



**The Hong Kong University of Science and Technology**

**Department of Mathematics**

**Seminar on Harmonic Analysis**

**Hamming cube, martingales, Monge-Amp\`ere, and  
ancient solutions of heat equation**

**By**

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**Abstract**

Harmonic analysis is intimately related with martingale estimates. But there is another type of discrete analysis, namely, harmonic analysis on Hamming cube (the math. foundation of Big Data science) that seemed to be disjoint from this relationship. We show how many classical (and some new) estimates on Hamming cube follow from martingale estimates. We also show why this is related to solving certain non-linear PDE of Monge-Amp\`ere type and what are the relations with classical inequalities in Gaussian spaces. Our Monge-Amp\`ere equation will naturally bring us to ancient solutions of heat equation. On Hamming cube Monge-Amp\`ere should be discretized accordingly. But how? There are so many different ways to discretize PDE. We will show one way that seems to be often the right one and that ties harmonic analysis estimates of martingales with Poincar\`e type estimates on Hamming cube.

***Date: Thursday, 21 December, 2017***

***Time: 1:45p.m.-2:45p.m.***

***Venue: Room 4472, Academic Building,  
(near Lifts 25&26), HKUST***

***All are welcome!***