



DEPARTMENT OF APPLIED MATHEMATICS

應 用 數 學 系

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

Colloquium

**Solving Large-Scale Fixed-Point Problems by Asynchronous
Parallel Coordinate Updates**

by

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Abstract

Many problems reduce to the fixed-point problem of solving $x=T(x)$. This talk discusses a prevailing coordinate-friendly structure in the operator T . We develop a new theory for fixed-point coordinate updates. Then, we propose both sequential and asynchronous parallel algorithms. They have large-scale applications include machine learning, image processing, portfolio optimization, and second-order cone programs.

Our first theorem shows that, as long as T has a fixed point and is nonexpansive, then cyclic coordinate updates under proper step sizes converge to a fixed point. Our second theorem shows that asynchronous multiple-threaded random coordinate updates, under proper step sizes, still ensures almost-sure convergence. By "asynchronous", we mean that each thread updates a coordinate with the information it has, even if the latest information has not arrived. Asynchronous algorithms are amazingly fast!

We will present a software package and its numerical examples.

Date : 11 November, 2016 (Friday)

Time : 2:30p.m. – 3:30p.m.

Venue : TU801, The Hong Kong Polytechnic University

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