

Scuola tematica "Modern Trends in Pure and Applied Mathematics"



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V. Agostiniani (University of Trento) - Minicourse "Rigidity phenomena arising in Riemannian Geometry and in General Relativity"

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In geometric analysis, rigidity phenomena occur when specific conditions, typically expressed in terms of partial differential equations, are imposed on a family of mathematical objects, such as functions or tensor fields, leading to the conclusion that solutions can exist only on a distinguished subclass of manifolds, typically characterised by a high number of symmetries.

In this mini-course, we will review some of the most significant examples of rigidity phenomena that have emerged in recent decades in the fields of Riemannian geometry and mathematical relativity, illustrating the main ideas and the techniques employed to establish them. Starting with the classical Liouville Theorem on complete manifolds with Ricci tensor bounded from below, we will move toward the classification of static metrics in general relativity. We will then relax the curvature assumptions of the ambient space to derive sharp and rigid geometric inequalities.