ONE-DAY MEETING IN MATHEMATICAL ANALYSIS
TO CELEBRATE GIANNI MANCINI

BOOK OF ABSTRACTS

Jacopo Bassi (Università degli Studi di Roma "Tor Vergata")

TBA

Luca Battaglia (Università degli Studi Roma Tre)

New solutions for the Lane-Emden problem in planar domains

We consider the Lane-Emden problem on a smooth bounded planar domain. We find nodal concentrating solutions, for large values of p, where both the positive and negative part blow up, the latter with a non-radial profile. Up to our knowledge, this is the first result concerning concentration with such a pattern for planar elliptic problems. Joint work with I. Ianni and A. Pistoia (Rome Sapienza).

Daniele Castorina (Università degli Studi di Napoli "Federico II")

Mean-field sparse optimal control of systems with additive white noise

We analyze the problem of controlling a multiagent system with additive white noise through parsimonious interventions on a selected subset of the agents (leaders). For such a controlled system with an SDE constraint, we introduce a rigorous limit process toward an infinite dimensional optimal control problem constrained by the coupling of a system of ODEs for the leaders with a McKean–Vlasov type of SDE, governing the dynamics of the prototypical follower. The latter is, under some assumptions on the distribution of the initial data, equivalent with a (nonlinear parabolic) PDE-ODE system. The derivation of the limit mean-field optimal control problem is achieved by linking the mean-field limit of the governing equations together with the Gamma-limit of the cost functionals for the finite-dimensional problems.
This is a joint research project with Francesca Anceschi (Ancona), Giacomo Ascione (SSM Napoli) and Francesco Solombrino (Lecce).

Pierpaolo Esposito (Università degli Studi Roma Tre)

Exponential PDEs in high dimensions

I will report on recent progress in the study of a quasilinear equation involving the n-Laplacian and an exponential nonlinearity in $\mathbb{R}^n$. In particular quantization issues for blow-up masses in the non-compact situation will be discussed and their relationship with Harnack inequalities of $\sup + \inf$ type. I will also present some new achievements concerning sharp $\sup + \inf$ inequalities.

Gabriele Mancini (Università degli Studi di Bari "Aldo Moro")

N-Euclidean Logarithmic Moser-Trudinger-Onofri inequalities

In this talk I will provide a brief overview of the history of Onofri's inequality for the unit sphere, highlighting its connection with Trudinger-Moser type inequalities on Euclidean bounded domains. I will focus on an N-dimensional Euclidean version of Onofri's inequality, proved by del Pino and Dolbeault, for smooth compactly supported functions in $\mathbb{R}^N$. I will prove that this inequality can be extended to a suitable weighted Sobolev space and, although there is no clear connection with standard Sobolev spaces on $\mathbb{S}^N$ via stereographic projection, I will show that it is equivalent to the logarithmic Moser-Trudinger inequality with sharp constant, obtained by Carleson and Chang for balls in $\mathbb{R}^N$. These results are part of a joint work with N. Borgia and S. Cingolani..

Roberta Musina (Università degli Studi di Udine)

Hardy-Sobolev inequalities involving mixed radially and cylindrically symmetric weights

We deal with weighted Hardy–Sobolev type inequalities for functions on $\mathbb{R}^d$, $d \geq 2$. The weights involved are anisotropic, given by products of powers of the distance to the origin and to a nontrivial subspace.

We establish necessary and sufficient conditions for validity of these inequalities, and investigate the existence/nonexistence of extremal functions.

This is a joint paper with Gabriele Cora (Université Libre de Bruxelles) and Alexander I. Nazarov (St. Petersburg Dep. of Steklov Inst.).

Vincenzo Morinelli (Università degli Studi di Roma "Tor Vergata")

A geometric approach to Algebraic Quantum Field Theory

Algebraic Quantum Field Theory (AQFT) provides a framework for studying relativistic quantum systems with infinitely many degrees of freedom.
The interplay between geometric and algebraic structures in AQFT has long been a rich field of study, getting insights from operator algebras, Lie theory, category theory, and other areas of mathematics.
An important theme in AQFT is the relation between localization properties of quantum fields, the structure of local algebras, and the underlying geometry of the models.
In this work, we propose a new perspective on these connections by linking the geometry of standard subspaces, the role of Euler elements in the Lie algebra of a Lie group, and the geometric structures underlying AQFT.
Based on the joint work with K.-H. Neeb, "From local nets to Euler elements", Advances in Mathematics, Volume 458, Part A, (2024)

Kunnath Sandeep (TIFR Centre for Applicable Mathematics - Bangalore)

Nonlinear perturbations of Critical elliptic equations with Hardy-Sobolev type nonlinearity

The solvability of critical semilinear elliptic equations with linear perturbations, known as Brezis-Nirenberg problem is well studied for many decades. When the perturbation is nonlinear, the same equation was discussed in the seminal paper of Brezis and Nirenburg and necessary conditions on the nonlinearity for lowering the energy and hence establishing the existence was established. Later the problem was revisited by Adimurthi, Mancini and myself, and we refined further these results obtained in the Brezis-Nirenberg paper. In this talk we will mainly discuss similar questions for certain critical equations with nonlinearity of Hardy-Sobolev type and discuss similar issues.