

**Stanford University**  
**Department of Statistics**

DEPARTMENTAL SEMINAR

\*\*\* Extra Seminar: Special Day, Time & Venue \*\*\*

3:30pm, Friday, September 22, 2017  
Sloan Mathematics Center Room 380C

**Speaker:** Hau-tieng Wu, *Duke University*

**Title:** **Modern Data Science Solutions to Some Medical  
Time Series Challenges**

**Abstract:**

Adaptive acquisition of correct features from massive datasets is at the core of modern data analysis. In this talk, the particular interest in medicine is extracting hidden dynamics from a single channel time series composed of multiple oscillatory signals, which could be viewed as a single-channel blind source separation problem. The mathematical and statistical problems are made challenging by the structure of the signal, which consists of non-sinusoidal oscillations, with time varying amplitude/frequency, and by the heteroscedastic nature of the noise. I will discuss recent progress in solving this kind of problem by combining the cepstrum-based nonlinear time-frequency analysis and manifold learning techniques. I will also discuss the application of this method to two medical problems: (1) the extraction of a fetal ECG signal from a single lead maternal abdominal ECG signal; (2) the simultaneous extraction of the instantaneous heart/respiratory rate from a PPG signal during exercise. If time permits, the clinical trial results and/or an application to the atrial fibrillation will be discussed.