Jeny Rajan

Curriculum Vitae

Address

Department of Computer Science and Engineering
National Institute of Technology Karnataka (NITK)
Surathkal, Mangalore
India – 575 025

Contact Information

Tel : +91 **824 2473412**
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Research Interests

Image Processing, Medical Image Analysis, Computer Vision, Deep Learning

Ph.D (in Computer Science)
Vision Lab, University of Antwerp, Belgium
Thesis Title : Estimation and removal of noise from single and multiple coil magnetic resonance images. 2009- 2012
Thesis Advisor: **Prof. Dr. Jan Sijbers**

M.Tech. Computer Science (*Specialization in Digital Image Computing*)
Department of Computer Science
University of Kerala, India
Thesis Title : Image denoising using partial differential equations [Received best thesis award from INAE, New Delhi].
Thesis Advisor : **Prof. Dr. M.R Kaimal**
CGPA: 3.16/4 (*first class with distinction*) 2003-2005

Awards and Honors

- **Young System Scientist Award** from System Society of India (SSI), 2016.
- **PhD Research Fellowship**, Vision Lab, University of Antwerp, Belgium, 2009.
- **Technology Breakthrough Award 2007**, from NeST, Technopark, Trivandrum, India (for the development of BrainAssist – a State-of-the-art tool for Brain Tumor Analysis)
- **Innovative Student Projects Award 2006**. (Best Thesis Award, M.Tech. Level) from the Indian National Academy of Engineering (INAE), New Delhi, India.
- Matlab Central, File exchange **pick of the week**, 2012.

Research and Teaching Experience

Associate Professor October 2023 – Till date
Dept. of Computer Science and Engineering
National Institute of Technology Karnataka
Surathkal, Mangalore, India.

Assistant Professor February 2013 – October2023
Dept. of Computer Science and Engineering
National Institute of Technology Karnataka
Surathkal, Mangalore, India.

Postdoctoral Researcher November 2012 – February, 2013
Vision Lab, University of Antwerp, Belgium

PhD Research Student
Vision Lab, University of Antwerp, Belgium April 2009 - October 2012

Senior Specialist April 2005- March 2009
Medical Imaging Research Group,
Healthcare Division, NeST,
Technopark, Trivandrum.
(was working in collaboration with the Sree Chitra Thirunal Institute of Medical Sciences and Technology, Trivandrum, India / Toshiba Medical Systems Corporation, Japan)

Publications

Journals (Published or Accepted: 61)

1. Bhavesh Varma, Nitesh Naik, K Chandrasakeran, M Venkatesan and **Jeny Rajan**, Forecasting Land-Use and Land-Cover Change using Hybrid CNN-LSTM Model, IEEE Geoscience and remote sensing letters. (in press), 2024
2. Rishi Raj, D. Pruthviraja, Ayush Gupta, Jimson Mathew, Santhosh Kumar Kannath, Adity Prakash, **Jeny Rajan**, Multilevel Multimodal framework for automatic collateral scoring in brain stroke, IEEE Access, Vol. 12, pp: 33730-33748, 2024.
3. A S Neethi, Santhosh Kumar Kannath, Adarsh Anil Kumar, Jimson Mathew and **Jeny Rajan**, A Comprehensive Review and Experimental Comparison of Deep Learning Methods for Automated Hemorrhage Detection, Engineering Applications of Artificial Intelligence, Vol. 133 (part C), pp: 1-23, 2024.
4. Siva Bonthada, Sankar Pariserum Perumal, Poornanand Purushottam Naik, Mahesh A. Padukudru, **Jeny Rajan**, An automated deep learning pipeline for detecting user errors in spirometry test, Biomedical Signal Processing and Control, Vol. 90, pp: 1-9, 2024.
5. R C Radha, B S Raghavendra, B V Subhash, **Jeny Rajan**, A V Narasimhadhan, Machine learning techniques for periodontitis and dental caries detection: A Narrative Review, International Journal of Medical Informatics, Vol. 178, pp: 1-13,2024.

