Review of: "An Improved Hybrid Transfer Learning-Based Deep Learning Model for Alzheimer's Disease Detection Using CT and MRI Scans"

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Potential competing interests: No potential competing interests to declare.

The authors presented a study on the use of deep learning models for the detection and classification of Alzheimer's Disease (AD) stages using CT and MRI scans. The paper focuses on using transfer learning with ResNet50, VGG16, and DenseNet121 along with CNN networks on a large dataset. The study claims significant improvements in accuracy compared to previous approaches, with a final accuracy of 96.6%.

Here are my academic criticisms, limitations, and recommendations:

Strengths:

1. The model achieves a high accuracy rate, which is promising for early detection of Alzheimer's Disease.
2. The application of transfer learning using pre-trained models like VGG16, DenseNet121, and ResNet50 is a novel approach in this field.
3. The study's approach to classifying AD into various stages using a combination of different models is comprehensive and shows a deep understanding of the problem.
4. The use of advanced deep learning techniques and the integration of multiple models demonstrate a sophisticated approach to medical image analysis.

Limitations and Shortcomings:

1. The study uses the ADNI dataset, which, while comprehensive, may not represent the global population. The generalizability of the model to other datasets or demographic groups is not discussed.
2. The use of complex models like VGG16, DenseNet121, and ResNet50 can lead to issues with interpretability. Understanding how these models make decisions is crucial in a clinical setting.
3. The study primarily focuses on one dataset. Validation of independent datasets is essential to establish the robustness of the model.
4. The paper does not discuss how this model could be integrated into clinical workflows or its compatibility with existing medical imaging systems.
5. There is no discussion on the long-term performance of the model, including how it adapts to new data over time or its scalability.

The study would benefit from addressing the limitations related to dataset diversity, model interpretability, and clinical integration. The authors should focus on validating the model across different populations, enhancing model transparency, and assessing its practicality in clinical environments.