PDE, Complex Analysis and Differential Geometry

UNIVERSITY OF NOTRE DAME
Department of Mathematics

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11:00 am
Room: 258 Hurley Hall

Title: Topology of nonholonomic loop spaces

Abstract:
On a manifold with generic nonholonomic constraints it is possible to go everywhere along admissible curves. It is interesting to study the topology of the space of admissible curves joining two points, the nonholonomic loop space. By applying Morse theory we can relate its topology with the structure of geodesics (critical points of the energy).

If the manifold is $\mathbb{R}^n$, the nonholonomic loop space is contractible, but we can still apply Morse theory and study what happens to the sublevels of the energy as it increases. On one hand, we get more and more geodesics and we find an upper bound for their number; on the other hand even if every Betti number of the loop space must eventually vanish, their sum still grows unbounded.

The leading coefficient of this growth order is a local invariant of the nonholonomic structure; in the case the non admissible directions are fewer than 3, this leading coefficient is computed analytically via an integral on the space of skew-symmetric matrices. (This is joint work with A. Agrachev and A. Lerario)