Contramodules and their applications in commutative algebra

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Timetable: 16 hrs. First lecture on January 10, 2018 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

Course requirements:

Examination and grading: knowledge of the basic concepts of homological algebra, such as the functors Ext and Tor and the definition of the derived category of modules, will be largely presumed.

SSD: MAT/02

Aim:

Course contents: Contramodules are module-like algebraic objects endowed with infinite summation operations, understood algebraically as infinitary linear operations subject to natural axioms. Contramodule categories appear as abelian right orthogonal subcategories in the categories of modules. Striking applications of contramodules to problems of commutative algebra, such as module structure of flat finitely presented commutative algebras over commutative rings, a description of strongly flat and weakly cotorsion modules, the structure of flat modules over Noetherian commutative rings with countable spectrum etc., have been recently discovered. This course will start with a discussion of infinite summation operations in modules over commutative rings and end with the proofs of the above-mentioned results.