The geometry of Nash: between algebra, analysis and topology

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In his 1952 masterpiece paper, Nash introduced a new concept of map, an intermediate concept between the ones of polynomial and analytic map. The geometry revealed by these new maps has amazing connections with other fields of Mathematics as algebra, analysis and topology.

In a suitable sense we can say that Nash geometry is the “smallest geometry” containing algebraic varieties, polynomial maps between them, and which is “closed under the implicit function theorem”. In particular a Nash map is analytic, if its Jacobian is invertible its local inverse is again a Nash map, and Nash submanifolds of $\mathbb{R}^n$ have tubular neighborhoods with Nash regular retractions. These facts are examples of the interplay between Nash geometry, analysis and differential topology. The connection with algebra is strong as well: consider that some basic global results for Nash maps were proved using the so-called Néron’s desingularization, a very deep theorem from commutative algebra.

In this talk we present some basic notions from Nash geometry, and we discuss some basic theorems describing the mentioned algebraic and analytic nature of these notions. Then we present some recent results concerning the existence of algebraic structures on Nash sets and the possibility of approximating continuous maps with values in a Nash set by smooth maps. The latter results strongly depend on the topology of Nash sets.

The seminar will take place in Italian or English, depending on the audience.

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