6. Rajath C Aralikatti, S J Pawan, **Jeny Rajan**, A Dual-Stage Semi-Supervised Pre-Training Approach for Medical Image Segmentation, IEEE Trans. on Artificial Intelligence (In Press), 2023.
7. S J Pawan, Rishi Sharma, J Hemanth Sai Ram Reddy, Vani M, **Jeny Rajan**, WideCaps: A Wide Attention based Capsule Network for Image Classification, Machine Vision and Applications, Vol 34 (4), pp: 1: 14, 2023.
8. Mohammad Rahil, B. N Anoop, G N Girish, Abhishek R Kothari, Shashidhar G Koolagudi and **Jeny Rajan**, A Deep Ensemble Learning-based CNN Architecture for Multiclass Retinal Fluid Segmentation in OCT Images, IEEE Access, Vol 11, pp: 17241-17251, 2023.
9. Tojo Mathew, CI Johnpaul, Ajith B, Jyoti R Kini, **Jeny Rajan**, A deep learning based classifier framework for automated nuclear atypia scoring of breast carcinoma, Engineering Applications of Artificial Intelligence, Vol 120, pp: 1-14 (105949), 2023.
10. S Niyas, Ramya Bygari, Rachita Naik, Bhavishya Viswanath, Dhananjay Ugwekar, Tojo Mathew, J Kavya, Jyoti R Kini**, Jeny Rajan**, Automated Molecular Subtyping of Breast Carcinoma using Deep Learning Techniques, IEEE Journal of Translational Engineering in Health and Medicine, Vol. 11, pp :161-169, 2023
11. Rishi Raj, Jimson Mathew, Santhosh Kumar Kannath, **Jeny Rajan**, StrokeViT with AutoML for brain stroke classification, Engineering Applications of Artificial Intelligence, Vol 119, pp: 1-16, 2023, 2023
12. S J Pawan, Govind Jeevan, **Jeny Rajan**, Semi-Supervised Temporal Mixup Coherence for Medical Image Segmentation, Biocybernetics and Biomedical Engineering , Vol. 42, pp: 1149-1161, 2022
13. S. J Pawan, **Jeny Rajan**, Image Classification using Capsule Networks: A Review, Neurocomputing, Vol 509, pp:102-120, 2022.
14. A S Neethi, S Niyas, Santhosh Kannath, Jimson Mathew, Ajimi Mol Anzar and **Jeny Rajan**, Stroke Classification from Computed Tomography Scans using 3D Convolutional Neural Network, Biomedical Signal Processing and Control, Vol. 76, pp:103720, July 2022.
15. S. Niyas, S J Pawan, M Anand Kumar, **Jeny Rajan**, Medical Image Segmentation with 3D Convolutional Neural Networks : A Survey, Neurocomputing , Vol. 493,pp:397:413, 2022
16. Tojo Mathew, S. Niyas, C. I. Johnpaul, Jyoti R. Kini, **Jeny Rajan**, A novel deep classifier framework for automated molecular subtyping of breast carcinoma using immunohistochemistry image analysis, Biomedical Signal Processing and Control Vol. 76, pp:103657, 2022
17. Rishi Raj, Jimson Mathew, Santhosh Kumar K, **Jeny Rajan**, Crossover based technique for data augmentation, Computer Methods and Programs in Biomedicine, Vol. 218, pp: 106716, 2022.
18. Tojo Mathew, Ajith Bhaskaran, Jyoti Kini and **Jeny Rajan**, Deep Learning based Automated Mitosis Detection in Histopathology Images for Breast Cancer Grading, International Journal of Imaging Systems and Technology (In Press), 2022.
19. Govind Jeevan, Geevar C. Zacharias, Madhu S. Nair and **Jeny Rajan**, An Empirical Study of the Impact of Masks on Face Recognition, Pattern Recognition, 2021, Vol 122, pp: 108308, 2022
20. S Niyas, S Chethana Vaisali, Iwrin Show, T G Chandrika, S Vinayagamani, Chandrasekharan Kesavadas, **Jeny Rajan**, 3D Residual U-Net: A Voxel-based FCD Segmentation using Shallow Sliced Stacking, Biomedical Signal Processing and Control, Vol 70, pp (102951) 1 : 11, 2021
21. S J Pawan, Rahul Sankar, Anubhav Jain, Mahir Jain, D V Darshan, B.N Anoop, Abhishek R. Kothari, M.Venkatesan,and **Jeny Rajan**, Capsule Network based Architectures for the Segmentation of Sub-Retinal Serous Fluid in OCT Images of Central Serous Chorioretinopathy, Medical & Biological Engineering & Computing, Vol 59, pp: 1245–1259, 2021.

