



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

PHD STUDENT SEMINAR

**Computational Resolution Limit:
a Modern View of a Classical Problem**

By

Mr. Ping LIU

Abstract

Given an image generated by the convolution of point sources with a bandlimited function, the inverse problem is to reconstruct the source number, positions, and amplitudes. It is well-known that it is impossible to resolve the sources when they are close enough in practice. Rayleigh investigated this problem and formulated a classical resolution limit, also called Rayleigh limit, for the case of two sources with identical amplitudes. On the other hand, many numerical experiments demonstrate that a stable recovery of the sources is possible even if the sources are separated below the Rayleigh limit. To resolve the puzzle, we introduce new concepts “computational resolution limit” for number and support recovery: one is the minimum separation distance between the sources that is required for exact recovery of the number, and the other is the minimum separation distance between the sources that is required for a stable recovery of the supports. We quantitatively characterize the two limits and resolve the “resolution limit puzzle”. The quantitative characterization also implies a phase transition phenomenon in each of the two recovery problems, and the subtle difference between the two.

Date : 13 May 2020 (Wednesday)

Time : 3:00pm – 4:00pm

Zoom Meeting : <https://hkust.zoom.us/j/99725233525>

All are Welcome!