Southampton-Kyoto Workshop II

Titles and Abstracts

Guy Boyde

Title: A K-theory criterion for p-hyperbolicity

Abstract: For a (nice enough) finite CW-complex, consider the sequence of non-negative integers whose k-th term is the number of $\mathbb{Z}$-summands appearing in the direct sum of the first k homotopy groups. A famous dichotomy in rational homotopy theory says that either this sequence is bounded (hence eventually constant) or it grows exponentially. For example, this means that no finite CW-complex whose rational homotopy grows polynomially exists. Huang and Wu introduced the definitions of p- and $\mathbb{Z}/p^r$-hyperbolicity in order to study the growth of the number of torsion summands at a given prime p. I will give a condition on K-theory which implies p-hyperbolicity, and deduce some examples of p-hyperbolic suspensions. This condition is based on work of Selick on Moore's conjecture for torsion-free suspensions.

Jacek Brodzki

Title: Amenable actions and exactness of groups

Abstract: The exactness of groups has been studied quite intensively in the context of the Baum-Connes conjecture where it received a number of different characterisations. One problem remained open: Can exactness be characterised through properties of its action on a suitably selected space? We provide an overview of the problem, and of the attempts to solve it by means of coarse geometry. This talk is based on joint work with Cave and Li.

Tsuyoshi Kato

Title: L^2 harmonic theory and Seiberg-Witten, Bauer-Furuta theory on non-compact complete Riemannian 4-manifolds

Abstract: I will talk on some fusion of a topic on Singer conjecture in L^2 harmonic theory withSeiberg-Witten Bauer-Furuta theory on non-compact complete Riemannian 4-manifolds. We explain their analytic settings, certain results and questions.

Daisuke Kishimoto

Title: Relative phantom maps and rational homotopy

Abstract: Relative phantom maps were introduced as a topological counterpart of the theorem of de-Bruijn and Erdos on graph colorings. We will generalize the relation between usual phantom maps and rational homotopy to relative phantom maps. This is joint work with Takahiro Matsushita.

Simon Rea

Title: Homotopy types of gauge groups of PU(p)-bundles over spheres

Abstract: The gauge group $\mathcal{G}(P)$ of a principal G-bundle $P \to X$ is the group of G-equivariant homeomorphisms of P that cover the identity on X. Under certain conditions on G and X, the number of possible homotopy types of $\mathcal{G}(P)$ is finite. This number has been determined only in a few special cases. In this talk I will introduce the methods to determine this number and discuss

how, for bundles over even-dimensional spheres, the $PU(p)$-gauge groups are related to $SU(p)$-gauge groups.

Stephen Theriault

Title: Homotopy fibrations with a section after looping

Abstract: We consider homotopy fibrations where the map from the total space to the base has a section after looping. Methods are developed to determine the homotopy type of the fibre and the homotopy classes of the map from the fibre to the total space. Applications are given to certain Poincare Duality complexes.

Mitsunobu Tsutaya

Title: Homotopy type of the space of finite propagation unitary operators on $\mathbb{Z}$

Abstract: We determine the homotopy type of the space of finite propagation unitary operators on $\ell^2(\mathbb{Z})$ by a method appearing in study of quantum walks. This talk is based on joint work with Tsuyoshi Kato and Daisuke Kishimoto.