Frontiers of Mathematics Lecture
Soliton resolution and classification of global dynamics for nonlinear wave equation

Abstract

Nonlinear wave equations (in broad sense) describe space-time oscillations in various physics ranging from quantum mechanics to cosmology. Typical solutions consists of scattering waves, blow-up and solitons, depending on competition between dispersive effects and nonlinear interactions. The soliton resolution conjecture is a generic expectation to approximate the asymptotic behavior for large time by superposition of solitons and radiation.

Although it is inspired by the case of completely integrable systems, the phenomenon is quite different as most of solitons are unstable in the non-integrable case. Then it is a more realistic question to describe how the asymptotic formula is changed for small perturbations, thereby classifying the initial data for the global behavior. It is highly nontrivial when there are multiple solitons, since the nonlinear interactions among unstable modes may screw up the dynamics even if the solitons are far from each other. In this lecture, I will quickly survey the state-of-art and then talk about my recent joint work with Gong Chen on the nonlinear Klein-Gordon equation.

Professor Kenji Nakanishi
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Date :
26 November, 2024 (Tuesday)

Time :
5:00 – 6:00pm
(Tea Reception starts at 4:30 pm)

Venue :
Lecture Theatre A, G/F,
Chow Yei Ching Building
The University of Hong Kong

Biography

Kenji Nakanishi is a Professor at Research Institute for Mathematical Sciences of the Kyoto University. He received his Bachelor of Science in Mathematics, Master of Science and Ph.D. in Mathematical Sciences from the University of Tokyo. Nakanishi has held several research and professional positions and became a Professor in Osaka University (2015-2018) and Kyoto University from 2018.

Prof. Nakanishi has received numerous prestigious awards for his contributions to mathematics, including the Takebe Prize from the Mathematical Society of Japan in 1999, the Analysis Prize from the Mathematical Society of Japan in 2005, the Spring Prize from the Mathematical Society of Japan in 2007, and the Inoue Prize for Science from the Inoue Foundation for Science in 2020. His research subject focuses on mathematical analysis of partial differential equations. He has published over 80 research papers in various reputable academic journals, such as the Journal of Differential Equations, Mathematische Annalen, and Communications in Mathematical Physics.