

國立中山大學應用數學系

學術演講

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講題：Optimal policies of non-cross-resistant chemotherapy on Goldie-Coldman's cancer model

時間：2021/10/21 (Thursday) 14:10 ~ 15:00

地點：本次為視訊演講



Google Meet Link : <https://meet.google.com/rtr-pknn-nhf>

Abstract

Chemotherapy has been widely used in the treatment of different cancers. However, resistance caused by the mutation of cancer cells reduces the efficacy of drugs and imposes great challenge to the treatment. To study the resistance problem, in 1979, Goldie and Coldman proposed the first stochastic-based model to relate the drug sensitivity of tumors to their mutation rates. Many scientists have since referred to this pioneering work because of its simplicity and elegance. Its original idea has also been extended and further investigated in massive follow-up studies of cancer modeling and optimal treatment. Goldie and Coldman, together with Guaduskas, later used their model to explain why an alternating non-cross-resistant chemotherapy is optimal with a simulation approach. Subsequently in 1983, Goldie and Coldman provided a rigorous mathematical proof to their earlier simulation work. However, their analytical study of optimal treatments majorly focused on a process with symmetrical parameter settings, and presented few theoretical results for asymmetrical settings.

In this talk, we first provide an introduction to Goldie and Coldman's model, which shows how probabilistic framework is used to describe the mutational behavior of cancer cells. Afterwards, we recast and restate Goldie, Coldman, and Guaduskas' model as a multi-stage optimization problem. With an asymmetrical assumption, the conditions under which a treatment policy can be optimal are derived. Numerical results are also presented to justify the correctness of the theoretical derivations. Some related work and variants of the model will be discussed for possible extension as the conclusion of this talk.

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