THE UNIVERSITY OF HONG KONG

Department of Mathematics

Numerical Mathematics and Applied Analysis Group Seminar (NMAA)

September 12, 2013 (Thursday), 2:00 – 4:00pm
Rm 309, Run Run Shaw Bldg., HKU

Ms. Yushan QIU
Department of Mathematics, HKU

On Control of Singleton Attractors in Multiple Boolean Networks: Integer Programming-Based Method

Abstract: Boolean network (BN) is a mathematical model for genetic network and control of genetic networks has become an important issue because of its potential application to drug discovery and treatment of intractable diseases. Early researches have mainly focused on analysis of the attractor control for a randomly generated BN and very few studies performed the analysis for multiple BNs. However, one may also concern how the anti-cancer drugs act in both normal and cancer cells. Thus, the issue of how to develop controls for multiple BNs is an important and interesting challenge. In this talk, we formulate three novel problems about attractor control for two BNs (i.e., normal cell and cancer cell). The first one is about finding a control which can damage a cancer cell significantly but has a limited damage to a normal cell. The second one is mainly about finding a control for normal cell with guaranteed damaging effect on a cancer cell. We propose integer programming-based methods for solving these problems in a unified manner. Furthermore, computational experiments are provided to illustrate both the efficiency and effectiveness of our method for the captured control problems of multiple BNs.

Ms. Yue XIE
Department of Mathematics, HKU

A Real Option Approach for Project Valuation in the High-Tech Industry

Abstract: We discuss the valuation of a project in a high-tech corporation using real option theory and modern capital budgeting. Certain key characteristics of the project are taken into consideration (including high-risk, multi-stage, technology life cycle are taken into consideration.) Since the real option is not tradable in the market, an actuarial approach is used to value risk that cannot be hedged by trading securities. The evolution of state variables are governed by irreversible regime-switching models due to the multi-stage nature of project and technology life cycle in high-tech industry. Under certain assumptions, the valuation of the real option can be transformed into the valuation of an American option with time-dependent strike price. A lattice-based method is then developed for valuing the real option. Numerical example are given to illustrate the proposed models and methods.

Ms. Dong-Mei ZHU
Department of Mathematics, HKU

On Discrete-Time Optimal Asset Allocation in a Partially Observed System with Risk Constraint

Abstract: We discuss an optimal portfolio selection problem in a discrete-time Hidden-Markov- Switching AutoRegressive (HMSAR) time series model for asset price dynamics in the presence of a risk constraint. The object of an investor is not only to maximize the expected utility on his terminal wealth, but also to ensure that the risk of an investment portfolio described by the VaR does not exceed a specified level. We present an efficient method to optimally estimate the model. Real data examples are used to illustrate the practical implementation of the model as well as the qualitative behavior of the optimal portfolio strategies.

All are welcome