FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Tuan Vo

for the degree of Doctor of Philosophy (Ph.D.)

Dissertation Title:
Extraction and Interpretation of EEG Features for Diagnosis and Severity Prediction of AD and FTD using Deep Learning

Date: Friday, March 20,2026, Time: 2:00pm -3:30pm
Building: EE96, Room # 405
777 Glades Road
Boca Raton, FL 33431

DEPARTMENT: Electrical Engineering

ADVISOR: Hanqi Zhuang, Ph.D.

PH.D. SUPERVISORY COMMITTEE: Daniel Raviv, Ph.D.; Minghan Wei, Ph.D; Zvi Roth, Ph.D

ABSTRACT OF DISSERTATION

Alzheimer's disease (AD) is the most common form of dementia and is characterized by progressive cognitive decline and memory impairment. Frontotemporal dementia (FTD), the second most prevalent form, primarily affects the frontal and temporal lobes and often leads to changes in personality, behavior, and language. Due to overlapping clinical symptoms, FTD is frequently misdiagnosed as AD. Electroencephalography (EEG) offers a portable, non-invasive, and cost-effective method for studying brain activity; however, its diagnostic utility for differentiating dementia subtypes is limited by signal complexity and noise. In this dissertation, I propose an EEG-based feature extraction framework that leverages deep learning to identify AD and FTD and to estimate disease severity. The analysis reveals elevated delta-band activity in frontal and central regions as potential biomarkers associated with these neurodegenerative conditions. By combining temporal and spectral representations of EEG signals, the proposed framework integrates a Convolutional Neural Network (CNN) with an attention-based Long Short-Term Memory network (aLSTM). The model achieves over 90% accuracy in distinguishing AD and FTD from cognitively normal (CN) individuals and predicts disease severity with relative errors below 35% for AD and approximately 15.5% for FTD. Differentiating AD from FTD remains challenging due to shared neural patterns; however, incorporating a feature selection step improves specificity, increasing AD–FTD classification accuracy from 26% to 65%. Building on these findings, a two-stage classification strategy is developed for AD, CN, and FTD by first identifying CN individuals and then separating FTD from AD, resulting in an overall classification accuracy of 84\%. These results demonstrate the potential of integrating temporal and spectral EEG features with deep learning to improve the identification and characterization of dementia subtypes, offering a promising non-invasive approach that may support clinical screening and monitoring of neurodegenerative disease progression.

College of Engineering and Computer Science
Office of the Dean
777 Glades Road, EE96, Room 308
Boca Raton, FL 33431
561.297.3400

BIOGRAPHICAL SKETCH

TUAN VO
Ph. D candidate
Department of Electrical Engineering and Computer Science
Florida Atlantic University, Boca Raton, FL

Education
- Ph. D (expected), Florida Atlantic University
- M.S., Seoul Nation University of Science and Technology

CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

Time in Preparation: Spring 2019 – Spring 2026

Qualifying Examination Passed: Fall 2020

Published Papers:

[1]. Vo, T., Ibrahim, A. K., & Zhuang, H. (2025). A multimodal multi-stage deep learning model for the diagnosis of Alzheimer's disease using EEG measurements. Neurology international, 17(6), 91.

[2]. Vo, T., Ibrahim, A. K., Zhuang, H., & Bang, C. (2026). Extraction and interpretation of EEG features for diagnosis and severity prediction of Alzheimer's Disease and Frontotemporal dementia using deep learning. *Biomedical Signal Processing and Control*, *112*, **108667.**