



Seminari di Matematica

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Morse theory in infinite dimension old and new

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Abstract

The Morse theory of critical points, originally developed by Morse with his work on closed geodesics and later extended by Palais and Smale to a certain class of functionals on Hilbert manifolds, is inapplicable for problems defined in a Banach setting, as the usual notion of non-degeneracy for critical points cannot be satisfied, and, even in a Hilbert setting, it is of no use in case the critical points have infinite Morse index and co-index, as the critical groups always vanish. One way to overcome these issues is to use the Morse complex approach, which relies on a different notion of non-degeneracy, and uses the intersections between stable and unstable manifolds of pairs of critical points to build a chain complex generated precisely by critical points. In this talk I will discuss advantages and drawbacks of the Morse complex approach with respect to the classical approach, both from a general point of view and for concrete examples, such as the Hamiltonian action functional on cotangent bundles, functionals involving the p -Laplacian or the p -area functional, and the functionals of Dirac-harmonic maps.

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