

# BSc/MSc-project

## Title: Deep Neural Networks for Automatic Detection of Atrial Fibrillation (AFIB)

### Description:

Atrial fibrillation (AFIB) is the most common cardiac arrhythmia, and its detection could substantially help in the early diagnosis, management and thus the prevention of complications associated with AFIB. Several methods with varying success have been developed for the automatic detection of AFIB, which rely on the R-R irregularities (RRI) [1-3], or the absence of P-waves [4], or combinations of both [5]. Success of these methods rely on the accuracy of P-wave or RRI detection and most of these methods were shown to perform poorly with short (< 1 minute) ECG data segments [6]. In this project, a method based on the discrete wavelet transform (DWT) and support vector machine (SVM) is proposed for real-time automatic detection of AFIB [7]. The proposed method does not require either the P-wave or RRI estimations and guaranteed to perform well for shorter data segments. There are four major steps in the proposed method: (1) ECG pre-processing, (2) feature extraction/selection, (3) classification and validation, and (4) system testing on real-time ECG data. A block schematic of the proposed scheme is shown in Figure.1.

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- [2]. X.Zhou, H.Ding, W.Wu and Y.Zhang, A real-time atrial fibrillation detection algorithm based on the instantaneous state of heart rate, PLOS One, September (2015), pp.1-16.
- [3]. J. Lee, Y.Nam, D.D.McManus, K.H.Chon, Time-varying coherence function for atrial fibrillation detection, IEEETrans.Bio-Med.Eng., 60, (2013), pp.2783–2793.
- [4]. S.Ladavich and B Ghoraani, Rate-independent detection of atrial fibrillation by statistical modelling of atrial activity, Biomed. Sig. proc. And Cont., 18, (2015), pp.274-281.
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- [6]. S. Asgari, A. Mehrnia, and M. Moussavi, Automatic detection of atrial fibrillation using stationary wavelet transform and support vector machine, Comput. In Biol. & Med., 60, (2015), pp.132-142.
- [7]. J.Rodenas, M.Garcia, R.Alcaraz and J.J.Rieta, Wavelet entropy automatically detects episodes of atrial fibrillation from single-lead electrocardiograms, Entropy, 17 (2015), pp.6189-6199.

**Prerequisites:** Knowledge in signal processing, programming skills and experience with MATLAB

**Responsible institution:** DTU Elektro

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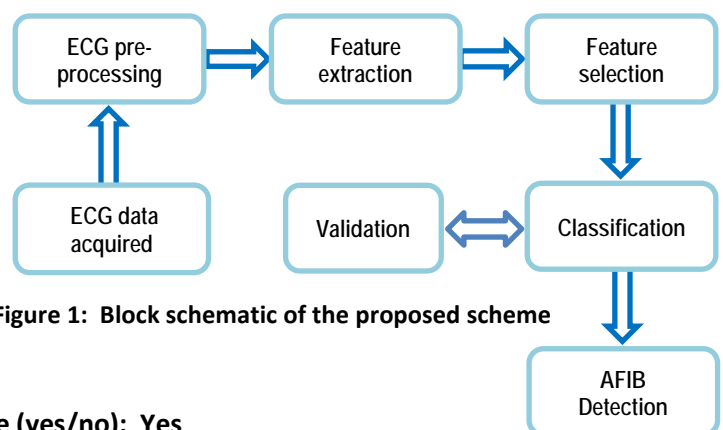


Figure 1: Block schematic of the proposed scheme

**Allowed no of students per project:** 1-2

**The project description may be published on the website (yes/no):** Yes



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