K-THEORY WORKSHOP

ABSTRACTS

Wednesday 25 July

9:30 - 10:20 **Lars Hesselholt**

K-theory of cusps

In the early nineties, the Buenos Aires Cyclic Homology group calculated the Hochschild and cyclic homology of hypersurfaces, in general, and of the coordinate rings of planar cuspical curves, in particular. With Cortias' spectacular birelative theorem, proved in 2005, this gives a calculation of the relative K-theory of planar cuspical curves over a field of characteristic zero. By a p-adic version of Cortiñas' theorem, proved by Geisser and myself in 2006, the relative K-groups of planar cuspical curves over a perfect field of characteristic $p > 0$ can similarly be expressed in terms of topological cyclic homology, but the relevant topological cyclic homology groups have resisted calculation. In this talk, I will show that the new setup for topological cyclic homology by Nikolaus and Scholze has made this calculation possible. This is joint work with Nikolaus and similar results have been obtained by Angeltveit.

11:00 - 11:50 **Marc Levine**

An algebraic approach to Welschinger invariants

Welschinger defined his "mass invariant for a real rational curve on a rational surface with only ordinary double points as singularities by counting the number of isolated real singularities: if there are A isolated singularities, the mass is $(-1)^A$. He showed that for a sufficiently ample dimension N linear system of curves of genus g, if one considers the linear subsystem of curves passing through r general real points and s general complex conjugate pairs of points with $r + 2s + g = N$, the mass-weighted count of real rational curves in the linear system containing all these points is independent of the actual points chosen. Weischinger results were in the setting of almost complex structures and his results were translated into the algebro-geometric setting by Itenberg-Kharlamov-Shustin. Here we reinterpret Welschingers mass as a norm of the quadratic forms associated to the singularities. We look at the case of degree d curves in P^2 and show that taking the trace of this norm over all the rational curves containing a given reduced 0-cycle of degree $3d$-1 defines a global section of the Grothendieck-Witt sheaf over the parameter space for such 0-cycles, that is the open subscheme $\mathrm{Sym}^{3d-1}_{red}P^2$ of $\mathrm{Sym}^{3d-1}P^2$ of 0-cycles without (geometric) multiple points. As consequence, this "algebraic Welsching invariant is constant over A^1-connected components of $\mathrm{Sym}^{3d-1}_{red}P^2(K)$ for each field K (of characteristic > 3). This recovers Welschingers invariance result in the algebraic setting and extends it to the case of 0-cycles with total residue field an extension of the base-field of degree at most 3.

12:00 - 12:50 **Ralf Meyer**

Classification of non-simple C^*-algebras

Homological algebra in triangulated categories allows to classify objects up to isomorphism when there are sufficiently short projective resolutions. A projective resolution of length 1 gives a Universal Coefficient Theorem and hence classification. A projective resolution of length 2 still gives a classification, using an extra homological obstruction class. I will apply these methods to the bivariant K-theory for C^*-algebras over certain finite T_0-spaces or with an action of the circle group.

This is based on joint work with Rasmus Bentmann.