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Sparse Recovery based Quadrature for Integration of Solutions to Hyperbolic Problems

Let $f : \Omega \times D \to R$ be some parameterized function with the parameter domain D. We develop a sparse empirical quadrature to compute $I(\mu) = \int_\Omega f(x, \mu)dx$. To this end, we compute $I(\mu)$ for a set of training parameters and compute the weights of the quadrature using sparse recovery. At least computationally, we observe that the number of non-zero weights in such a quadrature are bounded by the rank of a snapshot matrix. Since the snapshot matrix of solutions to hyperbolic problems do not have a low rank, we could not preserve the sparsity of the empirical quadrature. Therefore, to retain sparsity, we discuss the possibility of taking the samples of $I(\mu)$ from a calibrated snapshot matrix, which has a low rank.

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