UNIVERSITÄT HEIDELBERG Zukunft. Seit 1386.



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## **TOPOLOGY SEMINAR SS 2025:**

## INTERSECTION HOMOLOGY

**Time and Place**: We meet Fridays 2-4pm c.t., INF 205, SR 3. The first meeting is on April 25, 2025, at which point talks will be distributed.

**Registration**: Please register for the seminar online both on the MÜSLI-System and on Hei-CO. To receive credit points, you must give a talk. Towards the end of the course period, you need to register on HeiCO for a seminar- "exam", which is a formal necessity that enables grades to be entered.

**Info**: It is well-known that many of the key invariants in the high-dimensional classification of manifolds rely on Poincaré self-duality in one form or another. This global duality is actually induced by a local duality using the uniformity of manifolds. Singular spaces, on the other hand, are not uniform and their ordinary homology usually does not satisfy local or global Poincaré duality. The solution is to use a different homology theory called *intersection homology*. We will construct intersection homology both geometrically (via simplicial chains) and sheaf-theoretically. One aims for complexes of sheaves on a singular space that have local self-duality everywhere (this is called "Verdier-duality"), which then induces global Poincaré duality and hence powerful invariants such as characteristic classes. It turns out that not all singular spaces can be equipped with appropriate self-dual sheaves, and the seminar will clarify when this can be done. Important examples are the intersection chain sheaves on complex algebraic varieties. The seminar provides in particular a self-contained introduction to sheaves and to triangulated and derived categories. This seminar is open to both Bachelor and Master students. The seminar language is English.

**Prerequisites**: Some algebraic and/or differential topology. Alternatively, a background in algebraic or analytic geometry should also suffice to participate.

## Literature:

M. Banagl, *Topological Invariants of Stratified Spaces*, Springer Monographs in Mathematics, Springer-Verlag, 2007.