Lecture 1 - Thursday 21 October.

We start by considering the notions of a torsor and a gerbe over a discrete Abelian group A (over a discrete set X). We describe central extensions of a group G by A as multiplicative A-torsors on X=G. A categorification of this construction is given by the notion of a gerbal central extension of G by A. We classify gerbal A-central extensions of the group G by A-valued 3-cocycles of G.

Then we recall the construction of determinantal gerbe Det(V) of an infinite dimensional Tate vector space V (e.g. V=k((s))) due to Kapranov. We explain that the obstruction of Det(V) to be GL(V)-equivariant provides the well known central extension of GL(V) by k^*. Given a 2-Tate vector space V, e.g. V=k((s))((t)), we consider the determinantal 2-gerbe 2-Det(V). The obstruction of 2-Det(V) to be GL(V)-equivariant provides a gerbal central extension of GL(V) by k^*.

Lectures 2 and 3 - Monday25 and Wednesday 27 October:

We recall the constructions of the Springer variety and the Grothendieck variety of a simple Lie algebra g. Then we recall the construction of the Weyl group action on the cohomology a of Springer fibers. We categorify the construction by introducing an action of the affine Braid group on the category of coherent sheaves on the Grothendieck variety due to Bezrukavnikov and Riche. Finally we quantize the construction: the category of coherent sheaves on the Grothendieck variety is replaced by the category of modules over the ring of universal twisted differential operators on the Flag variety of g. The Braid group action is constructed.

Catharina Stroppel:

Lecture 1 - Friday 22 Oct.: Rational Euler characteristics and categorification

Lecture 2 - Tuesday 26 Oct.: Knot invariants and categorified networks

Abstract: A general belief in the categorification
community is that all integral structures should be categorified and vice versa structures should be integral to have a chance to be categorified. This talk wants to explain how one could think about categorifying rational numbers via rational Euler characteristics. We illustrate this by explicit examples. If times allows we will connect this with 3j-symbols and construct a categorification of the Jones-Wenzl projector.