International Conference in Memory of Filippo Chiarenza

Degenerate Elliptic Operators and Applications

Department of Mathematics and Computer Sciences - Lecture Hall

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The problem of Harnack inequality and of H"older regularity of variational solutions of a degenerate uniformly elliptic second order equation has been addressed since the beginning of the seventies. Nowadays it is well known that if the matrix of the coefficients of the equation is comparable to the diagonal matrix $w(x)I$ and if the weight function $w$ belongs to the Muckenhoupt class $A_2$, then an invariant Harnack inequality holds and the variational solutions are H"older continuous.

On the other side, the necessity of the assumption $w \in A_2$, or of similar structural assumptions on the weight function, is far from being well understood. Also the simpler question of the necessity/sufficiency of quantitative assumptions on $w$ and $1/w$, even if better understood, is not yet completely settled.

The study of the associated parabolic equations has provided elementary examples of the necessity of adapted geometries intrinsic to the equations.
Nicola Garofalo: **Heat kernels for a class of evolution equations of hybrid type**

Abstract: The aim of my talk is to construct some explicit heat kernels for a class of hybrid evolution equations which arise in conformal CR geometry and in subelliptic PDEs. By hybrid I mean that the relevant partial differential operator appears in the form $L_1 + L_2 - \partial_t$, but the variables cannot be decoupled. This means that the relative heat kernel cannot be written as the product of the heat kernels of the operators $L_1 - \partial_t$ and $L_2 - \partial_t$. The approach is completely self-contained, elementary, and it is purely based on PDE methods. The aim is to emphasise the so far unexplored connection of such hybrid equations with the heat kernel of the generalised operator of Ornstein-Uhlenbeck type in the opening of Hörmander’s groundbreaking 1967 work on hypoellipticity. This is joint work with Giulio Tralli.