22. B N Anoop, Kaushik S Kalmady, Akhil Udathu, Siddharth V, Girish G N, Abhishek R Kothari, **Jeny Rajan**, A Cascaded Convolutional Neural Network Architecture for Despeckling OCT images, Biomedical Signal Processing and Control, Vol 66, pp : 1 – 14, 2021

23. Tojo Mathew, Jyothi Kini, **Jeny Rajan**, Computational Methods for Automated Mitosis Detection in Histopathology Images: A Review, Biocybernetics and Biomedical Engineering, Vol. 41, Issue 1, pp : 64 – 82, 2021.

24. Edwin Thomas, Pawan S. J, Shushant Kumar, Anmol Horo, S. Niyas, S. Vinayagamani, Chandrasekharan Kesavadas and **Jeny Rajan**, Multi-Res-Attention UNet : A CNN Model for the Segmentation of Focal Cortical Dysplasia Lesions from Magnetic Resonance Images, IEEE Journal of Biomedical and Health Informatics, Vol. 25 (5), pp : 1724 – 1734, 2021.

25. PV Sudeep , P Palanisamy , Chandrasekharan Kesavadas , **Jeny Rajan**, An lmproved nonlocal maximum likelihood estimation method for denoising magnetic resonance images with spatially varying noise levels, Pattern Recognition Letters, Vol 139, pp: 34-41, 2020.

26. Girish G.N, Abhishek R Kothari, **Jeny Rajan**, " Marker Controlled Watershed Transform for Intra-Retinal Cysts Segmentation from Optical Coherence Tomography B-Scans", Pattern Recognition Letters, Vol 139, pp: 86-94, 2020.

27. B N Anoop, Rakesh Pavan, G N Girish, Abhishek Kothari and **Jeny Rajan**, Stack Generalized Deep Ensemble Learning for Retinal Layer Segmentation in Optical Coherence Tomography Images, Biocybernetics and Biomedical Engineering, Vol. 40 (4), pp: 1343-1358, 2020.

28. K M Bijay Dev, Pawan S. Jogi, S. Niyas, S Vinayagamani, Chandrasekharan Kesavadas and **Jeny Rajan**, Automatic Detection and Localization of FCD Lesions in Magnetic Resonance Images using Fully Convolutional Neural Network, Biomedical Signal Processing and Control, Vol 52, pp : 218-225, July 2019.

29. Chetan L Srinidhi, Aparna P and **Jeny Rajan**, Automated Method for Retinal Artery/Vein Separation via Graph Search Metaheuristic Approach, IEEE Transactions on Image Processing Vol. 28(6), pp: 2705-2718, June 2019.

30. G. N Girish, Bibhash Thakur, Sohini Roy Chowdhury, Abhishek R. Kothari and **Jeny Rajan**, Segmentation of Intra-Retinal Cysts from Optical Coherence Tomography Images using a Fully Convolutional Neural Network Model, IEEE Journal of Biomedical and Health Informatics, Vol 23(1), pp: 296 - 304, 2019.

31. Yamanappa, P V Sudeep, M. K. Sabu, **Jeny Rajan**, Non-local Means Image Denoising using Shapiro-Wilk Statistical Similarity Measure, IEEE Access, Vol. 6, pp:66914-66922, 2018

32. Rani Oomman Panicker, Kaushik S Kalmady, **Jeny Rajan**, Sabu M K, "Automatic Detection of Tuberculosis Bacilli from Microscopic Sputum Smear Images using Deep Learning Methods", Biocybernetics and Biomedical Engineering, Vol 38,pp: 691-699, 2018.

