

MATH 822: Topics in Geometry
Spring 2019 Syllabus
T-TH 9:30 – 10:45

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Office hour: Wednesday 2-3:30.

Overview:

The main theme this year is **geometry of quivers and mirror symmetry**. Quiver is simply another name for directed graph. We mainly concern about the path algebra and its representations when we talk about ‘quiver’. It arises naturally in noncommutative geometry, mirror symmetry and Donaldson-Thomas invariants. It also has nice applications in “persistence theory” for data science, and system engineering.

Prerequisites:

A curious mind. We will learn the ‘prerequisites’ all together along the course (and indeed skip most of them).

References:

This is a topics course. So it would be mixture of “seminar style” and “course style”. I will present papers or expository articles in various topics.

Derksen; Weyman – An introduction to quiver representations
King – Moduli of representations of finite dimensional algebras
Nakajima – Instantons on ALE spaces, quiver varieties and Kac-Moody algebras
Altmann; Hille – Strong exceptional sequences provided by quivers
Helton; Klep; Scott McCullough – Free convex algebraic geometry
Keller-Yang – Derived equivalences from mutations of quivers with potential
Reineke – Framed quiver moduli cohomology and quantum groups
Cho; Hong; Lau – Noncommutative homological mirror functor
Fan; Hong; Lau; Yau – Mirror of Atiyah flop in symplectic geometry and stability conditions
Nagao; Nakajima – Counting invariants of perverse coherent sheaves and its wall-crossing

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Exam:

There will be no exam. The best of this topic is that it has a lot of examples which illustrate the general theory very well.
You will be asked to make a 30-minutes presentation of related topics of your choice.