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Jiequn Han*, jiequnh@princeton.edu. *Deep Learning-Based Numerical Methods for High-Dimensional Parabolic PDEs and Forward-Backward SDEs*. Preliminary report.

Developing algorithms for solving high-dimensional partial differential equations (PDEs) and forward-backward stochastic differential equations (FBSDEs) has been an exceedingly difficult task for a long time, due to the notorious difficulty known as the curse of dimensionality. In this talk we introduce the “deep BSDE method”, to solve general high-dimensional parabolic PDEs and FBSDEs. Starting from the BSDE formulation, we approximate the unknown Z component by neural networks and design a least squares objective function based on the terminal condition to optimize parameters. Numerical results of a variety of examples demonstrate that the proposed algorithm is quite effective in high-dimensions, in terms of both accuracy and speed. We furthermore provide a theoretical error analysis to illustrate the validity and property of the objective function. (Received September 19, 2018)