33. Krishna Kumar P, Tadashi Araki, **Jeny Rajan**, John R Laird, Andrew Nicolaides Jasjit S Suri, " State-of-the-Art Review on Automated Lumen and Adventitial Border Delineation in Carotid Ultrasound", Computer Programs and Methods in Biomedicine, Vol 163, pp: 155-168, 2018.

34. Chetan L Srinidhi, Aparna P, **Jeny Rajan**, A visual attention guided unsupervised feature learning for robust vessel delineation in retinal images, Biomedical Signal Processing and Control, Vol. 44, pp: 110-126, July 2018.

35. Girish G.N, Anima V A, Abhishek R Kothari, Sudeep P. V, Sohini Roy, **Jeny Rajan**, A Benchmark Study of Automated Intra-retinal Cyst Segmentation Algorithms using Optical Coherence Tomography B-Scans, Computer Methods and Programs in Biomedicine , Vol 153, pp 105-114, 2018.

36. Nagaraj Y, Pardhu Madipalli, **Jeny Rajan**, P Krishna Kumar, A V Narasimhadhan, Segmentation of intima media complex from carotid ultrasound images using wind driven optimization technique, Biomedical Signal Processing and Control, Vol 40, pp: 462-472, 2018.

37. Jithin Gokul, Madhu S. Nair, **Jeny Rajan**, "Guided SAR Image Despeckling with Probabilistic Non Local Weights", Computers and Geosciences, Vol 109, pp: 16-24, Dec. 2017

38. Sujin Surendran S, **Jeny Rajan**, Madhu S Nair, "Rotation Invariant and Two-Level Filtering Approaches for Accelerating the Non-Local Maximum Likelihood Estimation for Rician Noise Reduction in MR Images", CSI Transactions on ICT (Springer), Vol 5, pp:247-257, 2017.

39. Chetan L Srinidhi, Aparna P, **Jeny Rajan**, "Recent advancements in retinal vessel segmentation", Journal of Medical Systems, Vol. 41, pp 70, 2017.

40. Sudeep P.V, Palanisamy P, C. Kesavadas, Jan Sijbers, Arjan den Dekker, **Jeny Rajan**, "A Nonlocal Maximum Likelihood Estimation Method for Enhancing Magnetic Resonance Phase Maps", Signal Image and Video Processing, Vol. 11, pp: 913:920, 2017.

41. Krishna Kumar P, Luca Saba, Tadashi Araki, **Jeny Rajan**, Francesco Lavra, Nobutaka Ikeda, Aditya M. Sharma, Shoaib Shafique, Andrew Nicolaides, John L Laird, Ajay Gupta, Jasjit S. Suri, "Accurate Lumen Diameter Measurement in Curved Vessels based on Iterative Spatial Transformation and Scale Space Techniques", Medical & Biological Engineering & Computing, pp 1:20, 2016.

42. Tadashi Araki, Krishna Kumar P, Harman S Suri, Nobutaka Ikeda, Ajay Gupta, Luca Saba, **Jeny Rajan**, Francesco Lavra, Aditya M. Sharma, Shoaib Shafique, Andrew Nicolaides, John L Laird, Jasjit S. Suri, "Two Automated Techniques for Carotid Lumen Diameter Measurement: Regional versus Boundary Approaches", Journal of Medical Systems, Vol. 40 (182), pp: 1:19, 2016.

43. P.V Sudeep, P Palanisamy, **Jeny Rajan**, Hediyeh Baradaran, Luca Saba, Ajay Gupta, Jasjit S Suri, "Speckle Reduction in Medical Ultrasound Images using an Unbiased Non-Local Means Method", Biomedical Signal Processing and Control, Vol 28, pp: 1-8, 2016.

44. Tadashi Araki, Asheed Kumar, Krishna Kumar P, Nobutaka Ikeda, Ajay Gupta, Luca Saba, **Jeny Rajan,** Francesco Lavra, Aditya M Sharma, Shoaib Shafique, Andrew Nicolaides, John R. Laird, , Jasjit S. Suri, "Ultrasound-Based Automated Carotid Lumen Diameter/Stenosis Measurement and its Validation System", Journal of Vascular Ultrasound, Vol 40 (3),pp 120-134, 2016.

