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Derived Categories, Arithmetic, and Rationality Questions

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Abstract: When trying to apply the machinery of derived categories in an arithmetic setting, a natural question is the following: for a smooth projective variety X , to what extent can $D^b(X)$ be used as an invariant to answer rationality questions? In particular, what properties of $D^b(X)$ are implied by X being rational, stably rational, or having a rational point? On the other hand, is there a property of $D^b(X)$ that implies that X is rational, stably rational, or has a rational point?

In this talk, we will examine a family of arithmetic toric varieties for which a member is rational if and only if its bounded derived category of coherent sheaves admits a full étale exceptional collection. Additionally, we will discuss the behavior of the derived category under twisting by a torsor, which is joint work with Matthew Ballard, Alexander Duncan, and Patrick McFaddin.

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