

Department of Computer Science and Engineering
Bangladesh University of Business and Technology (BUBT)



CSE 498: Literature Review Records

Student's Id and Name	17183103004, Mohammad Sabbir Ahmed
Capstone Project Title	Single Deep CNN Features to Detect Neurodegenerative Diseases and Context Behind the Detection: Alzheimer's, Parkinson's, Dementia disease.
Supervisor Name & Designation	Milon Biswas, Assistant Professor, Dept. of CSE, BUBT.
Course Teacher's Name & Designation	Dr. M. Firoz Mridha, Chairman & Associate Professor, Dept. of CSE, BUBT.

Aspects	Paper # 1
Title / Question (What is the problem statement?)	Convolutional neural networks for classification of Alzheimer's disease: Overview and reproducible evaluation.
Objectives / Goal (What is looking for?)	<p>They found 3 problems and their goal is to solve these problems:</p> <ol style="list-style-type: none">1.The classification performance is difficult to compare across studies due to variations in components such as participant selection, image preprocessing, or validation procedure.2.These studies are hardly reproducible because their frameworks are not publicly accessible and because implementation details are lacking.3.Some of these papers may report a biased performance due to inadequate or unclear validation or model selection procedures.
Methodology/Theory (How to find the solution?)	They proposed a solution:

	<p>1. Performed a systematic literature Review. To do so, they Identified four main types of approaches:</p> <ul style="list-style-type: none"> i) 2D slice-level, ii) 3D patch-level, iii) ROI-based and iv) 3D subject-level CNN <p>2. Their second contribution is the extension of an open-source framework for the classification of AD using CNN and T1-weighted MRI. The framework comprises previously developed tools to automatically convert ADNI, AIBL, and OASIS data into the BIDS standard, and a modular set of image preprocessing procedures, classification architectures, and evaluation procedures dedicated to deep learning.</p> <p>3. Finally, they used this framework to rigorously compare different CNN architectures.</p>
Software Tools (What program/software is used for design, coding, and simulation?)	<p>image preprocessing procedures were implemented with Nipype, The DL models were built using the Pytorch library, TensorboardX was embedded into the current framework to dynamically monitor the training process. The linear SVM was implemented using Scikitlearn</p>
Test / Experiment How to test and characterize the design/prototype?	
Simulation/Test Data (What parameters are determined?)	
Result / Conclusion (What was the final result?)	
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	

Terminology (List the common basic words frequently used in this research field)	Convolutional neural network Reproducibility Alzheimer's disease classification Magnetic resonance imaging
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision on how to use/refer to the obtained knowledge to prepare a separate and new methodology for your own research project)	

Aspects	Paper # 2
Title / Question (What is the problem statement?)	Classification of MRI images for Alzheimer's disease detection
Objectives / Goal (What is looking for?)	To develop an early diagnosis, which would allow people with dementia to plan ahead while they still have the capacity to make important decisions about their future care as well as it would allow them to access available drug and non-drug therapies that may improve their cognition and enhance their quality of life.
Methodology/Theory (How to find the solution?)	
Software Tools (What program/software is used for design, coding, and simulation?)	SPM5 toolbox, MATLAB,
Test / Experiment How to test and characterize the design/prototype?	

Simulation/Test Data (What parameters are determined?)	They used ADNI Dataset
Result / Conclusion (What was the final result?)	This paper deals with the important challenge of identification of Alzheimer's disease and the condition prior to dementia which is Mild Cognitive Impairment (MCI), developing intelligent classifiers, which using the information of magnetic resonance imaging, can successfully classify different patients according to their condition
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	They identified the identification of Alzheimer's disease and the condition prior to dementia which is Mild Cognitive Impairment (MCI) as a challenge for them.
Terminology (List the common basic words frequently used in this research field)	Support Vector Machine (SVM); Alzheimer's Disease; Mild Cognitive Impairment (MCI); PCA; Wavelets; MRI
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision on how to use/refer to the obtained knowledge to prepare a separate and new methodology for your own research project)	

Aspects	Paper # 3
Title / Question (What is the problem statement?)	A CNN based framework for classification of Alzheimer's disease.
Objectives / Goal (What is looking for?)	
Methodology/Theory (How to find the solution?)	
Software Tools (What program/software is used for design, coding, and simulation?)	Google Colab, Python, Kears package for deep learning, ReLU, SoftMax
Test / Experiment How to test and characterize the design/prototype?	
Simulation/Test Data (What parameters are determined?)	
Result / Conclusion (What was the final result?)	<p>Their proposed framework achieved 99.6%, 99.8%, and 97.8% classification accuracies on Alzheimer's disease Neuroimaging Initiative (ADNI) dataset for the binary classification of AD and Cognitively Normal (CN).</p> <p>In multi-classification experiments, the proposed framework achieved 97.5% classification accuracy on the ADNI dataset</p>
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	

