Adaptive Monitoring of Chronic Disease in Large-scale Heterogeneous Population

Abstract: Chronic disease monitoring, which relies on routine and one-size-fits-all monitoring guideline, has low effectiveness and high cost in the clinical practice. To improve the cost-effectiveness in chronic disease monitoring, a transition from the population-based routine monitoring to patient-specific adaptive monitoring is needed. This talk will present (a) a novel statistical learning framework, collaborative learning, to effectively model heterogeneous disease trajectories from sparse and irregular sensing data by exploiting the progression patterns and similarities between individuals; (b) a decision support algorithm, selective sensing, to adaptively allocate the limited monitoring resources to large population and maximally detect the high-risk individuals by integrating the disease progression, individual prognostics and monitoring strategy design into a unified framework. The proposed methods were further applied in the context of cognitive decline monitoring in Alzheimer’s Disease (AD) and depression trajectory monitoring to facilitate the effective use of monitoring technology in chronic disease management.