Mini-course program

January 3-4

Chang-Shou Lin

The existence of self-dual non-topological solutions in the Chern-Simons-Higgs model.

We will introduce the notion of topological solutions and non-topological solutions for the Chern-Simons Higgs equation. In the lecture, we want to prove a general result of the existence of non-topological multi-vortices solution in R^2.

Filomena Pacella

Symmetry of solutions of semilinear elliptic equations

First part of this course will be an introductory lecture on symmetrization.Second part will deal with the symmetry of solutions of semilinear elliptic equations using Morse index

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Frederic Robert:

Concentration phenomena for some elliptic nonlinear equations

In this short course, we will detail a few applications to elliptic equations of classical tools in the calculus of variations. We will focus on the limit case of these applications where these tools do not apply directly, but require a deep understanding of the underlying dynamics of the equations at stake.

Kunnath Sandeep

Concentration compactness principle

We will briefly discuss a few simple cases where compactness comes in to picture in the study of PDE and then discusses the two concentration compactness lemmas.

Kyril Tintarev

Cocompactness: concentration compactness in terms of functional analysis

In absence of a compact imbedding, we define the “next best” property, a cocompact imbedding, where convergence in the target space follows by a weak converegence strengthened by actions of a suitable group. This allows to describe behavior of bounded sequences as convergent modulo a well-structured sum of “blowups”, which for Sobolev spaces found its expression in profile decompositions of Solimini, Gerard and Jaffard. We will concentrate on the implications of the concentration for Sobolev spaces on manifolds, and present concentration theory for the borderline imbeddings (Trudinger-Moser case).

Vanninathan

Interpolation Spaces.

Beginning with Interpolation Theorems of Riesz-Thorin and Marcinkiewicz,it is shown how they can be generalized to abstract situations giving rise to Complex and Real Interpolation Methods.
We intend to describe properties and give examples of Interpolation Spaces obtaind through these methods.

January 9-12 (updated version will follow)

Stefanella Boatto

The Poisson equation, the Robin function and singularities' dynamics :
an hydrodynamic approach

Monica Clapp

Symmetries in variational problems

Pierpaolo Esposito

Blow-up phenomena in two-dimensional problems

Stephane Jaffard

Some interplays between multifractal analysis and functional
analysis.

The wavelet characterization of Besov spaces suggests an interpretation of the wavelet norm in terms of the distributions of wavelet coefficients at each scale. Natural extensions are supplied by conditions directly bearing on these distributions, which leads to the notion of S^ν spaces. We will also consider T^ν spaces, which are defined by conditions on the distributions of wavelet leaders (i.e. local suprema of wavelet coefficients). The purpose of this course is to give a self contained introduction to the properties of these spaces. It will cover the following topics:

- Orthonormal wavelet beses
-wavelet charcaterization of Besov and Sobolev spaces
- spaces defined by wavelet conditions: the notion of ``Robustness''
-Definition and properties of S^{ν} spaces
-wavelet leaders
-definition and properties of T^{ν} spaces

Rowan Killip

Inverse Inequalities

We review some tools from harmonic analysis and then show
how they lead to inverse inequalities. Such inequalities give a strong quantitative formulation of the phenomenon that functions that almost saturate certain classical inequalities must contain a bubble of concentration. Even in the case of Sobolev embedding, there are several different formulations, which we will contrast. This talk provides background information for Monica Visan's lecture.

Roberta Musina:

On the Sacks-Uhlenbeck approach to noncompactness

Frank Pacard

Minimal surfaces and the Allen-Cahn equation.

The Allen-Cahn equation arises in the modeling of phase transition. In recent years there has been a lot of activities around this equation in particular, many solutions non trivial solutions have been constructed exploiting the noncompactness of the moduli space of the solutions. In this series of lectures, I will present all the ingredients which are necessary to understand the construction of solutions to the Allen-Cahn equation whose profile close to the interface is prescribed.

Monica Visan
UCLA

Linear and nonlinear profile decompositions for the Schrodinger equation

We discuss linear and nonlinear profile decompositions for the Schrodinger equation, using the energy-critical case as our model. We will then describe how this leads to the existence and almost
periodicity of minimal blowup solutions.