## Liu Bie Ju Centre for Mathematical Sciences
## City University of Hong Kong

## Mathematical Analysis and its Applications Colloquium

**Organized by Prof. Ya Yan Lu and Prof. Roderick S. C. Wong**

## An Integral Equation Method for Single-Photon Emission Computed Tomography Image Reconstruction

**by**

## Professor Yuesheng Xu

**School of Data and Computer Science, Sun Yat-sen University**

**Date** : **6 April, 2017 (Thursday)**
**Time** : **4:30 pm to 5:30 pm**
**Venue** : **Room B6605**
**Blue Zone, Level 6, Academic 1 (AC1)**
**City University of Hong Kong**

### *ABSTRACT:*

Single-photon emission computed tomography (SPECT) can be used to complement a gamma imaging study, where a true 3D representation can be helpful, e.g., tumor imaging, infection imaging, thyroid imaging or bone scintigraphy. Because SPECT permits accurate localization in 3D space, it can be used to provide information about localized function in internal organs, such as functional cardiac or brain imaging. SPECT reconstruction is traditionally modeled by a discrete linear system, which is in fact a piecewise constant approximation of a physical model that has not been specifically written. The discrete model imposes a bottleneck model error. We introduce an integral equation model for SPECT reconstruction taking both attenuation and system spatial resolution into consideration. The existing discrete model is a piecewise constant approximation of the introduced model. We discretize the proposed integral equation by a higher-order piecewise polynomial approximation. We then introduce regularization for the resulting ill-posed new discrete system and propose a fixed-point proximity algorithm to solve the resulting non-smooth optimization problem. Numerical and clinical results are presented to show that the proposed integral equation method outperforms significantly the traditional discrete method for SPECT reconstruction.

Light refreshments will be provided before the colloquium from 4:00 pm to 4:30 pm. Please come and join us!

** All interested are welcome **

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