Distinguished Lectures

Department of Mathematics
香港城市大學
City University of Hong Kong

DEPARTMENT OF MATHEMATICS

City University of Hong Kong

Inverse problems for non-linear partial differential equations

by

Professor Matti LASSAS
University of Helsinki

Date: 24 Feb. 2022 (Thursday)
Time: 4:00 – 5:00 pm

ABSTRACT

In the talk we give an overview on how inverse problems can be used solved using non-linear interaction of the solutions. This method can be used for several different inverse problems for non-linear hyperbolic or elliptic equations. In this approach one does not consider the non-linearity as a troublesome perturbation term, but as an effect that aids in solving the problem. Using it, one can solve inverse problems for non-linear equations for which the corresponding problem for linear equations is still unsolved. For the hyperbolic equations, we consider the non-linear wave equation $\square_g u+u^m=f$ on a Lorentzian manifold $M\times R$ and the source-to-solution map $\Lambda_V:f\to u|_V$ that maps a source f, supported in an open domain $V\subset M\times R$, to the restriction of u in V. Under suitable conditions, we show that the observations in V, that is, the map Λ_V, determine the metric g in a larger domain which is the maximal domain where signals sent from V can propagate and return back to V. We apply non-linear interaction of solutions of the linearized equation also to study non-linear elliptic equations. For example, we consider $\Delta_g u+qu^m=0$ in $\Omega\subset R^n$ with the boundary condition $u|_{\partial \Omega}=f$. For this equation we define the Dirichlet-to-Neumann map $\Lambda_{\partial \Omega}:f\to u|_V$. Using the high-order interaction of the solutions, we consider various inverse problems for the metric g and the potential q.

Registration URL:
https://cityu.zoom.us/meeting/register/tJApc-GqqzkuGd3Lhyw1W6bkd470yNF4t3xY

~ALL ARE WELCOME~