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TOPOLOGY SEMINAR SS 2024

SMOOTH MANIFOLDS AND BORDISM THEORY

Time and Place: We plan to meet Thursdays 2-4pm c.t., INF 205, SR 4. This information is tentative and may change. The first meeting is on April 18, 2024, at which point talks will be distributed.

Registration: Please register for the seminar online on the MÜSLI-System.

Info: We will start out with a basic introduction to smooth manifold theory. These will be understood abstractly and are not necessarily embedded in Euclidean space. Topics include tangent spaces, regular values, Sard's theorem, immersions and submersions, a weak version of the Whitney embedding theorem, tubular neighborhoods, smooth approximations, fiber bundles (in particular vector bundles), transversality, and universal bundles over Grassmann manifolds. This material will be applied in studying smooth bordism theory, the backbone of manifold classification theory. Roughly, two closed n-manifolds are called bordant if they form the boundary of a compact $(n+1)$-manifold. One often incorporates additional tangential requirements; we will here focus primarily on framed bordism and on oriented bordism. We aim for a computation over the rationals of the oriented bordism ring (a theorem of R. Thom). This also requires a brief discussion of characteristic classes. Time permitting, we shall then consider bordism as a generalized homology theory. This seminar is open to both Bachelor and Master students. The seminar language is English.

Prerequisites: Basic algebraic topology.

Literature:
M. Banagl, *Topological Invariants of Stratified Spaces*, SMM, Springer-Verlag, 2007.
G. E. Bredon, *Topology and Geometry*, GTM 139, Springer-Verlag, 1993.
P. Conner, *Differentiable Periodic Maps*, LNM 738, 2nd ed., Springer-Verlag, 1979.
J. Milnor, *Topology from the differentiable viewpoint*, revised ed., Princeton Univ. Press, 1965.
J. Milnor, J. Stasheff, *Characteristic Classes*, Annals of math. Studies 76, Princeton Univ. Press, 1974.