An implicit Euler scheme with non-uniform time discretization for stochastic heat equations

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We present a new algorithm for solving stochastic heat equations on the spatial domain $[0,1]^d$. We derive an error bound, which depends on $d$, on the number of evaluations of one-dimensional components of the driving Brownian motion $W$, and on the decay of eigenvalues of the covariance of $W$. This bound matches known lower bounds that are valid for every algorithm. Hence the new algorithm is asymptotically optimal.