ALGEBRAIC MODEL OF MANIFOLDS

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Abstract: The surgery theory of dimension at least 5 stayed in the central position of classification of manifolds in the last century. In 1970s, Ranicki invented the cosheaf theory of derived quadratic forms to give an algebraic discription of the existence of high dimensional manifolds over a fixed homotopy type and the homotopy manifold classifications. On the other hand, we could understand a homotopy type by passage to rational and p-adic information. Quillen and Sullivan individually developed the rational homotopy theories. Sullivan sketched the approach to algebraize simply connected rational manifolds, i.e., a free dga over Q together with a Poincare duality and several rational Pontryagin classes, and Zhixu Su completed the proof in her thesis. About two decades ago, Mandell proved that E-inifinity algebras over Fp-bar canb be the algebraic models of p-adic nilpotent homotopy types. Five years ago, Rivera and Zeinalian showed that the cobar construction of coalgebras could give algebraic models of integral homotopy types. We want to generalize Sullivan's rational discussion of manifolds to give algebraic models of manifolds. The project is still in progress but I will talk about our recent work of 2-adic discussion of Ranicki's theory and one application of this powerful theory to understand Galois actions on smooth complex varieties.

Biography: I am currently a 5th year PhD student of Stony Brook University. My thesis advisor is Dennis Sullivan. I am now interested in classification theory of high dimensional manifolds, which achieved a big success in the last century. My thesis research is to complete my advisor's dicussion in 1970 ICM report, i.e., to construct the abelianzed Galois action on the homotopy topological manifold structure set over a fixed simply connected etale homotopy type so that the action is compactible with the Galois action on the complex varieties defined over Q-bar. To complete the theory, I have to complete the 2-adic surgery theory under the help of Ranicki and Levitte's theorem of liftings of bundle structures and connect their work with Brumfiel， Morgan and Sullivan's works of characteristic classes. We also proved that branched coverings could extend the etale homotopy theory to any spaces. We want to use this new understanding to give a pictural explanation of Galois actions on varieties.