When engineering meets biology: latest approaches in systems and synthetic biology

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Abstract:

Increases in throughput and installed base of biomedical research equipment led to a massive accumulation of 'omics' data known to be highly variable, high-dimensional, and sourced from multiple often incompatible data platform. These kinds of 'omics' data, which include the genome sequencing data (genomics), microarray-based genome-wide expression profiles (transcriptomics), protein abundances data (proteomics), etc., provide unprecedented views of cellular components in the biological systems. We are now formally in the Million-Genome era. However, given this massive amount of data, how do we know which information or feature is crucial towards certain diseases or behaviors? This is similar to finding a needle in a haystack. A systematic viewpoint and methodology to retrieve biological insights from these data is hence essential.

The field of engineering often deals with complicated system problems such as communication systems, control systems, IC systems and etc. Various methods and algorithms have been developed by engineers to specifically tackle these kinds of challenging and practical system-level problems. Therefore, various efforts have been expended to apply systematic approaches in the engineering field to biological problems, giving rise to the emerging fields of systems and synthetic biology. Via such systematic approaches, researchers have shown promising breakthroughs in uncovering crucial information that lies within these massive biological data.

In this talk, I hope to provide a brief introduction to the interdisciplinary and exciting fields of systems and synthetic biology. I will further provide two examples of applying systems biology approaches to revealing interesting biological insights in infectious disease and regeneration ability in zebrafish through our own studies. In addition, I will show how to use synthetic biology approaches to construct biology adjustable synthetic filter via novel utilization of terminators as regulatory genetic parts in *Escherichia coli*. The aim of this talk is to provide a platform for researchers with biological or engineering backgrounds to share ideas and collaborate. Researchers with either backgrounds are welcomed to join us!

Bio:

Che Lin received the B.S. degree in Electrical Engineering from National Taiwan University, Taipei, Taiwan, in 1999. He received the M.S. degree in Electrical and Computer Engineering in 2003, the M.S. degree in Math in 2008, and the Ph.D. degree in Electrical and Computer Engineering in 2008, all from the University of Illinois at Urbana-Champaign, IL. In 2008, he joined the Department of Electrical Engineering at National Tsing Hua University as an assistant professor, and has been an associate professor since August 2014.

Dr. Lin received a two-year Vodafone graduate fellowship in 2006, the E. A. Reid fellowship award in 2008, and holds a U.S. patent, which has been included in the 3GPP LTE standard. In 2012, he received the Excellent Teaching Award for the college of EECS, NTHU. He won the best paper award for 2014 GIW-ISCB-ASIA conference. In 2015, he received the CIEE outstanding young electrical engineer Award. He is a senior member of IEEE.

His research interests include deep learning, data mining and analytic, signal processing in wireless communications, optimization theory, and systems biology.