

SoSe26 seminar ” Algebraic topology” and ” Higher structures”:

Introduction to Infinity-categories

Organizers: Luca dal Forno, Vishnu KS (content and structure), Thomas Schick (responsible)

Time and Place: Tue 14:15-15:55, Sitzungssaal (preliminarily)

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Preliminary meeting: Friday, February 13, 16:15 Sitzungszimmer. We will discuss the goals of the seminar and a tentative programm for the talks.

Goal of the seminar:

In the usual category of topological spaces, there are several categorical constructions that do not work up to homotopy, often requiring workarounds to make sense of them in a ”homotopy invariant” way. The goal of higher category theory is to have a categorical framework with a built-in notion of homotopy, so that usual categorical constructions, such as limits and colimits, are naturally invariant up to homotopy. The main objects of study are the so-called ∞ -categories.

The first widespread approach to higher category theory was the theory of *quasicategories* by Joyal [Joy02] and Lurie [Lur09]. Their approach makes extensive use of simplicial sets and combinatorial approaches to define and work with ∞ -categories. Thanks to the huge amount of literature, this is still among the main models used when discussing higher categories, and the goal of this reading seminar is to take a detailed look at this approach. We will follow mostly the more recent textbook by Markus Land [Lan21], hopefully to a good level of detail.

Prior knowledge of at least some basics of category theory is required. Prior knowledge of some algebraic topology and basic homotopy theory is not necessary, but would also be helpful.

References

- [Joy02] A. Joyal. ”Quasi-categories and Kan complexes”. English. In: *J. Pure Appl. Algebra* 175.1-3 (2002), pp. 207–222. ISSN: 0022-4049. DOI: 10.1016/S0022-4049(02)00135-4.
- [Lur09] Jacob Lurie. *Higher topos theory*. English. Vol. 170. Ann. Math. Stud. Princeton, NJ: Princeton University Press, 2009. ISBN: 978-0-691-14049-0; 978-0-691-14048-3. DOI: 10.1515/9781400830558.
- [Lan21] Markus Land. *Introduction to infinity-categories*. English. Compact Textb. Math. Cham: Birkhäuser, 2021. ISBN: 978-3-030-61523-9; 978-3-030-61524-6. DOI: 10.1007/978-3-030-61524-6.