ROBUST ADAPTIVE MESH REFINEMENT AND ENERGY-DRIVEN DEEP DISTRIBUTION TRANSFORMERS

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Abstract. Generating a mesh (or a distribution of points) with a certain structure plays a vital role in scientific computing. In the context of partial differential equations (PDEs), adaptive mesh generation is necessary to resolve the singularity in the solution in order to achieve desired accuracy with as little computational overhead as possible. Of particular importance is the a posteriori error estimation technique. We will present theoretical and numerical results on *robust* a posteriori error estimation for PDEs with high-contrast coefficients (including diffusion and convection-reaction-diffusion equations) to demonstrate the robustness of the estimators with respect to the PDE coefficient. In the second part of the talk, we present a new deep neural network-based distribution transformer for generating structured distribution of points with applications to fast algorithms in machine learning.

Keywords: adaptive mesh refinement, a posteriori error estimation, convection-reaction-diffusion equations, deep neural network, quasi-Monte Carlo, machine learning

Mathematics Subject Classifications (2010): 65N15, 65N30, 65N50, 15A23, 11K38, 68W25, 65D99

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