Praveen Gurunath Bharathi

Contact Information

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Research Gate, University Link, Research Group

Research Interests

Medical Image processing, Deep Learning, Computer Vision and Biomedical Instrumentation.

Research Experience

Research Associate July 2019 to Present

Division of Informatics, Imaging & Data Sciences, Faculty of Biology, Medicine and Health,
The University of Manchester, Manchester, United Kingdom.
Advisors: Prof. Chris Taylor & Prof Ariane Herrick

Scope of work: Development of an inexpensive imaging and automated analysis system to support early diagnosis of Systemic Sclerosis.

Description: Developing a deep learning based framework for stitching video frames to create a high resolution mosaic image. The video frames are captured from a hand held nailfold capillaroscopy cameras from a group of patients with systemic sclerosis and a group with primary Raynaud′s. Using these stitched image mosaics to make reliable measurements of capillary appearance and computing the likelihood of systemic sclerosis based on the vessel morphology measurements. An end-to-end deep learning based system is developed using UNet and ResNet to extract the features at each stage and classify the extracted capillaries into separate class. A logistic regression model is stacked on the top of the deep learning based system which performs subject level discrimination between the systemic sclerosis and healthy controls.

Research Scholar January 2013 to December 2018

Department of Electrical and Electronics Engineering,
BITS PILANI- K.K Birla Goa Campus, Goa, India.
Supervisor: Prof. Anita Agrawal

Scope of work: Development of an Automated Intelligent Decision Support System for Multiple Brain Disorder (brain tumor, ischemic stroke and cerebral hemorrhage) Diagnosis from MRI Scans.

Description: Developed five-layered stacked sparse auto encoder (SSAE) frame - work for patch-based classification of an image into normal or abnormal. If abnormality is found, sub-classification into brain tumor, ischemic stroke and cerebral hemorrhage is carried out. Brain tumor detection and multi stage classifica -tion into glioma and meningioma is carried out using textural feature extraction and supervised classification. Unsupervised feature extraction based on k-means clustering is designed to detect the ischemic stroke lesions from MR scans. Location and structural feature extraction methodology is used for cerebral hemorrhage classification into Intra Cerebral Hemorrhage (ICH) and Sub Dural Hemorrhage (SDH). The overall intelligent system is designed as a three-layered and three-class classification problem.

Handled undergraduate labs such as Electronic Instruments and Instrumentation Technology lab, Analog Electronics lab, Digital Design lab.

Project Intern June 2010 to August 2011

Department of Aerospace Engineering, Indian Institute of Science (IISc), Bangalore, India.

Scope of work: Analysis of strain distribution in the Human body parts using 3D Digital Image Correlation.

Analysis of ECG signals during Yoga using MATLAB.
Analysis of EEG signals during BhramariPranayama (BhPr) using MATLAB.
Analysis of Calf muscle stretch during leg dorsiflexion using Ultrasound Images.
Advisor: Dr. S.N.Omkar

Education

Doctor of Philosophy Jan 2013 - Aug 2019
Electrical and Electronics Engineering.
BITS PILANI - K.K Birla Goa Campus, Goa, India.

- Thesis: ***Development of an Automated Intelligent Decision Support System for Multiple Brain Disorder Diagnosis from MRI Scans.***
- Advisor: Prof. Anita Agrawal

Master of Technology Sep 2009 - Oct 2011
Biomedical Signal Processing and Instrumentation, Percentage: 72.66/100
R V College of Engineering, Bangalore, India

- Thesis: ***Application of 3D Digital Image Correlation in Biomechanics for human strain studies.***
- Advisors: N.K. Jayasimhan and Dr. S.N. Omkar

Bachelor of Engineering Aug 2005 - Jun 2009
Computer Science Engineering, Percentage: 55.00/100
N.M.A.M. Institute of Technology, Nitte, India

- Major Project: ***Principal Component Analysis (PCA) based Face Recog -nition using Asp.net and c#.***

