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Regularity and positivity of densities for the stochastic (fractional) heat equation.

In this talk, I will present a recent study on the density of the solution to a semilinear stochastic (fractional) heat equation (SHE), which includes the *parabolic Anderson model* as a special case. In the first part, we prove that the solution to a semilinear SHE with measure-valued initial data has a smooth joint density at multiple points. This result extends the work by Mueller and Nualart [EJP'08] from the density at single point to the joint density at multiple points and from function-valued initial data to more general initial data. This is achieved by proving that solutions to a related stochastic partial differential equation have negative moments of all orders. In the second part, we establish the strict positivity of the density in the interior of the support of the joint law. This result extends the known results to allow measure-valued initial data and unbounded diffusion coefficient (e.g., the parabolic Anderson model). This talk is based on a joint work with Yaozhong Hu and David Nualart. (Received February 15, 2016)