2014NCTS & NCU

Probability Seminar

題　目：(1) On Spherical Monte Carlo Simulations for Multivariate Normal Probabilities

(2) Localization of Wiener Functionals of Fractional Regularity and Applications

主講人：(1) 鄧惠文教授 (中央大學統計研究所)

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演講茶會時間: AM9:30-10:00, 星期五, 5 月 30 日, 2014

演講茶會地點: 國立中央大學鴻經館 M306 教授休息室

演講時間:

(1) AM10:00-11:00,星期五, 5 月 30 日, 2014

(2) AM11:00-12:00,星期五, 5 月 30 日, 2014

演講地點：國立中央大學鴻經館 M107 演講廳

摘要：

(1) The calculation of multivariate normal probabilities is of great importance in many statistical and economic applications. This paper proposes a spherical Monte Carlo method with both theoretical analysis and numerical simulation. To begin with, the multivariate normal probability is rewritten via an inner radial integral and an outer spherical integral by the spherical transformation. For the outer spherical integral, we apply an integration rule by randomly rotating a predetermined set of well-located points. To find the desired set, we derive an upper bound for the variance of the Monte Carlo estimator and propose a set which is related to the kissing number problem in sphere packings. For the inner radial integral, we employ the idea of antithetic variates and identify

certain conditions so that variance reduction is guaranteed. Extensive Monte Carlo experiments on some probabilities calculation confirm these claims. This is a joint work with Cheng-Der Fuh and Ming-Hsuan Kang.

(2) Under the condition that the diffusion coefficients are uniformly elliptic, we study the Euler scheme of (non-Markovian) stochastic differential equations. While the strong approximation (i.e. approximation in Lp) and the weak approximation (i.e. approximation in terms of expectation) have been well studied, we study an approximation which has not been very much touched so far-- the approximation of probability densities. We are concerned with the following problems: do the corresponding densities converge and, if they do, in which Holder space the convergence takes place? Using differential analysis on the Wiener space (Malliavin's stochastic calculus of variations), especially Watanabe's theory of pullback of distributions and fractional Sobolev space over the Wiener space, we answer the above problems. To this end we localize fractional calculus of Wiener functionals. We obtain the relation between the Holder indexes of the spaces in which the convergence can take place and those of the spaces in which the coefficients lay in.

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