Terminology (List the common basic words frequently used in this research field)	AD-classification, Convolutional neural network (CNN), Magnetic resonance imaging (MRI), Adaptive momentum estimation (Adam), Glorot uniform weight initializer
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision how to use/refer the obtained knowledge to prepare a separate and new methodology for your own research project)	

Aspects	Paper # 4
Title / Question (What is the problem statement?)	Detection of Parkinson Disease in Brain MRI using Convolutional Neural Network.
Objectives / Goal (What is looking for?)	
Methodology/Theory (How to find the solution?)	.
Software Tools (What program/software is used for design, coding, and simulation?)	software package to convert DICOM-to-JPEG, MATLAB,
Test / Experiment How to test and characterize the design/prototype?	

Simulation/Test Data (What parameters are determined?)	They used PPMI Dataset which contains 250 MRI scans of PD while 250 for HC. Furthermore, these data are divided into training, validation and testing sets with a ratio of 70%, 10%, and 20% respectively.
Result / Conclusion (What was the final result?)	
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	During the experimentation, they found that the limited dataset was a major issue, leading the CNN model towards overfitting.
Terminology (List the common basic words frequently used in this research field)	Parkinson Disease, MRI, Deep Learning, Convolutional Neural Network, CNN
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision how to use/refer the obtained knowledge to prepare a separate and new methodology for your own research project)	

Aspects	Paper # 5
Title / Question (What is the problem statement?)	Automated MRI-Based Deep Learning Model for Detection of Alzheimer's Disease Process*
Objectives / Goal (What is looking for?)	
Methodology/Theory (How to find the solution?)	
Software Tools (What program/software is used for design, coding, and simulation?)	Think Server TS560, UBUNTU, Python , TensorFlow, Keras,
Test / Experiment How to test and characterize the design/prototype?	
Simulation/Test Data (What parameters are determined?)	<p>They used the ADNI Dataset.</p> <p>They randomly assigned the samples according to the proportion of 85% in the training group and 15% in the validation group and ensured that the proportion of patients in the two groups was similar</p>
Result / Conclusion (What was the final result?)	
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	
Terminology	

(List the common basic words frequently used in this research field)	
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision how to use/refer the obtained knowledge to prepare a separate and new methodology for your own research project)	

Aspects	Paper # 6
Title / Question (What is the problem statement?)	Deep learning to differentiate parkinsonian disorders separately using single midsagittal MR imaging: a proof of concept study
Objectives / Goal (What is looking for?)	To evaluate the diagnostic performance of deep learning with the convolutional neural networks (CNN) to distinguish each representative parkinsonian disorder using MRI
Methodology/Theory (How to find the solution?)	They used CNN to find the solution.
Software Tools (What program/software is used for design, coding, and simulation?)	Python, Keras, EZR software ver. 1.33 for statistical analyses
Test / Experiment How to test and characterize the design/prototype?	They trained the CNN to distinguish each parkinsonian disorder using single mid-sagittal T1-weighted MRI with a training group to minimize the differences between predicted output probabilities and the clinical diagnoses; then, we adopted the trained CNN to the validation data set.

Simulation/Test Data (What parameters are determined?)	
Result / Conclusion (What was the final result?)	<p>The accuracy of diagnostic performances regarding PD, PSP, MSA-P, and normal subjects were 96.8, 93.7, 95.2, and 98.4%, respectively.</p> <p>The areas under the receiver operating characteristic curves for distinguishing each condition from others (PD, PSP, MSA-P, and normal subjects) were 0.995, 0.982, 0.990, and 1.000, respectively</p>
Obstacles/Challenges (List the methodological obstacles if authors mentioned in the article)	
Terminology (List the common basic words frequently used in this research field)	Artificial intelligence . Parkinson disease . Magnetic resonance imaging . ROC curve . Deep learning
Review Judgment (Briefly compare the objectives and results of all the articles you reviewed)	
Review Outcome (Make a decision how to use/refer the obtained knowledge to prepare a separate and new methodology for your own research project)	