African-European Early-Career Network for Mathematical Analysis and Related Fields

Meeting 08.05.26 17:00-19:00 CET

Program

Math Talk | 45 *min*

H^1- Global wellposedness of Nonlinear Schrödinger Equation with exponential non-linearity on compact surfaces

By Filone Gilson Longmou Moffo, AIMS-Senegal

Abstract: In this work, we establish a probabilistic global theory (existence for all times, uniqueness and continuity) in H^1 for the NLS equation with a Moser-Trudinger nonlinearity posed on compact surfaces. This equation is known to be the two dimensional counterpart to the classical energy-critical Schrödinger equations and there exists a trichotomy around the criticality of the equation based on the size of the total energy. In particular, for supercritical regimes (large energy), the equation is known to exhibit instabilities : the (uniform) continuity of the flow fails to hold. Also large data distributional non unique probabilistic solutions have been obtained in the work of Casteras and Monsaingeon but their setting does not handle the uniqueness issue for the H^1-data and therefore could not define a flow for this regularity. Our main focus here is to build a single probabilistic framework that provides both existence, uniqueness, and continuity with respect to the initial data in H^1. Our uniqueness and continuity are based on the so-called Yudowich argument , and the probabilistic estimates are derived through the IID limit procedure.

Math Talk | 30 min

Monotonicity-Based Reconstruction for Inverse Coefficients Problems

By Chayma Nssibi, ENIT-LAMSIN, University of Tunis El Manar

Abstract: We addresses the inverse problem of reconstructing the spatially varying Lamé parameters (λ, μ) and the coefficient ρ in the system of linear elasticity from boundary measurements, specifically the Neumann-to-Dirichlet (NtD) map, in any spatial dimension d ≥ 2. Such problems are fundamentally ill-posed, requiring a sophisticated mathematical framework to achieve stable and unique reconstructions. The core of our approach is built upon the monotonicity method, which establishes a qualitative relationship between the material parameters and the associated NtD operator, combined with the theory of localized potentials, whose existence is guaranteed by the Strong Unique Continuation Property (SUCP) for the Lamé system. First, we establish new Lipschitz stability estimates. We derive a constructive stability result for the recovery of the coefficient ρ when the Lamé parameters are known, and we prove a

simultaneous Lipschitz stability estimate for the joint recovery of (λ, μ, ρ), provided the parameters belong to a known finite-dimensional subspace. Second, we develop a robust numerical framework for support identification. We introduce a hybrid reconstruction algorithm that synergistic-ally combines monotonicity principles with Truncated Singular Value Decomposition (TSVD) regularization. This method demonstrates enhanced accuracy and noise robustness, effectively handling the challenging case of disjoint inclusions. The theoretical findings are supported by numerical experiments that confirm the stability, accuracy, and practical applicability of the proposed methods. This work provides a comprehensive and unified framework, bridging rigorous mathematical analysis with computational practice, for solving inverse problems in linear elasticity, with direct relevance to fields such as medical imaging and non-destructive testing.