D-modules and their applications

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D-modules and their applications is the second part of a year long advanced course.

In this part we will study D-modules on general algebraic varieties.

This would require from the beginning to use more sophisticated homological technique (derived categories). We will spend some time discussing this technique.

In case of general algebraic varieties one has to work with sheaves - so I will discuss the basic properties of sheaves.

I will also try to describe how the language and some basic results of D-module theory allow to give a geometric interpretation and also prove some highly non-trivial results in representation theory of reductive Lie algebras and reductive Lie groups.

I will try to make my lectures formally self contained, but a prior knowledge of basic facts of algebraic geometry would help as well knowledge about some basic properties of coherent sheaves on algebraic varieties .

Books

"Algebraic D-modules" by A.Borel et all and probably some other more recent texts on the subject.

Home works.

Home works for this course will be given weekly. They constitute an important part of the course - many topics for which there is not enough time in the lectures will be discussed in homeworks.

Homeworks will be graded by Dmitry Gourevitch.