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Periodic free resolutions from twisted matrix factorizations.

The notion of a matrix factorization was introduced by Eisenbud in the commutative case in his study of bounded (periodic) free resolutions over complete intersections. Since then, matrix factorizations have appeared in a number of applications. In this work, we extend the notion of (homogeneous) matrix factorizations to regular normal elements of connected graded algebras over a field.

Next, we relate the category of twisted matrix factorizations of an element over a ring and certain Zhang twists. We also show that in the AS-regular setting, every sufficiently high syzygy module is the cokernel of some twisted matrix factorization. Furthermore, we show that in this setting there is an equivalence of categories between the homotopy category of twisted matrix factorizations and the singularity category of the hypersurface, following work of Orlov. (Received February 10, 2014)