Mahesh Raveendranatha Panicker *PhD*

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Brief Biography

Mahesh Raveendranatha Panicker received his B. Tech. degree in Electrical and Electronics Engineering from Rajiv Gandhi Institute of Technology (Govt. Engineering College, Kottayam) in 2003 (First rank in the Mahatma Gandhi University) and Ph.D. degree from School of Computer Engineering, Nanyang Technological University (NTU), Singapore in 2009. From August 2003 to July 2005, he was a lecturer with Saintgits College of Engineering (Mahatma Gandhi University), Kerala. From August 2008 to July 2010, he was a post-doctoral fellow with centre for high performance embedded systems, NTU, Singapore. In August 2010, he started his career in industry with General Electric (GE) Global Research Centre, Bangalore. He was lead research engineer with GE till April 2017. From May 2017 till May 2018, he was senior chief engineer with Samsung Research Institute, Bangalore. He was Assistant Professor of Electrical Engineering at IIT Palakkad from June 2018 to November 2021. Currently he is an Associate Professor with the department of Electrical Engineering at IIT Palakkad.

Mahesh is a Senior Member with IEEE, Six Sigma Green Belt certified and a TRIZ practitioner. He is a recipient of the Early Career Research Award from Science and Engineering Research Board, Government of India in 2019. He has won GE wide technical excellence awards in 2013 and 2015. He has also won silver award for ten or more patents with GE. During his stay in GE, Mahesh has worked on a range of projects, which include portable foetal ECG platform, compressor blade health monitoring program, real-time detection of rotor imbalance in GE transportation locomotive engines, detection of corrosion under insulation in oil/gas pipelines in refineries, nuclear reactor rebar corrosion detection, fMRI-based neuro analytics, GE's software beamforming platform for diagnostic ultrasound imaging and low-cost portable 3D ultrasound.

Mahesh's research interests include signal processing and machine learning, reconfigurable computing, and area efficient low power systems with applications in diagnostic ultrasound imaging, biomedical circuits and systems, multi-standard wireless communications and industrial prognostics and health monitoring. Mahesh has published his research findings in 13 international journals, 40 international conferences and 11 patents. Highlights of major research and translational projects are available at http://www.pulseecho.in/. He is an Associate Editor for Springer Circuits Systems and Signal Processing, review editor for Frontiers in Neurorobotics and Frontiers in Signal Processing and regular reviewer for Elsevier Pattern Recognition, IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE Transactions on Cognitive and Developmental Systems, IEEE Access, IEEE Transactions on Signal Processing, IEEE Transactions on Circuits and Systems - I and II, IEEE Transactions on Vehicular Technology, IEEE Transactions on VLSI Systems, IET Transactions on Signal Processing, Springer Journal of Signal Processing Systems for Signal, Image and Video Technology. He was the Vice Chair, IEEE Engineering in Medicine and Biology Society (EMBS) Kerala Chapter in 2020/2021 and the Chair - Sponsorship Committee, IEEE International Symposium on Biomedical Imaging (ISBI) 2022.

In IIT Palakkad, Mahesh was appointed as the first Head of the Department of Electrical Engineering effective October 2021 for a period of three years. Mahesh has served as a member of Board of Academic Studies and Industry Collaboration and Sponsored Research. He has also took a leading role in setting up a Centre for Computational Imaging at IIT Palakkad.

1. EDUCATION

Ph.D., 2009
School of Computer Engineering, Nanyang Technological University, Singapore
Dissertation topic: Reconfigurable low complexity digital filter banks for software radio receivers (Advisor: Professor Vinod Achutavarrier Prasad)

Bachelor of Technology - B.Tech., 2003 (First Rank in the University)
Department of Electrical and Electronics Engineering, Rajiv Gandhi Institute of Technology (Govt. Engineering College), Mahatma Gandhi University, Kerala, India
Project topic: Microprocessor based Autonomous Robot (Advisor: Professor Dinesh Gopinath)

2. SUMMARY OF WORKING EXPERIENCE

Total Work Experience – 16 years (Teaching: 6 years, Industry: 10 years)

Nov 2021 – Till Now: Associate Professor and Head of the Department, Electrical Engineering, Indian Institute of Technology, Palakkad.
Instructor for courses in B. Tech Electrical Engineering and M. Tech System on Chip Design. Involved in research and development of advanced signal processing, analytics, and imaging techniques for diagnostic ultrasound systems. Highlights of major research and translational projects are available at http://www.pulseecho.in/.

