CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE

Notice for the PhD Viva Voce Examination

Mr Alwin Joseph, Registration Number: 2170226, PhD Scholar at the Department of Computer Science, School of Sciences, CHRIST (Deemed to be University) will defend his PhD thesis at the public viva-voce examination on Tuesday, 19 May 2026 at 10.30 am in Room No. 628, 6th Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Artificial Intelligence Based Brain Stroke Classification Using Multi-Modal MRI**
Discipline	:	**Computer Science**
External Examiner - I	:	**Dr Sunil Kumar C** Sr Director Department of Data Science and AI Maersk Global Service Centres (India) Private Ltd Thanisandra Main Road, Kannuru Bengaluru - 560064 Karnataka
External Examiner - II	:	**Dr Neelam Chaplot** Associate Professor Department of Computer Science and Engineering Manipal University Jaipur Jaipur-Ajmer Express Highway Dehmi Kalan, Near GVK Toll Plaza Jaipur - 303007 Rajasthan
Supervisor	:	**Dr Chandra J** Professor Department of Computer Science School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva–voce examination.

Registrar (Academics)

Place: Bengaluru
Date: 11 May 2026

ABSTRACT

Stroke is one of the leading causes of high mortality rates and long-term neurological damage worldwide. There is a need for an accurate, automated, and interpretable neuroimaging framework to support rapid clinical decision-making at the earliest stages. Magnetic Resonance Imaging (MRI) is one of the imaging techniques used to analyze stroke and its effects on brain tissue. MRI modalities such as Fluid-Attenuated Inversion Recovery (FLAIR), Diffusion-Weighted Imaging (DWI), and Apparent Diffusion Coefficient (ADC) provide complementary diagnostic information that enables detailed assessment of ischemic lesions. The current research proposes a deep learning–based multimodal MRI-based stroke segmentation and classification framework - M3Stroke-Net. The novelty of the proposed framework lies in the unified integration of various phases for multimodal data, including adaptive registration and preprocessing, deep learning-based segmentation, feature extraction, and classification for stroke lesions. To achieve multimodal consistency and improve data quality, two dedicated preprocessing algorithms were developed. Select suitable Image Registration Technique (SUIRT), an algorithm that computes optimal alignment of multimodal data with the help of various transformations, and Select Suitable Preprocessing from Bias field correction, Intensity Normalization, and Filtering Technique (MRI-SPBi2), an algorithm for adaptive normalization, noise reduction, and bias field correction based on quantitative image quality evaluation. The preprocessed MRI modalities are used as the inputs to a 3D Fully Convolutional Network, which is designed to extract local and global anatomical features from MRI through encoder–decoder convolutional layers with instance normalization and skip connections. The segmentation model is trained and validated on multimodal stroke MRI data that was part of the Ischemic Stroke Lesion Segmentation challenge. The segmentation model in the current framework M3Stroke-Net have dice similarity coefficient of 0.7823, Jaccard index value of 0.6423, and Harsdorf distance of 13.90. The results from segmentation confirm that the model can segment stroke lesions with high boundary accuracy. Post- segmentation, a feature extraction and lesion profiling algorithm extracts and quantifies clinically relevant parameters, which include lesion volume, vascular territory involvement, laterality, cortical–subcortical distribution, and extent of lesion spread, and provides lesion-based classification to support clinical assessment and prognosis. The experimental results obtained using the current framework - M3Stroke-Net significantly improves multimodal lesion segmentation and provides clinical interpretability through feature extraction and lesion-based stroke assessment and classification.

Keywords: *Stroke, Multimodal MRI, Diffusion Weighted Imaging, Apparent Diffusion Coefficient, Fluid-Attenuated Inversion Recovery, MRI Preprocessing Pipeline, 3D U-Net, Lesion Segmentation, Deep Learning, Stroke Prognosis, ISLES.*

Publications:

1. **Joseph, Alwin** and J, Chandra (2025) "A Novel Preprocessing Model for Multi-Modal Brain MRI Image Classification for Stroke Prognosis," Northeast Journal of Complex Systems (NEJCS): Vol. 7: No. 1, Article 4. DOI: 10.22191/nejcs/vol7/iss1/4
2. **Joseph, A.**, Chandra, J., Banerjee, B., Rangaswamy, M. and Reddy, K.J., 2024. Applications of Machine Learning and Deep Learning Models in Brain Imaging Analysis. Machine Learning and Deep Learning in Neuroimaging Data Analysis, pp.43-56.
3. Malviya, M., Joseph, A., Chandra, J. and Pooja, V., 2024. Role of Artificial Intelligence in Neuroimaging for Cognitive Research. In Machine Learning and Deep Learning in Neuroimaging Data Analysis (pp. 91-108). CRC Press.
4. Preema, P.Y., Chandra, J. and Joseph, A., 2023. A Review on Multi-Modal Classification for Emotional Intelligence. Engineering, Science, and Sustainability, pp.118-122.
5. **Joseph, A.** and Jayaraman, C., 2023. Preprocessing techniques for neuroimaging modalities: An in-depth analysis. In Frontiers in Neuroimaging. IntechOpen.
6. Chandra, J., Rangaswamy, M., Banerjee, B., Prajapati, A., Akhtar, Z., Sakauye, K. and Joseph, A., 2022. Applications of artificial intelligence to neurological disorders: current technologies and open problems. In Augmenting Neurological Disorder Prediction and Rehabilitation Using Artificial Intelligence (pp. 243-272). Academic Press.