

Stochastic differential equations with Sobolev coefficients and applications

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Abstract: In this work we study the properties of solutions to stochastic differential equations with Sobolev diffusion coefficients and singular drifts such as: the stability with respect to the coefficients, weak differentiability with respect to the starting point, and the Malliavin differentiability with respect to the sample path. We also establish the Bismut-Elworthy-Li's formula. As applications, we use a stochastic Lagrangian representation to Navier-Stokes equations given by Constantin-Iyer to prove the local well-posedness of NSEs in R^d with initial values in the first order Sobolev space $W_p^1(R^d)$ provided $p > d$.