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Derived categories and Fourier-Mukai equivalences in algebraic geometry

Since its introduction in the 1960s by Grothendieck and Verdier, derived categories have been attracting the attention of mathematicians from various fields, in particular algebraic geometers. Mukai's breakthrough work in the 1980s showed that the notion of derived equivalence is very interesting from the geometric point of view and recently it has been playing a crescent role in birational geometry. In this talk I will survey some aspects of the theory of derived categories of sheaves and Fourier Mukai transforms in algebraic geometry. If time permits, I will also report on joint work with A. Rapagnetta and F. Viviani where we use Fourier-Mukai transforms to show that certain algebraic varieties that show up in the classical limit of the Geometric Langlands Conjecture are autodual.