June 2018 – Nov 2021: Assistant Professor in Electrical Engineering, Indian Institute of Technology, Palakkad.
Instructor for courses in B. Tech Electrical Engineering and M. Tech System on Chip Design. Involved in research and development of advanced signal processing, analytics, and imaging techniques for diagnostic ultrasound systems. Highlights of major research and translational projects are available at http://www.pulseecho.in/.

May 2017 – May 2018: Senior Chief Engineer at Ultrasound Systems, Healthcare and Medical Equipments (HME), Samsung Research Institute, Bangalore, India
Involved in research, development and productization of advanced signal processing, analytics, and imaging techniques for diagnostic ultrasound systems.

Aug 2010 – April 2017: Lead Engineer at Software Sciences and Analytics Research, GE Global Research, John F Welch Technology Centre, Bangalore, India.
Helped in establishing diagnostic ultrasound imaging lab in GE Global Research, Bangalore and in establishing collaboration with General Imaging business, GE Healthcare, Milwaukee. Involved in development of advanced analytics, signal processing algorithms/systems for applications in health care, energy, oil and gas and transportation domains. Filed 10 patents and involved in many of the popular GE products such as diagnostic ultrasound systems, non-invasive neonatal/foetal heart rate monitoring, compressor blade health monitoring (BHM) and Tier4 locomotive prognostics.

Aug 2008 – Jul 2010: Research Fellow at Centre for High Performance Embedded Systems (CHiPES), NTU, Singapore.
Involved in development of novel reconfigurable low complexity spectrum sensing algorithms and architectures for military and cognitive radios.

Nov 2007 – Dec 2007: Sponsored Internship at SUPELEC in the Signal, Communication et Electronique Embarquee (SCEE) team as part of Merlion Project Grant (Dossier No. 9.03.07), France-Singapore Cooperation Platform in Science and Technology.
Involved in development of novel spectrum sensing architectures for cognitive radio.

Aug 2005 – Jul 2008: Teaching Assistant at School of Computer Engineering, NTU, Singapore.
Handled sessions in Instrumentation and Data Acquisition Lab and Digital Systems Lab.

Aug 2003 – Jul 2005: Lecturer at SAINTGITS College of Engineering, Mahatma Gandhi University, Kerala, India.
Taught basic and advanced courses in Electrical and Electronics Engineering.

2. TEACHING:

A. Current Courses:

- Microprocessor Systems: Design and Interfacing (Theory and Lab)
- Digital Image Processing
- Digital Circuits Laboratory

B. Past Courses:

- Sensor Arrays and Imaging
- Analog and Digital Communications
- Control Systems Lab
- Concepts in Engineering Design
- Introduction to Engineering

C. New Courses Developed:

- Microprocessor Systems: Design and Interfacing (B. Tech Year 2, Core) *(Different from conventional microprocessor course where students will first design an 8-bit microcomputer using logic gates and then learn microprocessor systems and interfacing using ARM Cortex M0+ core on FRDM KL25Z series SoC)* [Online Lectures]
- Digital Circuits Laboratory (B. Tech Year 2, Core) *(Designed the experiments including Verilog implementation on Zybo Zynq board)*
- Digital Image Processing (B. Tech Year 4/Graduate Level, Elective) *(Course deals with real-life dataset (e.g., student acquired dataset, industry CT data, COVID19 Lung Ultrasound Images))* [Online Lectures]
- Sensor Arrays and Imaging (M. Tech Year 1, Elective) *(Unique course dealing with wave physics, transducer design, array design, beamforming, and imaging)* [Online Lectures]

