Università degli Studi della Basilicata
Dipartimento di Matematica, Informatica ed Economia

Seminario Interdisciplinare di Matematica

Si avvisano gli interessati che ***Mercoledì 7 Novembre 2018 alle ore 16:30***, nell'Aula Seminari del Dipartimento (Aula n. 18),

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terrà la conferenza dal titolo

The canonical bundle and a conjecture of Trautman

Summary. A real hypersurface in a complex manifold has an induced geometry called a CR structure. Thinking about the lowest dimensional case, Hans Lewy found his famous example of a partial differential equation $Pu = f$ with no solutions. An analogous CR structure can be defined on any odd dimensional manifold. An obvious question is whether a given abstract CR structure can be identified with a real hypersurface. This question turns out to be of the most interest for three dimensional manifolds. Here again, a seminal result in PDE was discovered; namely Nirenberg's example of an homogeneous equation $Qu = 0$ with only u equal to a constant as a solution. This coresponds to a three dimensional CR structure that cannot be realized as a real hypersurface in $\mathbf{C^2}$.

In the 1950s, physicists working in general relativity found that one approach to Einstein's equations leads to a three dimensional CR manifold. More precisely, a shear-free congruence of null geodesics endows the quotient space with a CR structure. In 1998, A. Trautman conjectured that a natural physical assumption is equivalent to the CR structure being that of a real hypersurface. So under this assumption, the equation $Qu = 0$, unlike Nirenberg's example, has as many solutions as possible.

A weak form of this conjecture was already in the literature in 1987 and will also be discussed.

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