

Hyperbolic and Schrödinger Equations on Multi-Dimensional Bounded Domains: Uniform Stabilization with Nonlinear Boundary Dissipation and Nonlinear Inverse Problems through a Single Boundary Measurement

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These series of lectures will focus principally on second-order hyperbolic equations and Schrödinger equations, defined on a multi-dimensional bounded domain, subject to dissipation, control or observation/measurements localized at the boundary. Two main themes will be treated: (i) uniform stabilization with nonlinear boundary dissipation; and (ii) nonlinear inverse problems through a single boundary measurement.

An underlying theme will be Carleman estimates—both in the Euclidean as well as in the Riemannian metric—and their role in stabilization, observability (exact controllability) and inverse problems with a single boundary measurement. In particular, parallels between control problems and inverse problems will be noted.

The lectures will be based on the references listed below:

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- [La-Ta.1] I. Lasiecka and D. Tataru, Uniform boundary stabilization of semi-linear wave equations with nonlinear boundary damping, *Diff. Int. Eqns.* 6 (1993), 507–533.
- [La-To.1] I. Lasiecka and D. Toundykov, Energy decay rates for semilinear wave equations with nonlinear localized damping and source terms, *Nonlinear Anal.* 64 (2006), 1757–1797.
- [La-To.2] I. Lasiecka and D. Toundykov, Regularity of higher energies of wave equation with nonlinear localised damping and a nonlinear source, *Nonlinear Analysis* 69 (2008), 898–910.
- [La-T.1] I. Lasiecka and R. Triggiani, Uniform stabilization of a shallow shell model with nonlinear boundary feedback, *J. Math. Anal. Appl.* 269(2) (2002), 642–688.
- [La-T.2] I. Lasiecka and R. Triggiani, Well-posedness and uniform decay rates at the $L_2(\Omega)$ -level of Schrödinger equations with nonlinear boundary dissipation, *J. Evol. Eqns.* 6 (2006), 485–537.

- [La-T.3] I. Lasiecka and R. Triggiani, Uniform energy decay rates of hyperbolic equations with nonlinear boundary and interior dissipation, invited paper for special issue Control & Cybernetics, *Control Journal of Polish Academy of Sciences* in honor of J. P. Zolesio, 37(4) (2008), 932–966.
- [Li-T.1] S. Liu and R. Triggiani, Global uniqueness and stability in determining the damping and potential coefficients of an inverse hyperbolic problem, *Nonlinear Analysis, Series B* 12 (2011), 1562–1590.
- [Li-T.2] S. Liu and R. Triggiani, Global uniqueness and stability in determining the damping coefficient of an inverse hyperbolic problem with non-homogeneous Neumann B.C. through an additional Dirichlet boundary trace, *SIAM J. Math. Analysis*, to appear (39 pp.).
- [Li-T.3] S. Liu and R. Triggiani, Global uniqueness in determining electric potentials for a system of strongly coupled Schrödinger equations with magnetic potential terms, *J. Inverse Ill-Posed Prob.*, 25 pp., to appear.
- [T-Y.1] R. Triggiani and P. F. Yao, Carleman estimates with no lower order terms for general Riemannian wave equations. Global uniqueness and observability in one shot, *Appl. Math. & Optimiz.* 46(2–3) (2002), 331–375.
- [T-Z.1] R. Triggiani and X. Xu, Pointwise Carleman estimates, global uniqueness, observability and stabilization for non-conservative Schrödinger equations on Riemannian manifolds at the $H^1(\Omega)$ -level, *AMS Contemporary Math.* 426 (March 2007), 339–404.