D. Teaching Feedback Scores:

Year	Course	Number of Students	Score (Out of 10)
Aug-Nov, 2018	EE3050: Analog and Digital Communications	33	8.9
	EE3125: Control Systems Lab	31	8.8
Jan-May, 2019	EE2080: Microprocessor Systems - Design and Interfacing	33	9.1
Aug-Nov, 2019	EE5005: Digital Image Processing	22	8.73
	EE2170: Digital Circuits Laboratory	55	NA*
Jan-May, 2020	EE2080: Microprocessor Systems - Design and Interfacing	47	NA*
Aug-Nov, 2020	EE5005: Digital Image Processing	49	9.22
	EE2170: Digital Circuits Laboratory	43	NA*
Jan-May, 2021	EE2080: Microprocessor Systems -	43	8.69

	Design and Interfacing			
	EE5527: Sensor Arrays and Imaging	15	9.61	
July-Nov, 2021	EE5005: Digital Image Processing	72	8.86	

*Not Available due to COVID-19 schedule

D. Graduate Research Student Supervision:

Master of Science (By Research) Student: 1 (Converted to PhD)

No.	Name	Year of Commencement	Thesis Title	Current Status
1	Madhavanunni A N	2018	Portable Vector Flow Imaging for Ambulatory Scenarios	Converted to PhD on June 2020

Ph.D. Students Presently Supervising: 4

No.	Name	Year of Commencement	Thesis Title	Current Status
1	Gayathri M	2018	Cognitive Ultrasound - Towards Tissue Adaptive Software Beamforming in Ultrasound Imaging	Progressing (1 Transaction, 5 International Conferences)
2	Madhavanunni A N	2020	Portable Vector Flow Imaging for Ambulatory Scenarios	Progressing (4 International Conferences)
3	Pisharody Harikrishnan Gopalkrishnan	2019	Novel Transducer Array Designs for High Frame Rate Ultrasound Imaging	Progressing (1 Patent, 1 International Conference)
4	Mimisha M Menakath	2020	Underwater High Frame Rate Acoustic Imaging	Progressing (1 International Conference)

E. Achievements of PhD Students and Undergraduate Final Year Project Students:

- **Ph.D. Student, Harikrishnan Pisharody, <u>elected as a Finalist in the Student Paper Competition for the International Symposium on Biomedical Imaging (IEEE ISBI 2022).</u>** https://biomedicalimaging.org/2022/best-paper-awards/ *Paper: Madhavanunni A.N. and Mahesh Raveendranatha Panicker, "Extending The Capability Of Linear Array Ultrasound Probe To Concave Array Using Low-Cost Acoustic Lens For High Frame Rate Focused Imaging", in Proc. of IEEE ISBI 2022, Kolkata, Mar. 2022.*
- **Ph.D. Student, Madhavanunni A N, <u>elected as a Finalist in the Student Paper Competition for the 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (IEEE EMBC 2021).</u>** https://embc.embs.org/2021/student-paper-competition-finalists/ *Paper: Madhavanunni A.N. and Mahesh Raveendranatha Panicker, "An Angle Independent Depth Aware Fusion Beamforming Approach for Ultrafast Ultrasound Flow Imaging", in Proc. of 43rd IEEE EMBC 2021, Nov. 2021.*
- **Ph.D. Student, Madhavanunni A N, <u>has won the 2020 Robert F. Wagner All Conference Best Student Paper Finalist Award</u> at the SPIE Medical Imaging Conference at Houston, USA, September 2020.** https://spie.org/Publications/Proceedings/Volume/11313 *Paper: Madhavanunni A.N. and Mahesh Raveendranatha Panicker, "Triangulation based vector flow imaging with non-steered plane waves for transverse flows", in Proc. of SPIE Medical Imaging 2020, Houston, Feb 2020.*

- **Ph.D. Student, Gayathri M, was one of <u>10 Finalists of the 3 Minute Thesis competition organized as part of IEEE's flagship symposium in Medical Imaging- IEEE ISBI 2021.</u>** https://biomedicalimaging.org/2021/awards/ *Paper: Gayathri M and Mahesh Raveendranatha Panicker, "Towards diffuse beamforming for specular reflectors: A pixel level reflection tuned apodization scheme for ultrasound imaging," in Proc. of IEEE ISBI 2021, Nice, France, April 2021.*
- **B. Tech project student, Roshan P Mathews, <u>won Undergraduate Research and Innovation Awards 2021</u> at IIT Palakkad for excellence in undergraduate research.**

