



Numerical Analysis Seminar

Battling Gibbs Phenomenon: On Finite Element Approximations of Discontinuous Solutions of PDEs

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Abstract

We discuss the Gibbs phenomenon when adaptive continuous and discontinuous finite elements are used to approximate discontinuous or nearly discontinuous PDE solutions in this paper. For a simple discontinuous function, we explicitly compute its continuous and discontinuous piecewise constant or linear projections on discontinuity matched or non-matched meshes. For the simple discontinuity- aligned mesh case, piecewise discontinuous approximations are always good. For the general non-matched case, we explain that the piecewise discontinuous constant approximation combined with adaptive mesh refinements is a good choice to achieve accuracy without overshoots. For discontinuous piecewise linear approximations, non-trivial overshoots will be observed unless the mesh is matched with discontinuity. For continuous piecewise linear approximations, the computation is based on a “far away assumption” and non-trivial overshoots will always be observed under regular meshes. Also, we comment the L1-minimization-based method, and do not recommend such method due to its similar behavior as L2 based methods and more complicated implementations.

Date: October 26, 2021 (Tuesday)

Time: 4:00 – 5:00pm (Hong Kong Time)

Venue: Room 210, Run Run Shaw Bldg., HKU
and

ZOOM: <https://hku.zoom.us/j/>

Meeting ID: 913 6532 3891

Password: 310656



Attendance limited
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