

SPECIMEN FORMAT FOR THESIS OF MONTH

Faculty : S.Chithra

Department : Computer Science

Branch/ Area: : Machine Learning

Sub Subject Heading: : -

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Title of the thesis : A Framework for Developing an Enhanced Convolutional Neural Network-based Ensemble Learning Model for early detection of Alzheimer's Disease Classification using MRI Brain Images

(i) In Roman Script -

(ii) In roman Script -

Nomenclature of Degree: : Ph.D

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Month &Year of Award : August,2025

Name of Supervisor : Dr.R.Vijayabhanu

Designation of Supervisor : Associate Professor

Centre/department/school in which research was conducted : Computer Science, Department of Physical Sciences and Computer Science

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Abstract within 300 words:

The integration of machine learning techniques in the imaging domain is experiencing a deep transformation. It enables systems to analyze massive amounts of data, distinguish patterns, and make forecasts with minimal human intervention. Machine learning is applied to various domains in the healthcare sector like disease diagnostics, treatment planning, drug detection, and patient management. In medical imaging, ML models can examine MRIs and X-rays to identify irregularities with high accuracy, often surpassing human capabilities.

This study focuses on brain neuron images for classifying Alzheimer's Disease (AD) stages, aiding neurologists in understanding complex brain changes. Through brain imaging analysis, it aims to diagnose AD in its early stages. AD is a degenerative brain ailment caused by neuron degeneration, impairing memory and cognition, leading to dementia in the elderly. Computational techniques like ML and DL are used to analyze brain images, identifying patterns and features related to AD.

The objective is to enhance classification of AD stages using ML and DL methods derived from an ensemble classification framework. The research focuses on preprocessing to remove noise from brain neuron MRIs using de-noising filters, improving image quality and classification performance. Segmentation is applied for skull removal using thresholding to obtain a clear brain structure. To address class imbalance, a transfer learning approach is adopted for feature extraction. Features are retrieved from CNN using the AlexNet model.

Classification is performed using Decision Tree (DT), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), NeuroEvolution of Augmenting Topologies (NEAT), and BAGGING. Two hybrid techniques are proposed: BAGGING_SVM, combining BAGGING and SVM; and BAGGING_NEAT, combining BAGGING and NEAT, for accurate AD stage classification.

i) Major objectives :

- Improve AD stage classification using ML/DL ensemble.
- Enhance MRI quality via noise removal.
- Perform skull removal for clear brain structure.
- Use transfer learning (AlexNet) for feature extraction.
- Develop BAGGING_SVM & BAGGING_NEAT classifiers.

ii) Hypothesis:

Preprocessing + transfer learning + hybrid ensembles will outperform single models in AD stage classification.

iii) Methodology :

- Preprocess MRIs (denoise, skull removal).
- Extract features via AlexNet.
- Classify using DT, KNN, SVM, NEAT, BAGGING, BAGGING_SVM, BAGGING_NEAT.
- Evaluate accuracy and other metrics.

iv) Findings:

- i)** Preprocessing improved image clarity.
- ii)** AlexNet boosted feature quality for imbalanced data.
- iii)** BAGGING_NEAT achieved highest accuracy.

Examiners

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