

# The Hong Kong University of Science and Technology

## **Department of Mathematics**

## **Seminar on Applied Mathematics**

### Positivity-preserving high order discontinuous Galerkin schemes for compressible Navier-Stokes equations by

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#### <u>Abstract</u>

For gas dynamics equations such as compressible Euler and Navier-Stokes equations, preserving the positivity of density and pressure without losing conservation is crucial to stabilize the numerical computation. The L1-stability of mass and energy can be achieved by enforcing the positivity of density and pressure during the time evolution. However, high order schemes such as DG methods do not preserve the positivity. It is difficult to enforce the positivity without destroying the high order accuracy and the local conservation in an efficient manner for time-dependent gas dynamics equations. For compressible Euler equations, a weak positivity property holds for any high order finite volume type schemes including DG methods, which was used to design a simple positivity-preserving limiter for high order DG schemes by Zhang and Shu in 2010. Generalizations to compressible Navier-Stokes equations are however nontrivial. We show that weak positivity property still holds for DG method solving compressible Navier-Stokes equations if a proper penalty term is added to the scheme. This allows us to obtain the first high order positivity-preserving schemes for compressible Navier-Stokes equations.

Date: Tuesday, 18 June 2019 Time: 11:00a.m. – 12:00noon Venue: Room 3472, Academic Building, (Lifts 25-26), HKUST

All are welcome!