Bridgeland stability conditions in algebraic geometry and representation theory

Dott.ssa Anna Barbieri[1]

[1] *Dipartimento di Matematica "Tullio Levi-Civita", Università di Padova*
Email: anna.barbieri@unipd.it

Timetable: 16 hrs. First lecture on January 31, 2023, 15:30, (dates already fixed, see Calendar of Activities at https://dottorato.math.unipd.it/calendar), Torre Archimede, Room 2BC30.

Course requirements: Familiarity with notions of categories, manifolds, vector bundles, possibly sheaves; basis of algebra.

Examination and grading: Seminar

SSD: MAT/02, MAT/03

Aim: Bridgeland stability for triangulated categories has become a very active research theme, with applications in algebraic and birational geometry, representation theory, mirror symmetry, and mathematical physics. The aim of the course is to give an introduction to the notion of Bridgeland stability condition and the stability manifold associated to a category. We will see examples of stability for geometric and algebraic categories. Time permitting, we will review other notions of stability (Gieseker and slope stability) for abelian categories and the problem of constructing moduli spaces, and recent research directions in the field of stability conditions in algebra and geometry. The course is oriented towards students in geometry and algebra and can be considered complementary to a previous course by Mistretta-Fiorot which, however, is not a prerequisite.

Laura Pertusi, from the University of Milano, will deliver a seminar on stability conditions in purely geometric context, during the period of the course.

Course contents:

- review of categories, sheaves, cohomology, the derived category.
- triangulated categories, bounded t-structures, examples.
- Bridgeland stability conditions for triangulated categories.
- the stability manifold and main properties.
- stability manifold for relevant categories: curves, (K3 surfaces), quiver categories.
- optional: modern research directions.

Bibliography:

- Bridgeland, Tom. "Stability conditions on triangulated categories." Annals of Mathematics (2007): 317-345.
- Bayer, Arend. "A tour to stability conditions on derived categories." notes (2011)

- Huybrechts, Daniel. "Introduction to stability conditions", Moduli spaces 411 (2014):179-229.

- Gelfand, Sergei I., and Yuri I. Manin. Methods of homological algebra. Springer, 2002.

- Ringel, Keller, Keller-Yang research papers