Workshop on
Harmonic analysis and Nonlinear Evolution Equations

23-24 February 2018

Aula Magna and Sala Seminari, Department of Mathematics

http://people.dm.unipi.it/~georgiev/convegni/Pisa2018/PISA_2018.htm

Program

23rd February 2018

Tohru Ozawa : 10:00 – 10:45
On improved Hardy inequalities

Abstract: Hardy inequalities are studied in view of both radial and angular derivatives in the framework of equalities.

Fulvio Ricci : 11:00 – 11:45
About restriction of the Fourier transform

Abstract: The Fourier restriction phenomenon to surfaces in $\mathbb{R}^n$ is the source of some of the most attractive problems in harmonic analysis. Historically, Strichartz's inequalities for restriction to quadratic surfaces are at the basis of the inequalities for dispersive equations named after him. This talk will rather be concerned with the implications of restriction theorems on properties of Fourier transforms of L^p functions for p close to 1. We present results obtained jointly with D. Müller and J. Wright.

Jacopo Bellazzini : 12:00 – 12:45
Long time dynamics for semirelativistic NLS and half wave equation

Abstract: Aim of the talk is to present recent results concerning existence and dynamical properties of ground states for semirelativistic NLS and HW. Joint work with V. Georgiev and N. Visciglia.

∼ Lunch Break ∼

Nicola Visciglia : 14:30 – 15:15
On the growth of Sobolev norms in compact setting

Abstract: we show polynomial bounds on the growth of Sobolev norms for solutions to NLS on a compact manifold as well as to NLS perturbed by an harmonic oscillator.

Mirko Tarulli : 15:30 – 16:15
H^2-scattering for systems of weakly coupled fourth-order NLS equations in low space dimensions

Abstract: We prove that the scattering operators and wave operators are well-defined in the energy space for the system of defocusing fourth-order Schrödinger equations

$$\begin{cases} i\partial_t u_\mu + (\Delta^2 - \kappa\Delta)u_\mu + \displaystyle\sum_{\mu,\nu=1}^{N} \beta_{\mu\nu}|u_\nu|^{p+1}|u_\mu|^{p-1}u_\mu = 0, \qquad \mu = 1,\dots,N, \\ (u_\mu(0,\cdot))_{\mu=1}^N = (u_{\mu,0})_{\mu=1}^N \in H^2(\mathbb{R}^d)^N. \end{cases}$$

with $\kappa = 0, 1$, $N \geq 1$, $\beta_{\mu\nu} \geq 0$, $\beta_{\mu\mu} \neq 0$ for $p \geq 1$ if $d = 3$, and $p > 1$ if $d = 4$.

Norihisa Ikoma : 16:30 – 17:00
Uniqueness and nondegeneracy of ground states to scalar field equations

Abstract: This talk is concerned with the uniqueness and nondegeneracy of ground sates to scalar field equations. Our nonlinearity is a combined power type involving the Sobolev critical exponent. We show that if the frequency is sufficiently large, then the ground states is unique up to translations and nondegenerate in the Sobolev space consisting of radial functions. This talk is based on joint work with Takafumi Akahori (Shizuoka Univ.), Slim Ibrahim (Univ. of Victoria), Hiroaki Kikuchi (Tsuda Univ.) and Hayato Nawa (Meiji Univ.).

Gianmarco Brocchi : 17:15 – 17:45
Existence of extremizers for a Strichartz estimate for the fourth order Schrodinger equation

Abstract: In dispersive PDE, Strichartz estimates are a fundamental tool in understanding the evolution of waves. The search for extremizers in the corresponding inequalities is an active area of research, and is intimately related with the study of the Fourier extension operator from certain hypersurfaces.

In this talk, we discuss a sharp Strichartz estimate for the fourth order Schrodinger equation. A careful analysis of the convolution measure on the quartic shows that extremizers for this inequality do exist. This is a joint work with Diogo Oliveira e Silva and Rene Quilodran.

Quoc Hung Nguyen : 18:00 – 18:30
Singular integral operators of Kakeya type and quantitative estimates with BV vector fields

Abstract: In this talk, we introduce a singular integral operator of Kakeya type and establish a weak type $(1,1)$ bound for this operator. We then apply it to solve a main open problem mentioned in [L. Amborosio and G. Crippa, 2014]. Exactly, we prove the well posedness of regular Lagrangian flows to vector fields $B=(B^1,...,B^d)\in L^1((0,T);L^1\cap L^\infty(\mathbb{R}^d))$ satisfying

$$B^i=\sum_{j=1}^{m}\mathbf{K}_j^i * b_j, \quad b_j\in L^1((0,T),BV(\mathbb{R}^d))$$

and $\mathrm{div}(B)\in L^1((0,T);L^\infty(\mathbb{R}^d)$, where $(K_j^i)_{i,j}$ are singular kernels of fundamental type in $\mathbb{R}^d$.

Organizing Committee
Jacopo Bellazzini (University of Sassari)
Kazumasa Fujiwara (SNS,Pisa)
Vladimir Georgiev (Dipartimento di Matematica, Università di Pisa)