

Variational Training of Neural Network Approximations of Solution Maps for Physical Models

Yingzhou Li¹

1) *School of Mathematical Sciences, Fudan University, Shanghai 200438, China*

Corresponding Author: Yingzhou Li, yingzhouli@fudan.edu.cn

ABSTRACT

A novel solve-training framework is proposed to train neural network in representing low dimensional solution maps of physical models. Solve-training framework uses the neural network as the ansatz of the solution map and trains the network variationally via loss functions from the underlying physical models. Solve-training framework avoids expensive data preparation in the traditional supervised training procedure, which prepares labels for input data, and still achieves effective representation of the solution map adapted to the input data distribution. The efficiency of solve-training framework is demonstrated through obtaining solution maps for linear and nonlinear elliptic equations, and maps from potentials to ground states of linear and nonlinear Schrödinger equations.