3. RESEARCH

A. Technology Interests:

- Machine/Deep Learning for Imaging/Reconstruction
- Digital Signal Processing
- Reconfigurable Low Power / Area Efficient Circuits and Systems

B. Domain Interests:

- Diagnostic Ultrasound Imaging
- Biomedical Circuits & Systems
- Underwater Acoustic Imaging and Image Processing
- Industrial Prognostics and Health Monitoring

C. Publications: *Please refer Page 8 for detailed list of publications.*

- Published **53 papers** in international refereed journals and international conferences.
- Number of International Journal Papers: 13, Number of International Conference Papers: 40

D. Patents: *Please refer Page 11 for detailed list of patents.*

- Number of Patents: **11** (7 US patents granted and 4 Indian patents filed)

E. Research Grants:

On-going (Active) Research Grants:

No.	Title	Funding Organization	Amount	Duration	Role
1	Investigation of a portable, affordable, and self-guided bedside ultrasound system for tissue and blood velocity imaging	Early Career Research (ECR) award, Science and Engineering Research Board (SERB), India	Rs 49,01,830	March 2019 - March 2022	PI
2	Automatic Target Detection using Simulated Side Scan and Multi-beam Echo Sounder Images	Defense Research Development Organization (DRDO)	Rs 19,65,408	April 2022- January 2024	PI
3	Robust receive				

	beamforming algorithm for underwater sonar imaging system for Mine Like Object Detection in the presence of reverberation	Defense Research Development Organization (DRDO)	Rs 9,89,218	March 2022 – February 2023	PI
4	Cognitive Ultrasound Imaging	NVIDIA Corporation	Developer board worth USD 10000	NA	PI

Past (Completed) Research Grants:

No.	Title	Funding Organization	Amount	Duration	Role
1	An automated lung ultrasound workflow for diagnostic assistance in COVID-19 and beyond	COVID19 Special Core Research Grant, Science and Engineering Research Board (SERB), India	Rs 12,02,960	Aug 2020 - Aug 2021	PI
2	Automated Lung Ultrasound for COVID-19 Screening and Monitoring	CSR Fund - Federal Bank Limited, India	Rs 6,00,000	May 2020 - October 2020	PI
3	Development of a Real Time Spectral Analysis and Filtering System Based on Lyrtech SFF	Temasek Laboratories/DSO National Labs, Defence Science and Technology Agency (DSTA), Singapore	S$ 64,000	Sep 2008 - Sep 2009	Co-PI

F. Translational Research:

- Recent work employing lung ultrasound as a continuous monitoring tool to help clinicians in COVID19 which is deployed and available at http://www.pulseecho.in/alus/. The work was covered in detail by national daily Hindu, magazine The Week and in Doordarshan News.
- An automated multi-scale image contrast enhancement algorithm for industrial CT scans has been developed and incorporated into product chain assisted by https://vcxrayindia.com/
- MOUs signed with University of Alberta, GE Healthcare Bangalore and Sree Chitra Tirunal Institute for Medical Sciences & Technology, Trivandrum (SCTIMST) for automated image analysis for ultrasound systems.

4. PROFESSIONAL SERVICE

A. *Administrative Appointments*

- Head, Department of Electrical Engineering (Oct 2021 – Till Now)
- Member, Board of Industry Collaboration and Sponsored Research, Indian Institute of Technology Palakkad (July 2018 – July 2021)
- Member, Board of Academic Studies, Indian Institute of Technology Palakkad (June 2019 – July 2020)
- Stream Co-ordinator, Electrical Engineering, Indian Institute of Technology Palakkad (June 2019 – July 2020)
- Institute Coordinator DRDO-MoE PhD Fellowship (May 2020 – Till Now)
- Convenor, Centre for Computational Imaging, Indian Institute of Technology Palakkad

