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The Hong Kong University of Science and Technology

Department of Mathematics

<u>Lecture Series</u>
Scientific Computation

by

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<u>Abstract</u>

Lecture 1: **Do you really believe numerical simulations in CFD?**	P. Lax ever quoted Ami Harten's observation: "For computational scientists there are two kinds of truth: the truth that you prove, and the truth you see when you compute? [P.Lax Computational Fluid Dynamics, J. Sci. Comput., 31(2007), 185-193]. Do you really believe the "truth" you see when you compute? Due to intricate differences of discrete (computable) models from the corresponding physical models and those of discrete data for computers from the corresponding data for computation, this issue is quite subtle and was ever visited by extending the approaches of discrete Fourier analysis and modified equations for a large range of Fourier modes, particularly highest frequency (Fourier, oscillatory) modes. In this talk, we will discuss this issue through very simple examples and bring you some new observations.
Lecture 2: **Consistency and Convergence of Finite Volume Approximations to Non-linear Hyperbolic Balance Laws**	This lecture addresses the three concepts of consistency, stability and conver-gence in the context of compact finite volume schemes for systems of nonlinear hyperbolic conservation laws. The treatment utilizes the framework of "balance laws". Such laws express the relevant physical conservation laws in the presence of discontinuities. Finite volume approximations employ this viewpoint, and the present contribution can be regarded as being in this category. It is first shown that under very mild conditions a weak solution is indeed a solution to the balance law. The schemes considered here allow the computation of several quantities per mesh cell (e.g., slopes) and the notion of consistency must be extended to this framework. Then a suitable convergence theorem is established, generalizing the classical convergence theorem of Lax and Wendroff. Finally, the limit functions are shown to be en-tropy solutions by using a notion of "Godunov compatibility", which serves as a substitute to the entropy condition. This is a joint work with Matania Ben-Artzi from Hebrew University from Jerusalem, Israel.

Date: Tuesday, 4 June 2019

Time: 10:00am – 12:00pm

Venue: Room 4504, Academic Building (near Lifts 25-26), HKUST

All are welcome!