45. P.V. Sudeep, S. Issac Niwas S, P. Palanisamy, **Jeny Rajan**, Yu. Xiaojun, Xianghong Wang, Yuemei Luo, Linbo Liu, Enhancement and Bias Removal of Optical Coherence Tomography Images: an Iterative Approach with Adaptive Bilateral Filtering, Computers in Biology and Medicine, Vol 71, pp 97-107, 2016.

46. Luca Saba, Tadashi Araki, Krishna Kumar, **Jeny Rajan**, Francesco Lavra, Nobutaka Ikeda, Aditya M Sharma, Shoaib Shafique, Andrew Nicolaides, John R Laird, Ajay Gupta, and Jasjit Suri, Carotid Inter-Adventitial Diameter is More Strongly Related to Plaque Score Than Lumen Diameter: An Automated Tool for Stroke Analysis, Journal of Clinical Ultrasound, Vol 44 (4), pp 210-220, 2016.

47. Adithya Upadhya,, Basavaraj Talawar, **Jeny Rajan**, "GPU implementation of Non Local Maximum Likelihood method for MRI denoising" Journal of Real Time Image Processing, Vol. 13, pp:181-192, 2017.

48. Rani Oomman Panicker, Biju Soman, Gagan Saini, **Jeny Rajan**, "A review of automatic methods based on image processing techniques for tuberculosis detection from microscopic sputum smear images", Journal of Medical Systems, Vol. 40,pp 1 - 13, 2016.

49. Aditya M.Sharma, Ajay Gupta, Krishna Kumar P, **Jeny Rajan**, Luca Saba, Ikeda Nobutaka, John R Laird, Andrew Nicolades, Jasjit S. Suri, "A Review on Carotid Ultrasound Atherosclerotic Tissue Characterization and Stroke Risk Stratification in Machine Learning Framework", Current Atherosclerosis Reports (Springer), Vol 17, pp 1: 13, 2015.
50. Krishna Kumar P, Darshan P, Sheethal Kumar, Rahul Ravindra, **Jeny Rajan**, Luca Saba, Jasjit S Suri, "Magnetic resonance image denoising using nonlocal maximum likelihood paradigm in DCT-framework", International Journal of Imaging Systems and Technology, Vol 25, pp 256 : 264, 2015.
51. Sudeep P.V, Palanisamy P, Chandrasekharan Kesavadas, **Jeny Rajan**, "Nonlocal Linear Minimum Mean Square Error Methods for Denoising MRI", Biomedical Signal Processing and Control (Elsevier) , Vol 20, pp 125-134, 2015.
52. Riji R, **Jeny Rajan**, Jan Sijbers, Madhu S Nair, " Iterative Bilateral Filter for Rician Noise Reduction in MR Images", *Signal, Image and Video Processing* , Vol 9, pp 1543-1548, 2015.
53. **Jeny Rajan**, Arnold J. den Dekker and Jan Sijbers, "A new non-local maximum likelihood estimation method for Rician noise reduction in magnetic resonance images using the Kolmogorov-Smirnov test ", *Signal Processing,* Vol 103, pp 16-23, 2014.

