UAEU جامعة الإمارات العربية المتحدة United Arab Emirates University

**The College of Graduate Studies and the College of Information Technology Cordially Invite You to a**

## Master Thesis Defense

Entitled

# Heart Rhythm Classification from Static and ECG time-series Data using Hybrid Multimodal Deep Learning

by

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Date & Venue

**3:00 PM**
**Tuesday, 8 June 2021**

Join Meeting

https://uaeu-ac-ae.zoom.us/j/96141463891?pwd=UWw4YVZsQ0lOSDlsdFQyejdONGFOUT09

## Abstract

Cardiovascular arrhythmia diseases are considered as the most common diseases that cause death around the world. Abnormal arrhythmia diseases can be identified by analyzing heart rhythm using electrocardiogram (ECG). However, this analysis is done manually by cardiologists, which may be subjective and susceptible to different cardiologist observations and experiences, as well as to noise and irregularities in those signals. This can lead to misdiagnosis. We are motivated by this challenge and propose an automated heart rhythm diagnosis approach from ECG signals using Deep Learning. In order to achieve this goal, we seek to address three research problems. First, recognizing the role of each single lead of a 12-lead ECG to classify heart rhythms. Second, understanding the importance of static data (e.g., demographics and clinical profile) in classifying heart rhythms. Third, realizing whether the static data can be combined with the ECG time series data for a better classification performance. We have proposed different deep learning models to address these problems and achieved satisfactory results. Therefore, using these knowledges, we propose an effective hybrid deep learning model to classify heart rhythms. To the best of our knowledge, this is the first work to identify the importance of individual lead and combined lead as well as the importance of combining static data with ECG time series data in classifying heart rhythms. We have performed extensive experiments to evaluate our algorithms on a 12-lead ECG database that contains data from more than 10,000 individual subjects and obtained high average of accuracy (up to 98.7%) and F1-measure (up to 98.7). Moreover, we also analyzed the distribution of heart rhythms from the database based on heart rhythm type, gender, and age group, which will be valuable for further improvement of classification performance. We believe that this study will provide valuable insights and will prove to be an effective tool in automated heart rhythm classification and will assist cardiologists in effectively and accurately diagnose heart disease.



**Keywords:** Artificial Intelligent, Deep Learning, Multimodal, ECG, Arrhythmia, Cardiovascular Diseases.