

## **Computer-aided Personalized Medical Monitoring in Mobile Cloud Computing**

**Environment (PI: Prof. You Jia Jane; 2014/15)**

Computer-aided personalized medical monitoring opens a new scope of smart healthcare by utilizing advanced computing technology to explore vast and versatile medical data from various subjects for reliable medical evaluation. Such intelligent medical monitoring systems are in high demand by medical service providers, doctors and patients. First, they can not only reduce the workload for mass screening of a large population, but also enhance the services by analyzing high-dimensional medical data from different sources for quality assessment. In addition, they also speed up clinical data analysis and provide quantitative measures of disease severity and treatment effectiveness. Moreover, they offer convenient, timely, affordable and customized medical services to different users in particular the patients under chronic care. To meet all of these requirements, three fundamental challenging issues need to be addressed: 1) data management of high-dimensional data of clinical signs; 2) feature selection and fusion of high-dimensional data for comprehensive medical data evaluation; 3) classification and decision support scheme for convenient, reliable, efficient and cost effective medical services. Currently there are lacks of an integrated scheme to address these challenging issues systematically.

This project aims to develop solutions by leveraging mobile cloud computing paradigm to support computer-aided personalized medical monitoring. Cloud-based mobile healthcare provides cost-effective medical services by offloading computing intensive medical applications as a service to cloud clusters. However, most of the existing mobile-healthcare systems are mainly concerned with data management rather than sophisticated medical services such as diagnosis and monitoring. We propose the concept of personal medical record e-book and develop the relevant mechanisms and algorithms to bridge the gap between data management, medical applications and cloud based mobile computing. More specifically, the proposed framework provides a general approach to customized medical services by addressing the above three fundamental issues: 1) proposing a unique personal medical record e-book structure to facilitate flexible management of high-dimensional medical data; 2) developing an effective medical evaluation mechanism based on dynamic feature selection, multiple feature fusion, hierarchical vessel analysis, vessel abnormalities grading, and robust classification via ensemble learning; 3) extending an adaptive analytic hierarchy process (AHP) to guide dynamic computation partitioning of customized medical services in the cloud. The feasibility of our approach will be further demonstrated by developing a prototype system for diabetic care on our mobile cloud computing platform. The performance metrics for benchmarking include the accuracy (AC),

sensitivity (SE) and ROC curve (Receiver Operating Characteristics).

The long-term significance of this project is to provide a general effective approach to computer-aided healthcare with immediate applications to telemedicine and medical information processing. The findings will not only enhance the health service to the public and improve the quality of life and life expectancy, but also make substantial contributions to multidisciplinary research in multimedia, pattern recognition, cloud computing with excellent potentials for economic growth. Furthermore, this project will strengthen international and industrial links and collaboration among the researchers in the relevant areas.