



DEPARTMENT OF APPLIED MATHEMATICS

應 用 數 學 系

**The Hong Kong Polytechnic University  
Department of Applied Mathematics**

**Colloquium**

**High order positivity-preserving discontinuous Galerkin methods for  
steady state or implicit time discretization of hyperbolic equations**

**by**

**Prof. Chi-Wang Shu**

**Division of Applied Mathematics, Brown University**

**Abstract**

High order discontinuous Galerkin (DG) methods are widely used in solving linear and nonlinear hyperbolic equations. One important property of such equations is positivity of their solutions, in the sense that if the data (initial condition, boundary condition, source terms) are positive then the solution stays positive. It is a challenge to maintain such positivity numerically for high order schemes. In the past few years, significant progress has been made to design positivity-preserving (PP) DG methods which maintain high order accuracy with explicit strong stability preserving time discretization. However, it is more challenging to design implicit time discretization or steady state DG solvers which have the same property. In this talk we will describe our recent research on designing high order PP DG methods for steady state or implicit time discretization of linear hyperbolic equations. (1) For time dependent problems with periodic boundary conditions, we design high order in space PP DG solver with backward Euler time discretization which can maintain high order spatial accuracy with a lower bound on the CFL number. This is a joint work with Tong Qin. (2) For steady state or time dependent problems with inflow boundary conditions, we design PP DG methods which can maintain high order accuracy. In two spatial dimensions this would involve an augmented DG space. This is a joint work with Dan Ling and Juan Cheng.

**Date : 26 September, 2018 (Wednesday)**

**Time : 3:30p.m. – 4:30p.m.**

**Venue : TU801, The Hong Kong Polytechnic University**

**\* \* \* ALL ARE WELCOME \* \* \***