



# Detecting "un-occurred" disease state by dynamical network biomarkers – Precision Medicine by Big-Data

**Prof Luonan CHEN**

*Professor and Executive Director, Key Laboratory of Systems Biology, Chinese Academy of Sciences*

<b>DATE</b>	<b>: 23 October 2015, Friday</b>	<i>(including Q &amp; A session)</i>
<b>TIME</b>	<b>: 1430 – 1600</b>	
<b>VENUE</b>	<b>: SCM809</b>	
<b>LANGUAGE</b>	<b>: English</b>	
<b>FACILITATOR</b>	<b>: Dr. ZHANG Ge</b>	

## Abstract

Considerable evidence suggests that during the progression of complex diseases, the deteriorations are not necessarily smooth but are abrupt, and may cause a critical transition from one state to another at a tipping point. Here, we develop a model-free method to detect early-warning signals of such critical transitions, even with only a small number of samples. Specifically, we theoretically derive an index based on a dynamical network biomarker (DNB) that serves as a general early-warning signal indicating an imminent bifurcation or sudden deterioration before the critical transition occurs. Based on theoretical analyses, we show that predicting a sudden transition from small samples is achievable provided that there are a large number of measurements for each sample, e.g., high-throughput data. We employ microarray data of three diseases to demonstrate the effectiveness of our method for detecting "un-occurred" disease state (未病). The relevance of DNBs with the diseases was also validated by related experimental data and functional analysis.

## Speaker

**Prof Luonan Chen** received BS degree in the Electrical Engineering, from Huazhong University of Science and Technology, and the M.E. and Ph.D. degrees in the electrical engineering, from Tohoku University, Sendai, Japan, in 1988 and 1991, respectively. From 1997, he was an associate professor of the Osaka Sangyo University, Osaka, Japan, and then a full Professor. Since 2010, he has been a professor and executive director at Key Laboratory of Systems Biology, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences. He was the founding director of Institute of Systems Biology, Shanghai University, and from 2010 he has also been a research professor in Institute of Industrial Science, University of Tokyo, Japan. He was elected as the founding president of Computational Systems Biology Society of OR China, and Chair of Technical Committee of Systems Biology at IEEE SMC Society. He serves as editor or editorial board member for major systems biology related journals, e.g. BMC Systems Biology, IEEE/ACM Trans. On Computational Biology and Bioinformatics, Journal of Molecular Cell Biology, Mathematical Biosciences, and Journal of the Royal Society Interface. His fields of interest are systems biology, computational biology, and nonlinear dynamics. In recent years, he published over 200 SCI journal papers and two monographs (books) in the area of systems biology.

**\*\*Welcome\*\***