KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION (KARE)

Ph.D. Application.

<u>Annexure I</u>

ResearchProposal

Title: AnAI-DrivenMulti-MedicalImageDenoisingFrameworkforEnhancedImageQuality and Diagnostic Precision

1. Background of the Study: Medical imaging techniques such as MRI, CT, Ultrasound, and X-rayplayavitalroleindiagnosisandtreatmentplanning.However,theseimagesoftensuffer from noise during acquisition or transmission, which reduces clarity and diagnostic accuracy. The proposed research focuses on designing an AI-based framework to denoise medical images effectively while preserving essential diagnostic features.

2. ProblemStatement: Existingdenoisingmethodsfailtomaintaindiagnosticdetailand generalize across modalities. There is a need for a unified, intelligent system capable of reducing noise while preserving critical structures in multiple imaging types.

3. ObjectivesoftheStudy: Todevelopamulti-modalAI-drivenimagedenoisingframework adaptable to various imaging techniques.
• To integrate deep learning with modality-specific priors for improved image reconstruction.
• To enhance diagnostic precision by maintaining anatomical and textural integrity.
• To ensure robustness under different noise levels and imaging conditions.

4. Methodology: The study will employ deep learning-based denoising architectures using convolutionalandtransformer-basedmodels.Self-supervisedandadaptivelearningstrategies will be used to train the model without requiring clean reference images. Evaluation will be done using quantitative image quality metrics (PSNR, SSIM) and clinical feedback.

5. ExpectedOutcome: Theproposedframeworkisexpectedtoenhancemedicalimage clarity,preservediagnosticinformation,andimproveaccuracyindiseasedetection— contributing to better clinical decision-making and reducing repeat scans.

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