1157-65-596 **Shun Zhang*** (shun.zhang@cityu.edu.hk). *Battling Gibbs Phenomenon: Approximation of Discontinuous Solutions of PDEs by Adaptive Finite Elements.*

For both linear and nonlinear hyperbolic partial differential equations, the solution can be discontinuous. For singularly perturbed problems, when the transient layer is very sharp, the solution can also be viewed as discontinuous. When piecewise polynomials are used to approximate these discontinuous solutions, the numerical solutions often overshoot near a discontinuity. Can this be resolved by adaptive mesh refinements? Shall we use continuous or discontinuous approximation spaces? In this talk, we explain by simple examples that the piecewise discontinuous constant approximation with adaptive mesh refinement is the best choice to achieve accuracy without overshootings. For discontinuous piecewise linear approximations, non-trivial overshootings will be observed unless the mesh is matched with discontinuity. For continuous piecewise linear approximations, non-trivial overshootings will always be observed under regular meshes. We calculate the explicit overshooting values for several typical cases. We also will discuss the overshoot for numerical methods based on L1 minimization. As an example, for a transport problems with discontinuous solutions and boundary conditions, we propose a flux-based least-squares finite element method. (Received February 04, 2020)