System Level Analysis of Mutational Landscape of Cancer

Abstract: The genomic landscape of cancer obtained from large scale studies revealed mutational patterns such as mutual exclusivity and co-occurrences. Despite significant efforts, the understanding of the patterns harbored by specific genes and their interplay with functional interactions are still limited. Both mutual exclusivity and co-occurrence can arise due to several reasons. For example, two functionally interacting genes may dysregulate the same cancer related pathway when either of them is mutated, leading to mutually exclusive mutations. Alternatively, mutual exclusivity might reflect mutations specific to two different cancer types. Methods for joint analysis of co-occurrence, mutual exclusivity, and functional interaction relationships can lead to a better understanding of the causes and impacts of mutations in cancer. In this talk, I will describe systems biology approaches to identifies groups of genes (or gene modules) with coherent patterns within modules, but distinct properties among genes in different modules. Our method allows us to investigate various aspects of the cancer mutational landscape, leading to uncovering relationships between mutated gene modules, cancer subtypes, and mutational signatures.