Post-doctoral position
Stochastic calculus with white noise theory
Applications to uncertainties management

1 Context

This post-doctoral position is in the field of Stochastic Modeling with application to numerical Engineering Design. The major aim is to develop a white noise-based stochastic calculus for certain classes of processes in view of solving some Stochastic Partial Differential Equations.

2 Job Description

In aeronautical, automotive and energy industries, numerical simulation of physical phenomena plays an essential role for conception and decision making. These models aim at optimizing parameters which govern technical and economical performances of systems. The increase of computer performances and the development of the mathematics of randomness open the emergence of a new challenge in numerical simulation: The definition of a decision process based on multi-physical optimization and an exploration of the design space in presence of uncertainties.

This post-doctoral position aims at developing a continuous probabilistic model as a substitute to a high-fidelity physical model with uncertainties. We will consider a specific physical phenomenon (yet to be determined) that is governed by a system of partial differential equations (mechanics or thermal models) and we will study whether local regularity characteristics of the model can help to identify a relevant probabilistic model. Particularly, the Hölder regularity of the physical model is an important parameter for interpolation issues or model reduction. We will consider stochastic processes with prescribed regularity, such as fractional and multifractional processes that have already been used to represent various fluctuating phenomena (Internet traffic, financial modeling, terrain modeling), and multistable processes, where the local intensity of jumps varies along the trajectory.

Since the processes we will consider are not in general semi-martingales, classical Itô theory does not apply. As a consequence, we will use white noise theory to solve the Stochastic Partial Differential Equations that will describe the studied physical phenomenon. The work will be performed in the frame of the CSDL project.

3 Skills and profile

Successful candidates will have a strong background in stochastic processes theory, and some experience in code development (Matlab or R). Scientific publications in high level international journals are required.

4 Contact

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5 Place of work

Ecole Centrale Paris, Chatenay Malabry

References

[1] Falconer, K.J. and Lévy Véhel, J. (2008). *Multifractional, multistable, and other processes with prescribed local form*, *J. Theoret. Probab.*, DOI 10.1007/s10959-008-0147-9.

[2] Le Guével, R. and Lévy Véhel, J. (2009). *A Ferguson - Klass - LePage series representation of multistable multifractional motions and related processes*, preprint. Available at http://arxiv.org/abs/0906.5042.

[3] Samorodnitsky, G. and Taqqu, M.S. (1994). *Stable Non-Gaussian Random Processes*, Chapman and Hall.