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# Deep Learning-Based Alzheimer's Disease Classification using Transfer Learning and Data Augmentation

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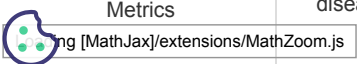
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**Abstract:**

Alzheimer's disease is a pressing healthcare concern worldwide, highlighting the importance of early and accurate detection. Deep learning models, particularly those utilizing transfer learning, have shown promise for AD classification. This research study explores the effectiveness of transfer learning in training models based on deep learning for the classification of Alzheimer's condition. We trained several transfer models using DenseNet121, InceptionV3, Xception, and ResNet101. Based on performance evaluation, InceptionV3 was selected as the base model, outperforming in comparison to the accuracy of the other models. To enhance the accuracy of the InceptionV3 base model, we added capacity, tuned hyperparameters using Keras tuner, and utilized data augmentation techniques. The final model was trained on the Kaggle Alzheimer's Dataset, consisting of 4 classes of images, and achieving an AUC value of 87%. Our research demonstrates that transfer learning and other data augmentation approaches are useful in improving the accuracy of deep learning models for the categorization of Alzheimer's condition. This research has practical implications for improving public health outcomes, facilitating timely intervention and effective treatment. It contributes to the development of more accurate diagnostic tools for AD and can help address the challenges associated with this disease.

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### I. Introduction

Alzheimer's disease has an impact on the lives of millions of individuals as well as their families, which is a serious public health concern worldwide. A loss of independence and function is the final result of the condition, which is marked by cognitive decline, memory loss, and behavioral problems that deteriorate over time [1]. For effective treatment and intervention to stop the progression of the disease and enhance the quality of life for patients and their caregivers, early and correct diagnosis is essential.

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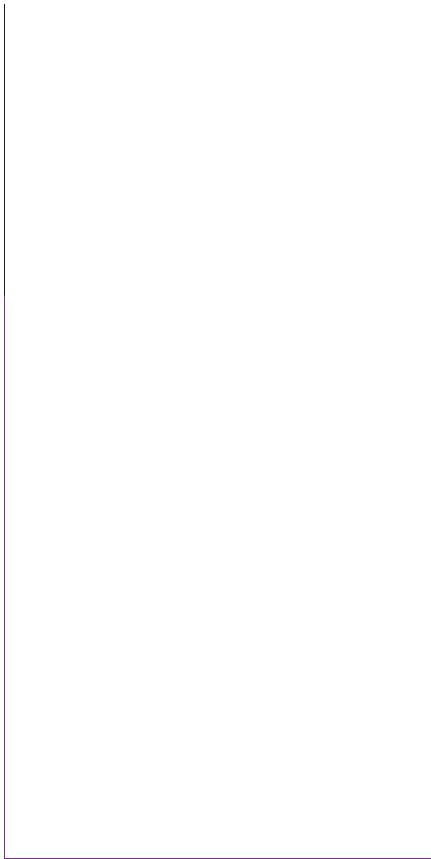Published: 2023

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