B. *Professional Activities*

- Six Sigma Green Belt Certification
- MATRIZ TRIZ Level 2 Certification (TRIZ Practitioner)
- Senior Member, IEEE
- Vice Chair, IEEE Engineering in Medicine and Biology Society (EMBS) Kerala Chapter, 2020-2021
- Chair - Sponsorship Committee, IEEE International Symposium on Biomedical Imaging (ISBI) 2022
- Executive Committee Member, National Institute of Electronics, and Information Technology (NIELIT) Calicut
- Review Board Member, NPOL Kochi
- Regular mentor for internship students funded by Indian Academy of Sciences (1 student in 2019, 1 student in 2020, 3 students in 2021)
- Department Advisory Committee member for
  - Electrical Engineering, Rajiv Gandhi Institute of Technology Kottayam
  - Electrical Engineering, Government Engineering College Idukki
  - Instrumentation and Control Engineering, NSS College of Engineering Palakkad
  - Biomedical Engineering, Sahrudaya College of Engineering Thrissur
- Associate Editor, Springer Circuits, Systems and Signal Processing
- Review Editor, Frontiers in Neurorobotics
- Associate Editor (Guest) and Review Editor, Frontiers in Signal processing
- Member, Technical Committee on Brain-Machine Interface Systems, IEEE Systems, Man and Cybernetics Society
- Member, IEEE Signal Processing Society
- Member, IEEE Circuits and Systems Society
- Member, IEEE Engineering in Medicine and Biology Society
- Member, IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society
- Session Chair, Biomedical Systems, IEEE Region-10 Conference, TENCON 2020 and TENCON 2019
- Program Committee, International Symposium on Electronic System Design (ISED), 2011-2014
- Program Committee, International Conference on Eco-friendly Computing and Communication Systems (ICECCS 2013)
- Program Committee, International Conference on Advances in Computing and Communications (ACC 2013)
- Track Chair, IEEE International Conference on Information, Communications and Signal Processing (ICICS 2009)
- Reviewer of Elsevier Pattern Recognition, IEEE Transactions on Biomedical Circuits and Systems, IEEE Access, IEEE Transactions on Signal Processing, IEEE Transactions on Circuits and Systems - I and II, IEEE Transactions on Vehicular Technology, IEEE Transactions on VLSI Systems, IET Transactions on Signal Processing, Springer Journal

of Signal Processing Systems for Signal, Image and Video Technology and International conferences such as BioCAS, EMBC, ISCAS, ICCS, ICICS, TENCON, SPCOM.

