

SEMINARIO DI GEOMETRIA

1 marzo 2018, h.11.00-12.00

Politecnico di Torino,
Dipartimento di Scienze Matematiche,
AULA BUZANO

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Some applications of the singularity theory of Rene' Thom

As part of his programme to study the genericity of stable differentiable maps between two differentiable manifolds, in the 1960's R. Thom developed a theory of stratified sets and maps. We will present some basic results of this theory - existence for algebraic varieties and semialgebraic sets, and the implications for the local topological and geometric structure of the sets (homogeneity along strata) - and will describe some recent improvements and applications. Early applications of stratified sets by Thom were to morphogenesis in biology and linguistics, via catastrophe theory. We shall describe a striking application by Canny (MIT thesis, 1987) to the generalised movers' problem in robotics, which uses the basic properties of stratified sets already described, as well as classical theorems in singularity theory due to Mather, Goresky and MacPherson. A more recent application of singularity theory using stratifications is to image analysis due to Damon, Giblin and Haslinger (2016).