54. Jelle Veraart, **Jeny Rajan**, Ronald R. Peeters, Alexander Leemans, Stefan Sunaert, Jan Sijbers, " Comprehensive framework for accurate diffusion MRI parameter estimation ", *Magnetic Resonance in Medicine,* Vol. 81, issue 4, pp. 972-984, 2013.
55. **Jeny Rajan**, Jelle Veraart, Johan Van Audekerke, Marleen Verhoye and Jan Sijbers, "Nonlocal maximum likelihood estimation method for denoising multiple-coil magnetic resonance images", Magnetic Resonance Imaging, Vol 30, pp. 1512-1518, 2012.
56. Mai Zhenhua, **Jeny Rajan**, Marleen Verhoye, Jan Sijbers," Robust edge-directed interpolation of magnetic resonance images". Physics in Medicine and Biology,vol. 56, pp. 7287-7303, 2011.
57. **Jeny Rajan**, Ben Jeurissen, Marleen Verhoye, Johan Van Audekerke and Jan Sijbers, " Maximum likelihood estimation based denoising of magnetic resonance images using restricted local neighborhoods", Physics in Medicine and Biology,Vol 56, pp 5221-5234,2011.
58. **Jeny Rajan**, Dirk Poot, Jaber Juntu andJan Sijbers, "Noise Measurement from magnitude MRI using local estimates of variance and skewness", Physics in Medicine and Biology, Vol 55, pp N441-N449, 2010.
59. Jaber Juntu, Jan Sijbers, Steve De Baker, **Jeny Rajan**, Dirk Van Dyck, "A Machine Learning Study of Several Classifiers Trained with Texture Analysis Features to Differentiate Benign from Malignant Soft Tissue Tumors in T1-MRI images", Journal of Magnetic Resonance Imaging (JMRI), Vol 31,pp 680-689, 2010.
60. **Jeny Rajan,** K. Kannan, C. Kesavadas, Bejoy Thomas "Focal Cortical Dysplasia (FCD) Lesion Analysis with Complex Diffusion Approach, Computerized Medical Imaging and Graphics, Vol 33 pp 553-558, 2009.
61. **Jeny Rajan**, K. Kannan, M.R. Kaimal, "An Improved Hybrid Method for Molecular Image Denoising", Journal of Mathematical Imaging and Vision, Vol 31, pp 71-78, May 2008.

Conference Papers: 32
Book Chapters: 5

Citation Details

Google Scholar : https://scholar.google.co.in/citations?user=7YrGeNoAAAAJ&hl=en
Scopus : https://www.scopus.com/authid/detail.uri?authorId=23470813600
ResearcherID : http://www.researcherid.com/rid/G-9484-2011

Funded Research Projects

1. Project Title : Retinal cysts identification and quantification from low SNR optical coherence tomography scans using image processing techniques.
Role: **Principal Investigator**
Funding Agency : DST (SERB, EMR grant)
Sanctioned Amount : 35 Lahks
Collaborators: Pink City Eye and Research Center, Jaipur
Duration: 3 Years (March 2017 -March 2020) [Completed]

2. Project Title : Automatic detection and quantification of focal cortical dysplasia regions from magnetic resonance brain images using machine learning techniques.
Role : **Principal Investigator**
Funding Agency : CSRI, DST
Sanctioned Amount: Rs. 33 Lakhs
Collaborators : Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum.
Duration : 3 Years (August 2018 – August 2021) [Completed]

3. Project Title : Speaker recognition system for Kannada language in emotional environments.
Role : **Co- Principal Investigator**
Funding Agency : CSRI, DST
Sanctioned Amount : Rs. 42.3 Lakhs
Duration : 3 Years (March 2021 – March 2024) [Ongoing]

4. Project Title : Development of an Artificial Intelligence based System for Comprehensive Cerebral Arterial Stroke Imaging and Prognostication.
Role : **Principal Investigator**
Funding Agency : DBT
Sanctioned Amount: Multi Institutional Project, Total Cost : 69.2 lakhs
Collaborators : Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum., IIT Patna.
Duration : 3 Years (March 2021 – March 2024) [Completed]

5. Project Title : Automatic Early Detection of Lung Cancer From LDCT Images Based On Deep Neural Networks.
Role : **Co- Principal Investigator**
Funding Agency : SERB, DST (CRG)
Sanctioned Amount : Rs. 28.5 Lakhs
Collaborators : JSS Medical College, Mysore
Duration : 3 Years (March 2023 – March 2026) [Ongoing]

Other Projects and collaborators: (i) Head & Neck Tumor quantification from CT images (with CMC, Vellore), (ii) Automated dental implant planning using AI techniques (Manipal College of Dental Sciences, Mangalore) (iii) On farm diagnosis of pomegranate diseases through computer vision (with NRCP Solapur and IIHR Bangalore)

PhD Thesis Guided: 6 (Completed), 6 (Ongoing)

M.Tech Thesis Guided : 45 (Completed), 5 (Ongoing)

B.Tech Thesis Guided : 30 (Completed), 3 (Ongoing)

(Jeny Rajan)