B. Invited Talks

- "Video Summarization", CapsNetwork Training School-2, NTNU Norway, 29th April 2022
- "Learning based beamforming algorithms for ultrasound imaging", Forum on "Trends in Multi Scale Signal and Image Processing for Biomedical Instrumentation", IEEE SPS Kerala Section, 17th Dec 2021.
- "Automated lung ultrasound for Covid19 and beyond", FDP on Advancements of Digital Health and Medical Innovations during Pandemic, Model Engineering College Kochi, 7th Dec 2021.
- "Transmit Receive Beamforming in Ultrasound Imaging", Virtual Workshop on Instrumentation and Signal Processing in Biomedical Imaging and Rehabilitation, IIT Gandhinagar - 25th Oct 2021.
- "Diagnostic Ultrasound– The Journey from Imaging to Therapy and Beyond," IEEE Malabar Hub Webinar Series #62 - 05th Aug 2021.
- "Introduction to Convolutional Neural Networks and Applications in Image Processing," 3-day Workshop on Generative Adversarial Networks (GANArt 2021) @ NIT Calicut, 20 - 22, May 2021.
- "Diagnostic Ultrasound Imaging Systems Overview and Advances", 7th National Seminar on ADVANCES IN SCIENTIFIC AND INDUSTRIAL INSTRUMENTATION (ASCII), CUSAT, 24th March 2021.
- "Neural Networks for Diagnostic Ultrasonic Imaging", ATAL FDP on Applications of AI in Healthcare", Model Engineering College Kochi, 25th Feb 2021.
- "Introduction to Convolutional Neural Networks and Applications in Image Processing", ATAL FDP on Machine Learning and Deep Learning: A Hands -On Approach, CUSAT, 9th December 2020.
- "IoT for Biomedical (Imaging)", ATAL FDP on Secure Internet of Things (IoT), IIT Palakkad, 19th October 2020
- "Lung Ultrasound Imaging for COVID19, From Physics to Neural Networks", IEEE Computer Society and IEEE Student Chapter Webinar, NIT Trichy, 15th August 2020.
- "Deep learning and Biomedical Applications", Faculty Development Program on Artificial Intelligence and Machine Learning for Biomedical Applications", Sahrudaya College of Engineering, 17th July 2020.
- "Digital Signal Processing -Journey from Physical Models to Statistical Models", Workshop on Implementation of Signal Processing Algorithms on DSP Processors", PSG Coimbatore, 16th December 2019.
- "From the physical world to the digital world: enabling machine learning driven by domain knowledge", IEEE SPS Kerala Section - Colloquium on ML with Signal Processing for Data Analytics", CUSAT, Kochi, 28th September 2019.
- "Signal Processing in The Era of Big Data", National Conference on Communication, Computing and System Design (NC33SD'19), PSGiTech, Coimbatore, 19th March 2019.
- "Compressive Sampling - A Paradigm Shift in Digital Signal Processing", Workshop on Advances in Signal and Image Processing, GITAM University, Visakhapatnam, Feb 2014.
- "Advances in Industrial Digital Signal Processing", Technical Quality Improvement Program (TQIP) for Faculty on Advances in Digital Systems, Cochin University of Science and Technology (CUSAT),
- Kochi, June 2011.
- "Reconfigurable Low Complexity Digital Filters", Military Radio Lecture Series, NTU, Singapore, Feb 2009.
- "Reconfigurable Low Complexity Spectrum Sensing", Visitor Lecture Series, SUPELEC, Rennes, France, Dec 2008.
- "Reconfigurable Low Complexity Digital Filter Banks for Software Radio Receivers", Graduate Students Workshop organized by IEEE CAS society, Singapore, September 2007.

PUBLICATIONS

Journals:

Published

1. Rohith Reddy Rachala and **Mahesh Raveendranatha Panicker**, "Hand-Drawn Electrical Circuit Recognition Using Object Detection and Node Recognition", Springer Nature Computer Science, 3, 244 (2022). https://doi.org/10.1007/s42979-022-01159-0

2. Arjun, Rajpoot, Aniket Singh, and **Mahesh Raveendranatha Panicker,** "Subject independent emotion recognition using EEG signals employing attention driven neural networks", in *Biomedical Signal Processing and Control*, 75 (2022): 103547. https://doi.org/10.1016/j.bspc.2022.103547

3. Roshan P Mathews, **Mahesh Raveendranatha Panicker** and Abhilash R Hareendranathan, "vid-SAMGRAH: A PyTorch framework for multi-latent space reinforcement learning driven video summarization in ultrasound imaging", in *Elsevier Software Impacts*, 100185 (2021). https://doi.org/10.1016/j.simpa.2021.100185

4. Gayathri M and **Mahesh Raveendranatha Panicker**, "Towards A Pixel-Level Reconfigurable Digital Beamforming Core for Diagnostic Ultrasound Imaging," in *IEEE Transactions on Biomedical Circuits and Systems,* 14, no. 3 (2020): 570-582. https://doi.org/10.1109/TBCAS.2020.2983759 *[pdf]*

5. **Mahesh, R.**, and A. Prasad Vinod, "An area-efficient non-uniform filter bank for low overhead reconfiguration of multi-standard software radio channelizers," *Journal of Signal Processing Systems* 64.3 (2011): 413-428. https://doi.org/10.1007/s11265-010-0502-9

6. **Mahesh, R.**, and A. Prasad Vinod, "A low-complexity flexible spectrum-sensing scheme for mobile cognitive radio terminals," *IEEE Transactions on Circuits and Systems II: Express Briefs* 58.6 (2011): 371-375. https://doi.org/10.1109/TCSII.2011.2158167

