A Supervised Learning Approach to Predicting Multigrid Convergence

Nicolas Nytko

Matthew West, Luke Olson, Scott MacLachlan

March 15, 2021

Overview

Poisson Problem

- Look at the 1D variable coefficients case w/ homogeneous Dirichlet conditions

$$-\nabla \cdot (k(\mathbf{x}) \nabla \mathbf{y}) = f$$

$$\Omega = [-1, 1] \quad \partial\Omega = 0$$

- Discretized on $N = 31$ internal points using finite differences, $k(\mathbf{x})$ is discretized on midpoints to preserve symmetry.
- For arbitrary C/F splitting, can we predict convergence rate and optimal relaxation weight?