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A Custom Convolutional Neural Network Model-Based Bioimaging Technique for Enhanced Accuracy of Alzheimer's Disease Detection

D. Rohan, S. M. Abdul Kareem, G. Pradeep Reddy, Y. V. Pavan Kumar, K. Purna Prakash, J. Malathi
Corresponding Author: Y. V. Pavan Kumar **Email ID: pavankumar.yv@vitap.ac.in**

INTRODUCTION & AIM

- Alzheimer's disease (AD) is a progressive neurological disorder that significantly impairs memory, behavior, and cognitive function, affecting millions worldwide.
- The growing prevalence of AD among the aging population highlights the critical need for early and accurate detection to enable timely intervention.
- While deep learning-based bioimaging has shown potential in medical image classification, challenges remain in achieving optimal accuracy for AD detection.
- This paper proposes a custom CNN designed to enhance feature extraction from medical images, addressing the limitations of models like ResNet50, VGG19, InceptionV3 and AlexNet.

METHOD

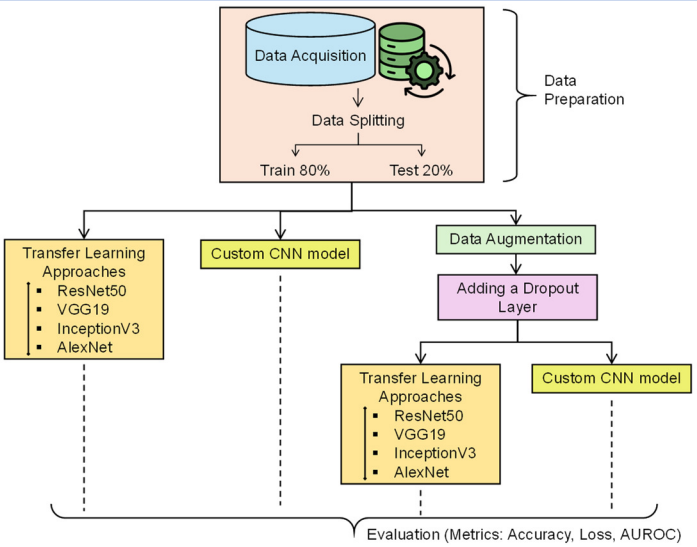
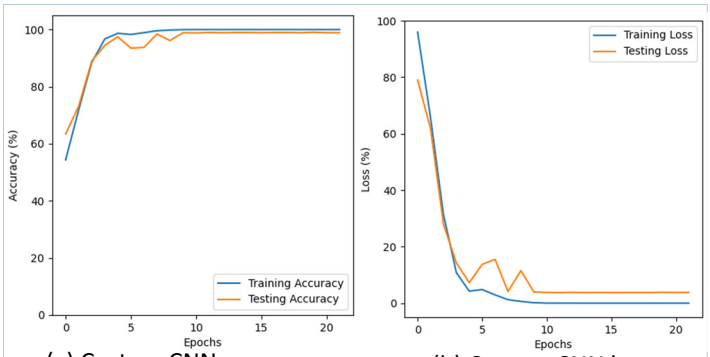


Fig. 1. Experimental workflow for AD detection

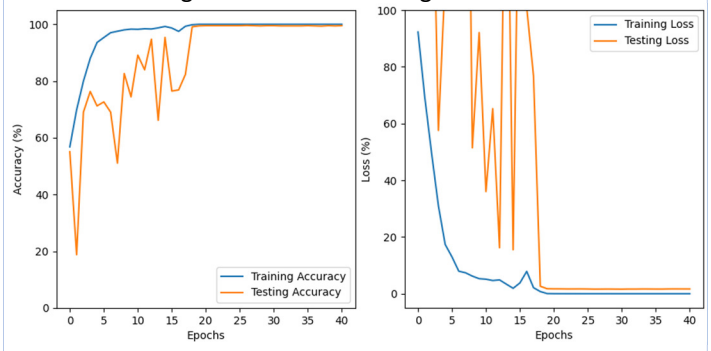
RESULTS & DISCUSSION

- Figure 1 illustrates the research methodology. Initially, four pre-existing DL models (ResNet50, VGG19, InceptionV3, and AlexNet) were chosen, along with a custom CNN model.
- ResNet50, InceptionV3, and custom CNN model achieved testing accuracies of 96.25%, 98.91%, and 99.53%, with losses of 0.1387, 0.0312, and 0.0214, before augmentation.
- After augmentation, InceptionV3 and custom CNN model achieved 98.89% and 99.79% testing accuracies, losses of 0.0536 and 0.0205. Key results are shown in Fig.2 and Fig.3.



(a) Custom CNN accuracy (b) Custom CNN loss

Fig. 2. Results before augmentation



(a) Custom CNN accuracy (b) Custom CNN loss

Fig. 3. Results after augmentation

CONCLUSION AND FUTURE SCOPE

- This paper proposed a custom CNN model for Alzheimer's detection, achieving 99.79% accuracy and outperforming traditional models.
- Future research shall focus on validating the model on diverse datasets and exploring its integration with other diagnostic modalities.

KEY REFERENCES

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