Link homology and categorification

May 10 – 25, 2007
RIMS (14 – 18) and Fac. of Science Bldg. No. 3, Daikaigi
shitsu (10, 11, 21–25), Kyoto University

Program

First Week (at Fac. of Science Bldg. No. 3)

5/10 (Thu.)
13:30 – 14:30 Aaron Lauda (Columbia) Jones polynomial and its extension to tangles
15:00 – 16:30 Dror Bar-Natan (Toronto) Overview of Khovanov Homology

5/11 (Fri.)
10:00 – 12:00 Aaron Lauda A homological invariant of tangles and tangle cobordisms
(with break)
14:00 – 15:00 Dror Bar-Natan Overview of Khovanov Homology, II
15:30 – 16:30 Aaron Lauda $sl(3)$ link homology
Second Week (at RIMS)

**5/14 (Mon.)**

9:30 – 10:30  Scott Morrison (Berkeley)  An introduction to Khovanov homology

11:00 – 12:00  Lev Rozansky (North Carolina)  An introduction to matrix factorizations

13:30 – 14:30  Ciprian Manolescu (Columbia)  Knot Floer homology I

15:00 – 16:00  Sergei Gukov (Caltech)  Link Homologies and Open Gromov-Witten Invariants

**5/15 (Tue.)**

9:30 – 10:30  Scott Morrison  More about Khovanov homology: genus bounds and spectral sequences the easy way

11:00 – 12:00  Lev Rozansky  Categorification of the $SU(N)$ HOMFLY-PT polynomial

13:30 – 14:30  Ciprian Manolescu  Knot Floer homology II

15:00 – 16:00  Sergei Gukov  Gauge Theory and Categorification

16:30 – 17:30  Marko Stosic (Inst. Super. Téc.)  Homology of torus knots and links

**5/16 (Wed.)**

9:30 – 10:30  Joel Kamnitzer (Berkeley)  Knot homology via derived categories of coherent sheaves: motivation and geometric setup

11:00 – 12:00  Raphael Rouquier (Oxford)  $sl(2)$-categorification

13:30 – 14:30  Catharina Stroppel (Glasgow)  An introduction into representation theory of Lie algebras

15:00 – 16:00  Marco MacKaay (Algarve)  Towards an $sl(n)$ link homology theory using foams (joint work with Marko Stosic and Pedro Vaz)

16:30 – 17:30  Alexander Shumakovitch (Washington)  Naive Categorification of the Skein $sl(N)$ Polynomial
5/17 (Thu.)

9:30 – 10:30 Sabin Cautis (Harvard) Knot homology via derived categories of coherent sheaves: spherical twists and relation to Khovanov homology

11:00 – 12:00 Raphael Rouquier Higher representation theory

13:30 – 14:30 Catharina Stroppel Khovanov’s algebra $H_n$ appearing naturally in representation theory

15:00 – 16:00 Joshua Sussan (Yale) Category $\mathcal{O}$ and the colored Jones polynomial

5/18 (Fri.)

9:30 – 10:30 Dror Bar-Natan The Virtues of Being an Isomorphism

11:00 – 12:00 Lev Rozansky Categorification of the $SO(2N)$ Kauffman polynomial

13:30 – 14:30 Peter Ozsvath (Columbia) Knot Floer homology III

14:45 – 15:45 Ciprian Manolescu Knot Floer homology IV

(We must evacuate the room at 16:00.)
Third Week (at Fac. of Science Bldg. No. 3)
5/21 (Mon.)
10:30 – 11:30 Susumu Ariki (RIMS) Integrable $\hat{U}(\mathfrak{sl}_e)$-modules via cyclotomic Hecke algebras
13:30 – 14:30 Peter Ozsvath Knot Floer homology V
15:00 – 16:00 Kokoro Tanaka (Gakushuin) Khovanov-Jacobsson numbers of surface-knots and their extension

5/22 (Tue.)
9:30 – 10:30 Catharina Stroppel Invariants of tangles and Cobordisms: From Jones to Kauffman and BMW
11:00 – 12:00 Yasuyoshi Yonezawa (Nagoya) Matrix factorizations and planar diagrams in MOY link invariant
15:00 – 16:00 Peter Ozsvath Knot Floer homology VI
16:30 – 17:00 Radmila Sazdanovic (George Washington) Torsion in Chromatic Graph Cohomology

5/23 (Wed.)
9:30 – 10:30 Joel Kamnitzer The affine Grassmannian and the geometric Satake correspondence I
11:00 – 12:00 Scott Morrison Functoriality and duality in Khovanov homology

(free afternoon)

Mikhail Kapranov (Yale) give a colloquium talk at 14:40 at RIMS 402

5/24 (Thu.)
9:30 – 10:30 Joel Kamnitzer The affine Grassmannian and the geometric Satake correspondence II
11:00 – 12:00 Stephan Wehrli (Columbia) Mutation invariance of Khovanov homology over $\mathbb{Z}/2\mathbb{Z}$
Abstract of Dror Bar-Natan’s talk:

I’m over forty, I’m a full professor, and it’s time that I come out of the closet. I don’t understand quantum groups and I never did. I wish I could tell you in my talk about one of the major stumbling blocks I have encountered - I don’t understand the amazing Etingof-Kazhdan work on quantization of Lie bialgebras. But hey, I can’t tell you about what I don’t understand! So instead, I will tell you about how I hope to understand the Etingof-Kazhdan work, one day, as an isomorphism between a topologically defined space and a combinatorially defined one. The former would be the unipotent completion of a certain algebra of virtually-knotted (trivalent?) graphs. The latter would be the associated graded space of the former.

I’ll start and spend a good chunk of my time with an old but not well known analogy, telling you why a Drinfel’d associator, the embodiment of the spirits of all quasi-Hopf algebras, is best viewed as an isomorphism between the unipotent completion of the algebra of honestly-knotted trivalent graphs and its associated graded space, a certain combinatorially-defined algebra of chord diagrams. A few words will follow, about the relationship between diagrammatic Lie bialgebras and finite type invariants of virtual knots.

Contact H. Nakajima (nakajima@math.kyoto-u.ac.jp) for any question.