbs.ac.in