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GAS: A Gaussian Mixture Distribution-based Adaptive Sampling Method for PINNs

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The Physics-Informed Neural Networks (PINNs) methods have been widely utilized for solving Partial Differential Equations (PDEs). However, the accuracy of PINNs solutions is relatively low when the underlying solution lacks sufficient smoothness. In this presentation, we introduce GAS, an adaptive sampling method for PINNs based on Gaussian mixture distribution. This approach incorporates concepts from adaptive finite element methods and incremental learning. During the training process, GAS employs the current residual information to generate a Gaussian mixture distribution for sampling additional points. These points are then trained alongside historical data to accelerate the convergence of the loss function and achieve higher accuracy. Several numerical simulations demonstrate that GAS is a promising method that attains state-of-the-art accuracy among deep solvers, while remaining comparable to traditional numerical solvers.