

Talk Title: Twisted homology and homotopy

Abstract: Barratt, Gugenheim and Moore introduced the notion of twisted Cartesian product, which played a key role for establishing the simplicial theory of fibre bundles and fibrations in their 1959 paper. The corresponding chain version is twisted tensor product, introduced by Brown in 1959. A variation led to the notion of twisted de Rham cohomology introduced by Witten et al in early 1980s. In 2016, Grigor'yan, Muranov and Yau introduced delta-cohomology theory, which can be roughly understood as taking the weighted alternating sum of faces to be the boundary operators. The notion of delta-homology introduced by Yau et al was generalized by Li, Vershinin and Wu to delta-twisted homology in 2017. In this talk, we will report our recent progress for unifying delta-homology and the twisted Cartesian product. As a generalization of the work of Li-Vershinin-Wu, we introduce the Delta-twisted Carlsson construction of Delta-groups and simplicial groups, with a property that its abelianization gives a twisted chain complex whose homology generalizes delta-homology and delta-twisted homology. For understanding the homotopy type of the Delta-twisted Carlsson construction, we introduce the concept of the Delta-twisted Cartesian product as a generalization of Barratt-Gugenheim-Moore's twisted Cartesian product, and the notion of Delta-twisted smash product. We show that the homotopy type of the Delta-twisted Carlsson construction is the loop space of a Delta-twisted smash product. This is a joint work with Mengmeng Zhang and Jingyan Li.