7. **Mahesh, R.**, and A. Prasad Vinod, "Low complexity flexible filter banks for uniform and non-uniform channelisation in software radios using coefficient decimation," *IET circuits, devices & systems* 5.3 (2011): 232-242. https://doi.org/10.1049/iet-cds.2010.0010

8. **Mahesh, R.**, and A. Prasad Vinod, "Reconfigurable low area complexity filter bank architecture based on frequency response masking for nonuniform channelization in software radio receivers*,*" *IEEE Transactions on Aerospace and Electronic Systems* 47.2 (2011): 1241-1255. https://doi.org/10.1109/TAES.2011.5751255

9. **Mahesh, R.**, and A. Prasad Vinod, "New reconfigurable architectures for implementing FIR filters with low complexity," *IEEE Transactions on computer-aided design of integrated circuits and systems* 29.2 (2010): 275-288. https://doi.org/10.1109/TCAD.2009.2035548

10. **Mahesh, R.**, A. Prasad Vinod, Edmund MK Lai, and Amos Omondi, "Filter bank channelizers for multi-standard software defined radio receivers," *Journal of signal processing systems* 62.2 (2011): 157-171. https://doi.org/10.1007/s11265-008-0327-y

11. Jimson Mathew, **Mahesh, R.**, A. P. Vinod and Edmund M-K. Lai, "Realization of low power high-speed channel filters with stringent adjacent channel attenuation specifications for wireless communication receivers," *IEICE transactions on fundamentals of electronics, communications and computer sciences* 91.9 (2008): 2564-2570. https://doi.org/10.1109/ICICS.2007.4449884

12. **Mahesh, R.**, and A. Prasad Vinod, "Reconfigurable frequency response masking filters for software radio channelization," *IEEE Transactions on Circuits and Systems II: Express Briefs* 55.3 (2008): 274-278. https://doi.org/10.1109/TCSII.2008.918996

13. **Mahesh, R.**, and A. Prasad Vinod, "A new common subexpression elimination algorithm for realizing low-complexity higher order digital filters," *IEEE transactions on computer-aided design of integrated circuits and systems* 27.2 (2008): 217-229. https://doi.org/10.1109/TCAD.2007.907064

1. Pisharody Harikrishnan Gopalakrishnan and Mahesh Raveendranatha Panicker, "Acoustic Gel Mask based Weakly Focused Ultrasound System for High Frame Rate Imaging," Under Review in IEEE Transactions on Biomedical Engineering (Major Revision, Revised version submitted on 09/05/2022).

2. Madhavanunni A. N. and **Mahesh Raveendranatha Panicker**, "A Nonlinear Beamforming for Enhanced Spatiotemporal Sensitivity in High Frame Rate Ultrasound Flow Imaging," Under Review in Elsevier Computers in Biology and Medicine (Major Revision, Revised version to be submitted before 14/07/2022). arXiv link: https://arxiv.org/abs/2108.02688

3. Gayathri M and **Mahesh Raveendranatha Panicker**, "A Tiered Sub-Aperture Directivity Indexing Technique for Specularity Visualization in High Frame Rate Ultrasound Imaging," Under Review in IEEE Transactions on Instrumentation and Measurements (Major Revision, Revised version to be submitted before 30/05/2022). arXiv link: https://arxiv.org/abs/2107.08069

4. Madhavanunni A. N. and **Mahesh Raveendranatha Panicker**, "Beam Multiply and Sum Beamforming for Non-Steered Plane Wave High Framerate Ultrasound Imaging," Under Review in Elsevier Computers in Biology and Medicine (Original version submitted on 20/04/2022).

5. Gayathri M and **Mahesh Raveendranatha Panicker**, "A Comparison of Plane-Wave and Synthetic Transmit Aperture Imaging for Specularity Characterisation in Ultrasound Imaging," Under Review in IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (Original version submitted on 30/04/2022).

