Local Positivity in Algebraic Geometry and Symplectic Topology

Dr. Thomas Eckl (Liverpool)

From 15.01.2018 to 17.01.2018, Dr. Thomas Eckl will give a graduate lecture series on the subject in the title under the framework of Graduiertenschule Mathematik / Informatik Köln. Post-docs, Graduate students and senior undergraduate students are welcomed to the lecture series. Please find below some useful information to this lecture series.

Abstract of the lectures:
Lecture 1: Local Positivity in Algebraic Geometry and Symplectic Topology
After presenting interpolation problems in the complex plane and formulating the Segre-Harbourne-Gimigliano-Hirschowitz (SHGH) conjecture and Nagata's conjecture in this context, we introduce Seshadri constants as an algebraic-geometric measure of local positivity. We restate Nagata's conjecture in terms of Seshadri constants, and calculate them on del Pezzo surfaces. Then we discuss lower bounds to Seshadri constants. Finally, we show how Seshadri constants translate to Kaehler geometry, and what this tells us on symplectic packing problems.

Lecture 2: Newton-Okounkov bodies and moment maps
We construct Newton-Okounkov (N-O-) bodies of graded linear systems on algebraic varieties and discuss some of the algebraic-geometric invariants encoded in them. In particular, we show how their form determines Seshadri constants on the projective complex plane. Connecting N-O-bodies to toric moment polytopes we ask whether we can find an analogue of the toric moment map for general N-O-bodies, and discuss examples of such moment maps following a construction by Harada and Kaveh.

Lecture 3: Seshadri constants and Kaehler packings
We introduce Kaehler packing constants on projective algebraic varieties and show that these constants are equal to the corresponding Seshadri constants. We also discuss how this equality gives rise to possibly new explicit symplectic packings of the projective complex plane.

Time and location:
Lecture 1: 15.01.2018, 14h15-15h45, Cohen-Vossen Raum 3.13.
Lecture 2: 16.01.2018, 14h-15h30, Cohen-Vossen Raum 3.13.
Lecture 3: 17.01.2018, 14h-15h, Seminarraum 1, 0.05.

Support:
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