

Public Abstract

First Name:Sowjanya

Middle Name:

Last Name:Paladugu

Adviser's First Name:Chi-Ren

Adviser's Last Name:Shyu

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:Temporal Mining Framework for Risk Reduction and Early Detection of Chronic Diseases

Chronic diseases significantly affect the quality of life of over 25 million Americans and are among the most common and costly health problems. Due to the complexity of these diseases, it is difficult for clinicians to analyze trends in patient data and correlate these trends with other patient information such as demographic data. Therefore, there is a need for informatics tools to efficiently monitor disease progression and to analyze trends in patient data to improve disease management. To this end, a temporal mining framework was developed to identify frequently occurring temporal patterns in patient measurements that may lead to development of diseases.

The developed framework uses patient data collected over a series of regularly-scheduled clinical visits. Temporal sequences were preprocessed, discretized, and mined to identify frequent episodes in measurement sequences before the onset of a disease. The relevance and importance of these episodes were determined by examining the episode frequency and confidence. Contrast mining was also performed to determine episodes significant to specific patient groups and to conduct side-by-side comparisons of episodes shared among patient groups. The efficacy of the temporal mining framework was evaluated via a case study of lymphedema to study the incidence and severity of lymphedema in post breast cancer patients. Temporal changes in limb volume (LV) measurement data were analyzed via the framework, with patients grouped based on body mass index, occurrence of post-operative swelling, and age. The analysis indicated that similar LV change episodes have varying probabilities of leading to lymphedema in various populations.