Optimization of Combinatorial Drugs Using an Engineering Feedback System Control Approach

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Abstract

Drug combinations have been increasingly applied in clinical treatments towards various types of lethal diseases, including HIV, TB and cancers, due to the superior advantages of high efficacy, low toxicity and low occurrence of drug resistance. While the drug combinations are in generally effective, optimizing drug combinations remains challenging. Furthermore, drug-drug interactions and drug-system interactions can be extremely complicated. Therefore, the information acquired from individual cellular molecules could hardly assess the accumulative response at the bio-system level. Herein, we introduce a Feedback System Control (FSC) approach, aiming to rapidly optimize drug combinations out of millions of possibilities. The FSC approach combines biological experimental tests and engineering feedback control algorithms, avoids the high-throughput examination on large dataset, optimizes a few combinations iteratively, bypasses the complicated intracellular molecular interactions, and is able to identify the optimal solution with only several rounds of experiments by testing less than 0.1% of the total searching space.
About the Speaker

Dr. Xianting Ding is an associate professor at the Department of Biomedical Engineering, Med-X Research Institute, Shanghai Jiao Tong University. He received his Ph.D. degree from the Department of Mechanical and Aerospace Engineering at University of California, Los Angeles (UCLA) in 2012. His research interests focus on developing personalized medicine and individualized therapy, including: 1) developing bio-sensors for early detection of cancer, infectious disease, metabolic diseases, age-related diseases, cardiovascular diseases, based on cellular electrochemical, impedance, mechanical and photonic signaling; 2) developing personalized treatment; optimizing drug combinations; studying drug-drug interactions; building models for bio-complex systems based on Feedback System Control (FSC), Microfluidics and Bio-MEMS; 3) Traditional Chinese Medicine (TCM) modernization, extraction, purification, and re-combination for treating ischemia, osteoporosis and depression.

All are welcome!
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