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Lightweight Deep Learning-Based Alzheimer's Detection Using MobileNetV2 and Grad-CAM: A Comprehensive Review

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Abstract: *This review paper surveys the use of lightweight deep learning approaches for detecting Alzheimer's disease from structural brain imaging data. Recent studies demonstrate that computationally efficient convolutional neural network architectures can classify different stages of cognitive impairment while significantly reducing model complexity and memory requirements. Explainable artificial intelligence techniques have been increasingly employed to generate visual explanations that highlight brain regions influencing diagnostic predictions. This review discusses the evolution of lightweight deep learning models, identifies key challenges such as limited data availability, computational constraints, and lack of interpretability, and highlights existing research gaps. Finally, a conceptual framework integrating lightweight deep learning models with visual explanation techniques is discussed to balance diagnostic accuracy, transparency, and clinical applicability for early disease screening.*

Keywords: Alzheimer's Disease, MobileNetV2, Lightweight Models, Grad-CAM, Explainable AI, Neuroimaging

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