Seminário de sistemas dinâmicos e estocásticos

IMECC - UNICAMP

Variational formulas for functionals of the Fractional Brownian Motion and applications to Large Deviations Principles

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Resumo:

The equivalence between the large deviations principle (LDP for short) and the Laplace-Varadhan principle in the setting of Polish spaces is the starting point for the designated weak convergence approach to large deviations theory. Instead of the usual approximation procedures and the cumbersome verification of exponential tightness, this approach allows the user to derive simpler sufficient conditions for establishing LDPs that rely on the verification of tightness for the laws of the processes involved and the verification of the convergence, through compactness arguments, in well-known functional spaces, of the associated controlled equations to the problem of finding the rate function for the LDP. This approach was developed in different settings by Dupuis, Ellis, Budhiraja and collaborators (we refer the reader to the book [3] and [2]). It is our purpose to derive a variational formula for functionals of Fractional Brownian Motions (fBMs for short) and to establish a sufficient condition for the verification of LDPs for families of measurable maps of fBMs. As a first application we have in mind the derivation of a LDP for an infinite-dimensional system given by the stochastic fractional Navier Stokes equation perturbed in small noise limit by the fBM. As a second application we have in mind the generalization of the work [1] giving a nonlinear Feynman-Kac formula for nonlocal partial differential equations (PDEs for short) associated to forward-backward stochastic differential equations driven by the fBM and studying, via probabilistic arguments and Malliavin calculus for the densities, the homogenization regime of those PDEs. This is ongoing work with prof. Pedro Catuogno.

References

[1] F. Baudoin. L. Coutin. Operators associated with a stochastic differential equation driven by fractional Brownian motions. Stochastic Processes and their Applications Vol. 117(5), pp 550-574. (2007)

[2] A. Budhiraja, P. Dupuis, V. Maroulas. Large deviations for infinite dimensional stochastic dynamical systems. Ann. Probab. vol.36(4),1390-1420 (2008)

[3] P. Dupuis, R. S. Ellis. A Weak Convergence Approach to the Theory of Large Deviations. Wiley Series in Probability and Statistics. Wiley and Sons, New York (1997)

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