Abstracts

Loop spaces and duality

David Chataur: Université des Sciences et Technologies de Lille

We will review the relationships between various types of duality: Poincaré, Gorenstein, Bar-coBar. We want to explain how these dualities play a prominent role in string topology and topological field theories.

Moment-angle complexes, Polyhedral products and their applications

Fred Cohen: University of Rochester

This talk will give descriptions of the polyhedral product functor, and applications in joint work. with T. Bahri, M. Bendersky, and S. Gitler. Further evolving applications with L. Taylor, F. Callegaro, and M. Salvetti will also be given.

Some enumerative invariants in Lagrangian topology and the free loop space

Octav Cornea: Université de Montréal

I will discuss some recent results joint with Paul Biran (ETH) that relate certain "quantum" structures in symplectic topology to the classical deformation theory of algebras, in particular, Hochschild homology and its relation to the free loop space.

The Growth of the Rational Homotopy Groups and Loop Space Homology of a Finite Complex

Steve Halperin: University of Maryland

This talk will describe some joint work with Yves Félix and Jean-Claude Thomas. Suppose X is any connected finite n-dimensional CW complex. There are then exactly three mutually exclusive possibilities: (i) $\dim \pi_{\geq 2}(X) \otimes \mathbb{Q} < \infty$ (X is rationally elliptic), (ii) each $\dim \pi_i(X) \otimes \mathbb{Q} < \infty$ but $\dim \pi_{\geq 2}(X) \otimes \mathbb{Q} = \infty$ (X is rationally hyperbolic), or (iii) some $\dim \pi_i(X) \otimes \mathbb{Q} = \infty$ (X is rationally of infinite type). In the first two cases the universal cover has the rational homotopy type of a finite complex; in the third case the universal cover is finite dimensional but has infinite dimensional rational homology.

For $k \geq 0$ set

$$\sigma_k = \max_{k+2 \leq i \leq k+n} \dim \pi_i(X) \otimes \mathbb{Q}.$$

An old result with Friedlander asserts that in the elliptic case, $\sigma_k = 0$ if $k > 2n$. In the hyperbolic case the σ_k grow exponentially and we provide an assymptotic formula with explicit error bounds depending only on n and the rational homology. In the infinite case we show that $\sigma_k = \infty$ for all k. Finally we consider the question as to whether in the hyperbolic case there is some q such that $\dim \pi_i(X) \otimes \mathbb{Q}$ is

controlled by the integers $\dim \pi_j(X) \otimes \mathbb{Q}\ i - q < j < i$. We do not know if this is true, but do establish the analogous result for the rational loop space homology.

Duality, descent and extensions

Kathryn Hess: Ecole Polytechnique de Lausanne

In recent work with Alexander Berglund, we studied the relationships among the notions of Koszul duality for dg algebras, Grothendieck descent for morphisms of dg algebras and Hopf-Galois extensions of dg algebras. We showed in particular if B is a multiplicative acyclic closure of a dg algebra A, and a dg Hopf algebra H coacts on B by algebra maps, then H is Koszul dual to A if and only if the inclusion map of A into B is an H-Hopf-Galois extension satisfying Grothendieck descent.

In this talk I will briefly recall the notions of Koszul duality, homotopic Grothendieck descent and homotopic Hopf-Galois extension, then describe the common categorical framework into which all of these notions fit and sketch the proof of the result stated above. I will also explain how to how to construct families of examples based on Hirsch algebras to which our framework can be applied.

The second Bernoulli number, endpoints of a path, and models of non-connected spaces

Aniceto Murillo: University of Malaga

Having as goal the algebraic modelling of non-connected spaces, we develop a particular version of the homotopy theory of differential graded Lie algebras, or more generally, L-infinity algebras, which is based in the Lawrence-Sullivan construction.

Cellular decompositions of configuration spaces

Paolo Salvatore: University of Rome

Fibrewise Rational Homotopy Theory

Sam Smith: Saint Joseph's University

We describe rational models for some constructions arising in fibrewise homotopy theory including gauge groups, continuous trace algebras, monoids of fibrewise self-equivalences and fibrewise topological groups. We discuss several classification problems for these objects. This is joint work with various coauthors: Urtzi Buijs, Yves Félix, Greg Lupton and Claude Schochet.

Topological Complexity and DGA modules

Lucile Vandembroucq: University of Minho

The topological complexity of a space has been introduced by M. Farber in order to give a topological measure of the complexity of the motion planning problem in robotics. This invariant is a special case of the notion of sectional category of a fibration and can be characterized in terms of n-fold fibrewise joins of the free path fibration. In this talk I will introduce a semi-free model for the n-fold fibrewise join of a fibration and use it to study some rational approximations of the topological complexity.