DOTTORATO

CYCLE 35th
ORAL DEFENCE OF THE PHD THESIS

Wednesday 10 May 2023 – at 11.00 am
Department of Physics - Physics Seminar Room
The event will take place in presence and online through the ZOOM platform.
To get the access codes please contact the secretary office

Antonio Carbone

PhD Student in Mathematics

Nash images of closed balls and applications

Abstract:

By Tarski's theorem the image of a semialgebraic set under a semialgebraic map is a semialgebraic set. We are interested in what might be called the `inverse problem' to Tarki's result for Nash functions. In particular, we study the Nash images of closed balls. We show that a d-dimensional semialgebraic set is a Nash image of a closed unit ball of dimension greater than or equal to d, if and only if the semialgebraic set is compact and connected by analytic paths.

We prove this result using two different types of techniques. The first approach is an *ad hoc* procedure inspired by some recent ideas and results developed by J. Fernando and C. Ueno concerning polynomial images of closed balls. Alternatively, we approach the problem using an improvement of Hironaka's desingularization of algebraic sets for semialgebraic sets connected by analytic paths and introducing a generalization of the double of a Nash manifold with boundary for Nash manifolds with corners. As a byproduct of these two constructions we obtain some relevant applications:

• Characterization of all the possible models to represent a given semialgebraic set connected by analytic paths as Nash image (both in the compact and non-compact case).
• Sufficient conditions to determine when there exists a surjective Nash map between two semialgebraic sets (not necessarily connected by analytic paths).
• An application to the problem of `elimination of inequalities': A compact semialgebraic set is the projection of an algebraic set whose connected components are Nash diffeomorphic to spheres (possibly of different dimension).
• Approximation by Nash maps of proper continuous semialgebraic maps whose target space is a Nash manifold with corners.

Supervisor: José Francisco Fernando Galván (University of Madrid)
Cosupervisor: Riccardo Ghiloni (University of Trento)

CONTATTI
Staff di Dipartimento - Matematica
tel. 0461 281508-1625-1701-3786
phd.maths@unitn.it
www.maths.unitn.it