Inequalities between Chern classes of vector bundles and their applications

Adrian Langer

University of Warsaw, Poland
alan@mimuw.edu.pl

The main aim of the lecture is to survey results on known restrictions on invariants of algebraic varieties and curves on such varieties coming from the study of inequalities between Chern classes of vector bundles. One of such restrictions is given by the Bogomolov–Miyaoka–Yau inequality, which bounds the topological Euler characteristic of a complex projective surface. Generalizations of this inequality were used by F. Hirzebruch to bound possible configurations of line arrangements on a complex projective plane and by Y. Miyaoka to bound genus of algebraic curves on surfaces.

I will focus on recent progress on analogous questions in positive characteristic p, where all such results were classically known to fail. We will show that, similarly to Deligne–Ilussie's work on vanishing theorems, all such examples are related to problems with lifting modulo p^2.