

# Workshop around skein modules

## Titles and abstracts

### Adrien Brochier : Factorization homology and quantum groups

This talk will be an overview of joint work with D. Ben-Zvi and D. Jordan where we explicitly compute a certain category-valued topological invariant of surfaces. Those invariants are defined using the formalism of factorization homology and produce, using as an input the braided tensor category of representations of a quantum groups associated with a reductive group  $G$ , canonical quantizations of categories of sheaves on character varieties of surfaces in the direction of the Atiyah–Bott Poisson structure. We recover this way various well-known quantum algebras, including the so-called moduli algebras introduced by Alekseev. For the closed torus in particular, we obtained a certain quantum analog of the category of  $D$ -modules on the adjoint quotient  $G/G$  which plays an important role in geometric representation theory.

### Juliet Cooke : Skein Categories

In this talk I will introduce skein categories which are a categorical analogue of skein algebras based on the category of coloured ribbon tangles. In my thesis I proved that skein categories satisfy excision. In this talk I shall outline a couple of applications of this result. Firstly, to proving that the  $k$ -linear factorisation homology of surfaces is given by the skein categories. Secondly, to showing that skein algebras (for  $q$  generic) are the algebra of invariants of the moduli algebras from the previous talk.

### Thang Le : Stated skein modules/algebras of 3-manifolds and surfaces

We present the basic of the theory of stated skein modules/algebras. We discuss the integrality, excision and decomposition, embedding into quantum torus, and roots of unity.

### François Petit : A brief introduction to the theory of Deformation Quantization modules

I will introduce the notion of Deformation Quantization modules (DQ-modules) and present briefly some fundamental results of the theory. I will explain how the holonomicity condition allows to obtain finiteness results.

### Sam Gunningham and Pavel Safronov : Finiteness for Skein Modules

We will outline a strategy for proving the finite-dimensionality of skein modules of closed 3-manifolds.

We will define the internal skein algebra of a surface, and the internal skein module of a 3-manifold with boundary. In the case of handlebody, this module may be computed very explicitly. Given a Heegard decomposition of a 3-manifold  $M$ , we express the skein module of  $M$  as a relative tensor product of internal skein modules over the internal skein algebra. We then reinterpret this tensor product in terms of  $D$ -modules and use the theory of holonomic modules to obtain the desired finiteness.