Journal Publications

1. **G.B. Praveen**, Anita Agrawal, Ponraj Sundaram, Sanjay Sardesai, "Ischemic stroke lesion segmentation using stacked sparse autoencoder", ***Computers in Biology and Medicine***, vol. 99, pp. 38-52, 2018. (SCI, Impact Factor: 4.589)
2. **Praveen G.B**, Anita Agrawal, Ponraj Sundaram, Sanjay Sardesai, "Combination of hand-crafted and unsupervised learned features for predicting ischemic stroke lesions from Magnetic Resonance Images", ***Biocybernetics and Biomedical Engineering***, vol. 39, no. 2, pp. 410-425, 2019. (SCIE, Impact Factor: 4.314)
3. **Praveen G.B**, Anita Agrawal, Shrey Pareek, Amalin Prince, "Brain abnormality detection using template matching", ***Bio-Algorithms and Med-Systems***, vol. 14, no.4, pp. 1-10, 2018. (Scopus)
4. **Praveen G.B**, S. Raghavendra, Victor IC Chang, "An Analysis of Leg Muscle Stretch Using 3D Digital Image Correlation", ***International Journal of Organizational and Collective Intelligence (IJOCI)***, vol. 7, no. 3, pp. 30-43, 2017.

Conferences Publications

1. **Praveen G.B**, Anita Agrawal, Jainam Shah, Amalin Prince, "MediCloud: Cloud-based solution to patient's medical records", *Proceedings of the International Conference on ISMAC in Computational Vision and Bio-Engineering 2018 (ISMAC-CVB). ISMAC 2018. Lecture Notes in Computational Vision and Biomechanics*, vol. 30, pp. 1099-1109, 2018, Springer.(Scopus)
2. **Praveen G.B**, Anita Agrawal, "Multi-stage Classification and segmentation of brain tumor", 3^{rd} *IEEE International Conference on Computing for Sustainable Global Development (INDIACom)*, pp. 1628-1632, 2016. (Scopus)
3. **Praveen G.B**, Anita Agrawal, "Hybrid approach for brain tumor detection and classification in magnetic resonance images", *IEEE International conference on Communication, Control and Intelligent Systems (CCIS)*, pp. 162-166, 2015.

Accepted Manuscripts

- "Development of an automated deep learning-based system for distinguishing between systemic sclerosis and normal capillaries" accepted for oral presentation at *British Society for Rheumatology Annual Conference 2022, Glasgow SEC.*

Training Events and Summer Schools

- ***Essential Instrumentation for Health Monitoring***, organized by the Instrument Society of India at the Department of Instrumentation, Indian Institute of Science, Bangalore.
- ***Medical Imaging*** organized by the Instrument Society of India at the Department of Instrumentation, Indian Institute of Science, Bangalore.
- ***Challenges of Futuristic Systems*** organized by the Department of Aerospace Engineering, Indian Institute of Science, Bangalore.
- ***Medical Image Computing*** Organized by the Department of Computer Science and Engineering, National Institute of Technology Karnataka, Suratkal.
- ***Soft-Computing in Healthcare Applications*** hosted by the Department of Biomedical Engineering, Manipal Institute of Technology, Manipal.
- ***Microsoft Azure (Microsoft cloud Service)*** conducted by Microsoft India at BITS PILANI – K.K Birla Goa Campus, Goa.

Software Skills

Computer Programming: Python, MATLAB, C, C++, Labview.
Libraries: Scikit-learn, OpenCV, LaTeX.

Patents Filed

- Anita Agrawal, Sham Nayse and **Praveen G.B.**, "Ergonomic sit right chair: A smarter way to fit the worker to the job", Indian patent application: 201621014740, filed 28^{th} April 2016 (Patent pending).
- Anita Agrawal, Sham Nayse and **Praveen G.B.**, "Intelligent system for retinal disease diagnosis", Indian patent application: 201621014739, filed 28^{th} April 2016 (Patent pending).

Certifications

- "Image and video processing: From Mars to Hollywood with a stop at the hospital", Coursera online course, Duke University.
- "Advanced Course in .NET Technologies", Three months online course, National Institute of Electronics and Information Technology (NIELIT), Calicut, Kerala, India.

Associate Editor

- Human-centric Computing and Information Science (HCIS)

Peer Reviewer

- IEEE Transactions on Cybernetics, IEEE.
- IEEE Journal of Biomedical and Health Informatics, IEEE.
- IEEE Access, IEEE.
- Future Generation Computer Systems, Elsevier.
- Journal of Digital Imaging, Springer.
- Human-centric Computing and Information Sciences, Springer.
- Computers in Biology and Medicine, Elsevier.
- International Journal of Imaging Systems & Technology, Wiley.
- Informatics in Medicine Unlocked, Elsevier.
- Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020,2021.
- Machine Learning for Health (ML4H) workshop at NeurIPS, 2020,2021.

Invited Talks

- "**Deep Learning in Medical Image Analysis**" at Dayananda Sagar University, Bangalore Institute of Technology and Siddaganga Institute of Technology, India