Some results for time-domain inverse problems

Soumen Senapati

Karlsruhe Institute of Technology
Germany

Abstract : In this talk, we present an overview of recent results for some hyperbolic inverse problems associated with the standard wave operator. Such problems are studied, for instance, to determine acoustic properties of a medium (often modelled by coefficients to the wave operator) from a given dataset. Depending on the measurement under consideration, these inverse problems may be of formally over-determined and determined nature. Our primary focus is to discuss the stability and reconstruction aspects with regard to simultaneous determination of several unknown coefficients including the source. At the end, we also discuss a uniqueness result for a non-local parabolic inverse problem and related unique continuation results.

This talk will be based on the works [BS24(a), BS24(b), KRS21, KRS23, S21] and [SS25].

References

[BS24(a)] A. Banerjee and S. Senapati; **The Calderón problem for space-time fractional parabolic operators with variable coefficients**, SIAM Journal on Mathematical Analysis, 56 (2024), no. 4 , 4759–4810.

[BS24(b)] A. Banerjee and S. Senapati; **Extension problem for the fractional parabolic Lame operator and unique continuation**, Calculus of Variations and Partial Differential Equations, Vol. 63, Article no. 203, 2024.

[KRS21] V. P. Krishnan, Rakesh and S. Senapati; **Stability for a formally determined inverse problem for a hyperbolic PDE with space and time dependent coefficients**, SIAM Journal of Mathematical Analysis 53 (2021), no. 6, 6822–6846.

[KRS23] V. P. Krishnan, Rakesh and S. Senapati; **Point sources and stability for an inverse problem for a hyperbolic PDE with space and time dependent coefficients**, Journal of Differential Equations 342 (2023), 622–665.

[S21] S. Senapati; **Stability estimates for the relativistic Schrödinger equation from partial boundary data**, Inverse Problems, 37 (2021), no. 1, paper no. 015001, 25 pp.

[SS25] S. Senapati and M. Sini; **Minnaert frequency and simultaneous reconstruction of the density, bulk and source in the time-domain wave equation**, Archive for Rational Mechanics and Analysis, 249 (2025), article no. 48.