MAT572: SEMINAR DIAGRAMMATIC ALGEBRA: A PROTOTYPICAL EXAMPLE

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What?

The theory of Soergel bimodules emerged in the work of Wolfgang Soergel in the 1990s and 2000s. Soergel bimodules are certain algebraic objects, and the collection of these forms a monoidal category under tensor product. Soergel bimodules are fairly elementary objects, yet they have deep links to representation theory, topology and geometry, and have a remarkably rich internal structure.

The purpose of this seminar is to provide a comprehensive introduction to the theory of Soergel bimodules, in particular, using diagrammatic methods. Indeed, it is not an exaggeration to say that the computational power afforded by diagrammatics was the key breakthrough that allowed many recent advances on the one hand, but is beautiful in its own right on the other hand.

The seminar follows the book [EMTW20].

Who?

BSC or MSC or PhD students in Mathematics interested in a mixture of linear algebra and combinatorics, but everyone is welcome.

Preliminaries?

Some linear algebra, algebra and category theory. More specifically: Algebra, means modules, bimodules, tensor products, linear algebra *etc.*. Category theory, means equivalence of categories, isomorphisms of functors, adjunctions *etc.*. But we can also learn these as we move along.

Where and when?

- Time and date.
  - Every Monday from 13:00–14:45.
  - All talks will be given using zoom https://zoom.us/download. Zoom links will be sent to participants shortly before the seminar starts.
  - First meeting: Monday 21.Sep.2020. Last meeting: Monday 23.Nov.2020.
- Website http://www.dtubbenhauer.com/seminar-soergel-2020.html

Preliminary Schedule.

▷ "The classical theory I – Coxeter groups, the beginnings". (21.Sep.2020)

▷ "The classical theory II – Coxeter groups and reflection groups". (28.Sep.2020)

▷ "The classical theory III – Kazhdan–Lusztig theory". (05.Oct.2020)

▷ "The classical theory IV – Soergel bimodules, the beginnings". (12.Oct.2020)

▷ "The classical theory V – Soergel bimodules, the feast". (19.Oct.2020)

▷ "The diagrammatic theory I – drawing monoidal categories". (26.Oct.2020)

▷ "The diagrammatic theory II – Frobenius extensions". (02.Nov.2020)

▷ "The diagrammatic theory III – the dihedral cathedral". (09.Nov.2020)

▷ "The diagrammatic theory IV – the diagrammatic Hecke category". (16.Nov.2020)

▷ "The diagrammatic theory V – Soergel's categorification theorem". (23.Nov.2020)

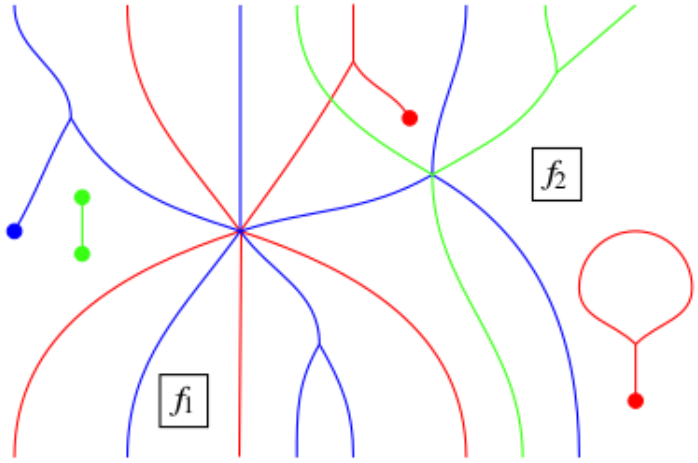

FIGURE 1. Soergel diagrams. (Picture from the course book.)

REFERENCES

[EMTW20] B. Elias, S. Makisumi, U. Thiel, G. Williamson. *Introduction to Soergel bimodules*. RSME Springer Series, volume 5. Springer International Publishing, 2020.

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