6. Arpan Tripathi, Abhilash Rakkunedeth, **Mahesh Raveendranatha Panicker**, Jack Zhang, Naveenjyote Boora, Jacob Jaremko, "Domain-Aware Contrastive Learning for Ultrasound Hip Image Analysis," Under Review in Elsevier Computers in Biology and Medicine (Major revision, Revised version to be submitted before 25/06/2022) arXiv link: https://arxiv.org/abs/2106.05929

7. Adithya Sineesh and **Mahesh Raveendranatha Panicker**, "Exploring Novel Pooling Strategies for Edge Preserved Feature Maps in Convolutional Neural Networks", Under review in Springer Machine Vision and Applications, Original version submitted on 18/04/2022) arXiv link: https://arxiv.org/abs/2110.08842

8. Arpan Tripathi, Abhilash Rakkunedeth, **Mahesh Raveendranatha Panicker**, Jack Zhang, Naveenjyote Boora, Jacob Jaremko, Yale Tung Chen, Kiran Vishnu Narayan, Kesavadas C, "Physics Driven Domain Specific Transporter Framework with Attention Mechanism for Ultrasound Imaging", To be submitted to Computerized Medical Imaging and Graphics. arXiv link: https://arxiv.org/abs/2109.06346

9. Roshan P Mathews, **Mahesh Raveendranatha Panicker**, Abhilash R Hareendranathan, Yale Tung Chen, Jacob L Jaremko, Brian Buchanan, Kiran Vishnu Narayan, Kesavadas C, Greeta Mathews, "Unsupervised multi-latent space reinforcement learning framework for video summarization in ultrasound imaging", Under Review in IEEE Journal of Biomedical and Health Informatics (Original version submitted on 01/02/2022). arXiv link: https://arxiv.org/abs/2109.01309

10. Jinu Joseph, Mahesh Raveendranatha Panicker, Yale Tung Chen, Kesavadas Chandrasekharan, Vimal Chacko Mondy, Anoop Ayyappan, Jineesh Valakkada and Kiran Vishnu Narayan, "covEcho-Resource Constrained Lung Ultrasound Video Analysis Tool for Faster Triaging and Active Learning", Under Review in Elsevier Computer Program Computer Methods and Programs in Biomedicine Update (Original version submitted on 01/12/2021).

11. **Mahesh Raveendranatha Panicker**, Yale Tung Chen, Gayathri M, Madhavanunni A N, Kiran Vishnu Narayan, C Kesavadas and A P Vinod, "An Approach Towards Physics Informed Lung Ultrasound Image Scoring Neural Network for Diagnostic Assistance in COVID-19", (Under Submission Process). arXiv link: https://arxiv.org/abs/2106.06980

Conferences:

1. Pisharody Harikrishnan Gopalakrishnan and **Mahesh Raveendranatha Panicker**, "Extending the capability of linear array ultrasound probe to concave array using low cost

acoustic lens for high framerate focused imaging," in *Proc. of IEEE ISBI 2022*, Kolkata, India, March 2022.

2. Madhavanunni A.N. and **Mahesh Raveendranatha Panicker**, "Lesion detectability and contrast enhancement with beam multiply and sum beamforming for zero angle plane wave ultrasound imaging," in *Proc. of IEEE ISBI 2022*, Kolkata, India, March 2022.

3. Mimisha M Menakath, **Mahesh Raveendranatha Panicker** and Hareesh G., "Exploring time domain beamforming algorithm for underwater 3D acoustic imaging," in Proc. of OCEANS 2022, Chennai, Feb. 2022.

4. Arjun, Aniket Singh Rajpoot and **Mahesh Raveendranatha Panicker**, "Introducing Attention Mechanism for EEG Signals: Emotion Recognition with Vision Transformers," in *Proc. of 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Online, Oct 2021. https://doi.org/10.1109/EMBC46164.2021.9629837

5. Roshan P Mathews and **Mahesh Raveendranatha Panicker**, "Towards Fast Region Adaptive Ultrasound Beamformer for Plane Wave Imaging Using Convolutional Neural Networks," in *Proc. of 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Online, Oct 2021. https://doi.org/10.1109/EMBC46164.2021.9630930

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