INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
PhD-17 SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The electrocardiogram (ECG) is a graphical representation of the heart's electrical activities, recorded via electrodes. It is a non-invasive, cost-effective, and reliable tool used in clinical practices to assess cardiac function and detect abnormalities. Deviations in ECG signals from normal patterns often indicate heart diseases. However, manually analyzing long ECG recordings is time-consuming and prone to human error, necessitating the development of automated computer-aided diagnostic (CAD) systems for accurate detection of cardiac disorders. The thesis introduces an approach that utilizes variational mode decomposition (VMD) to extract features for myocardial infarction classification using machine learning techniques. Additionally, standard ECGs use ten electrodes to capture 12 different perspectives of the heart, but this setup is cumbersome for continuous, ambulatory, and remote monitoring. Thus, deriving a full 12-lead ECG from a reduced subset of leads is crucial to simplify monitoring systems while maintaining diagnostic accuracy. This thesis proposes to decompose the three predictor leads using discrete wavelet transform and apply long short-term memory (LSTM) model on selected subbands to synthesize the 12-lead ECG signal. Furthermore, the synthesis ECG signal are expected to retain the person specific biometric information. In this direction, a hierarchical long short-term memory (HLSTM) architecture has been explored to investigate the effectiveness of synthesized ECG signals for person identification applications.