

SIMION STOILow INSTITUT OF MATEMATICS OF THE ROMANIAN ACADEMY

In the framework of the project “Singularities and Applications”

Lecture series: *A guided introduction to intersection homology and applications*

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- Wednesday, January 14, 10:30 – room 306 “C. Bănică”
- Thursday, January 15, 10:30 – room 306 “C. Bănică”
- Friday, January 16, in the Topology Seminar, 11:00 – room 306 “C. Bănică”

Abstract: Intersection homology was introduced by Goresky and MacPherson in order to recover some of the classical results and properties of manifolds (like Poincare duality, Lefschetz type theorems and Hodge theory for complex manifolds) in the context of singular spaces. The guiding principle of intersection homology is that these results hold once one considers only chains that meet the singular locus with a controlled lack of transversality.

Lecture 1 (January 14): We will give a motivated introduction to intersection homology, by first recalling basic homological properties for manifolds, and then illustrating by examples how these properties can be restored in the singular context.

Lecture 2 (January 15): We will give a second definition of intersection homology using sheaves, and discuss the Kaehler package for the intersection homology groups of complex projective varieties.

Lecture 3 (January 16): We will briefly indicate several applications of intersection homology: (i) for studying the topology of Hilbert schemes of points on smooth complex surfaces; (ii) Stanley's proof of McMullen's conjecture, describing the existence of a simplicial polytope with a prescribed face vector; and (iii) Huh-Wang's proof of Dowling-Wilson's conjecture for realizable matroids.