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Title of the talk: Stochastic Taylor expansion and stochastic viscosity solutions for nonlinear SPDEs

Abstract In an earlier work R.Buckdahn and J.Ma (2001) introduced a notion of stochastic viscosity solution, inspired by earlier results of P.L.Lions and P.E.Souganidis (1998). By using a Doss-Sussmann-type transformation and the so-called backward doubly stochastic differential equations (BDSDEs) introduced by E.Pardoux and S.Peng (1994), they established the existence and uniqueness of stochastic viscosity solution to the stochastic partial differential equation (SPDE)

$$u(t,x) = u(0,x) + \int_0^t (\mathcal{A}u + f(x,u,\sigma^*\nabla u)\,(t,x)dt + \int_0^t g(t,x,u(t,x))dB_t,$$

where B is a k-dimensional Brownian motion and $\mathcal{A}$ is the generator of a diffusion process. Our contribution extends the study of stochastic viscosity solutions to the class of SPDEs for which the dependence of diffusion coefficient g on the solution u is replaced by that on its the spatial derivative ∇u .

Our main tool is a new type of stochastic time-space Taylor expansion for Itô random fields which holds outside some universal null set N for every random expansion point. It generalizes the work on stochastic Taylor development by R. Buckdahn and J. Ma (2002) The second principal tool is the recently developed theory on BDSDEs (E. Pardoux, S. Peng, 1994). It is mainly used to prove existence of the stochastic viscosity solution.

The talk is based on a common with with I.Bulla (Université de Brest, France) and J.Ma (Purdue University, U.S.A).