

Abstract

Inverse scattering problems arise in diverse application areas, such as geophysical prospecting, submarine detection, near-field and nano optical imaging, and medical imaging. For a given wave incident on a medium enclosed by a bounded domain, the scattering (direct) problem is to determine the scattered field or the energy distribution for the known scatterer. The inverse problem is to determine the scatterer from the boundary measurements of the fields. Although significant recent progress has been made for solving the inverse problem, many challenging mathematical and computational issues remain unresolved. In particular, the severe ill-posedness has thus far limited the scope of inverse problem methods in practical applications.

In this talk, the speaker will first introduce several inverse scattering problems of broad interest and discuss recent developments in the mathematical and computational studies of the problems. Based on multi-frequency data, effective computational and mathematical approaches will be presented for overcoming the ill-posedness of the inverse problems. Selected mathematical and computational results will be discussed. Our most recent results on stability for the multifrequency inverse medium problems and inverse source problems in elasticity will also be highlighted.