

Seminar: Noncommutative Hodge structures

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Meeting time: Thursdays 10.15-12.00

First Meeting: Thursday, April 14

Location: MI, N 0.007 - Neubau

Description: Hochschild homology and periodic cyclic homology provide analogs of Hodge cohomology and de Rham cohomology for differential graded categories. The apparent question is then to what extent there is a noncommutative analog of classical Hodge theory based on these invariants. In this seminar we discuss various recent developments:

- (1) There is a Hochschild-to-periodic cyclic spectral sequence which is the analog of the Hodge-to-de Rham spectral sequence. To obtain a Hodge filtration on periodic cyclic homology we need degeneracy criteria. We will discuss the recent work of Kaledin [2] which shows that the spectral sequence degenerates for smooth and proper differential graded categories.
- (2) The second ingredient of a Hodge structure is given by a rational lattice. To this end, we discuss the recent work of Blanc [1] which implements a noncommutative version of complex topological K-theory for differential graded categories. In this context there is a natural Chern character map from topological K-theory to periodic cyclic homology and the lattice conjecture claims that the image provides a rational lattice.
- (3) A general proposal for a definition of noncommutative Hodge structures together with examples in the context of mirror symmetry is provided in [3]. If time and energy permits, this will be discussed in a last, open ended, part of the seminar.

REFERENCES

- [1] A. Blanc. Topological K-theory of complex noncommutative spaces. *arXiv:1211.7360*, 2012.
- [2] D. Kaledin. Spectral sequences for cyclic homology. *arXiv:1601.00637*, 2016.
- [3] L. Katzarkov, M. Kontsevich, and T. Pantev. Hodge theoretic aspects of mirror symmetry. In *From Hodge theory to integrability and TQFT tt*-geometry*, volume 78 of *Proc. Sympos. Pure Math.*, pages 87–174. Amer. Math. Soc., Providence, RI, 2008.