Graduate Seminar (S4D3)
Complex geometry and Hodge theory

Summer term 2023

Organized by Prof. Dr. D. Huybrechts

Start: April 4 or 11, Time: Tuesday 12:15-13:45. SR 1.008 (??) All subject to change

Prerequisite for the seminar is a good knowledge of cohomology of complex manifolds, including basic facts on Chern classes and Hodge theory. (We do not assume or need the notion of Chow motives as developed in the winter term.) 1Depending on the audience, we will include more background material on (mixed) Hodge structures, constructible sheaves, etc.

Please contact me directly huybrech@ if you would like to participate. Registration is possible until all slots are taken.

The seminar will loosely follow the book [1] (which occasionally is a bit short on proofs). The talks will correspond to the 14 Chapters and we will fill in necessary background material from other sources, e.g. [2,3,4,5,6,...].

1. Motives and topology

2. Hodge characteristic

3. Hodge characteristic: Bittner's example

4. Hodge theory revisited

5. Mixed Hodge theory

6. Motivic Hodge theory

7. Motivic aspects of degenerations

8. Motivic nearby fibres

9. Applications

10. Motives in the relative setting

11. Variations of Hodge structures

12. Hodge modules

13. Motives in the relative setting

14. Motivic Chern class ransformation

References:

1. Chris Peters *Motivic aspects of Hodge theory.* Narosa Publishing House. 2010 A draft of the book can be found here `https://www-fourier.ujf-grenoble.fr/~peters/Books/motivic.f/Tatalects.pdf`

2. A. Durfee *A naive guide to mixed Hodge structures,* Proc. Symp. in Pure Math. Vol. 40/I (1983) 313-320.

3. Robert Friedman *Mixed Hodge structures.* Notes `http://www.math.columbia.edu/~rf/MHS.pdf`.

4. Sergey Gelfand, Yuri Manin *Homological algebra.* Springer Verlag 1999, Chapter 6.

5. Daniel Huybrechts, Complex Geometry, Springer, Berlin, 2005.

6. Chris Peters & Joseph Steenbrink *Mixed Hodge Structures.* Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge 52. 2008.

7. Claire Voisin *Hodge Theory and complex algebraic geometry I, & II.* Cambridge University Press, Cambridge, 2002.