

# A one day workshop on Symmetry, Subharmonicity and Nonsmooth Vector Fields

Department of Mathematics, Pisa University, Aula Magna

February 22, 2012

**15:30-16:20 Ermanno Lanconelli** (Bologna University)

Some problems of gravitational symmetry in both Riemannian and sub-Riemannian contexts.

*Abstract.* Let  $P$  be a connected solid of mass  $m$  and suppose that the gravitational field of  $P$  outside this set is equal to the field generated by the mass  $m$  concentrated at the origin. It follows that  $P$  is a ball concentrated at the origin. From this symmetry result, proved by Ahn, Shiffer and Zalcman in 1981, one establishes a harmonic characterisation of Euclidean balls. The present talk will be concerned with this problem in both Riemannian and sub-Riemannian perspectives.

**16:30-17:20 Andrea Bonfiglioli** (Bologna University)

Subharmonic Functions in sub-Riemannian Settings.

Characterizations of subharmonicity.

*Abstract.* In this talk we describe mean value characterizations for subharmonic functions related to linear second order partial differential operators with non-negative characteristic form, possessing a well-behaved fundamental solution  $\Gamma$ . These characterizations are based on suitable average operators on the level sets of  $\Gamma$ . Asymptotic characterizations are also considered. We analyze as well the notion of subharmonic function in the weak sense of distributions, and we show how to approximate subharmonic functions by smooth ones. The classes of operators involved are wide enough to include, as very special cases, the sub-Laplacians on Carnot groups.

**17:20-17:40 Coffee break**

**17:40-18:30 Daniele Morbidelli** (Bologna University)

Exponential maps and integrability results for nonsmooth distributions.

*Abstract.* We will present some integrability results for distributions spanned by families of nonsmooth vector fields. This involves the discussion of the notion of commutator for vector fields with rough coefficients. Our integrability results are also related with some properties of a class of almost exponential maps which we discuss under low regularity assumptions. These are joint results with Annamaria Montanari (arXiv:1106.2410v2, arXiv:1201.5228, arXiv:1201.5209).