

PROPER COLORINGS, LIPSCHITZ FUNCTIONS AND CUTSETS IN HIGH DIMENSIONS

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We consider a uniformly chosen proper 3-coloring of the discrete torus \mathbb{Z}_n^d . We show that in sufficiently high dimensions, such a coloring is very rigid, taking a single color on most of either the even or odd sublattice. We will further explain the relation between proper 3-colorings and a certain class of Lipschitz functions, and how it implies that high-dimensional Lipschitz functions are typically flat. Our main tool is a detailed study of the combinatorics of certain cutsets in \mathbb{Z}^d . Along the way, we will mention many related conjectures and open questions concerning proper colorings and random functions. All concepts used will be introduced and the talk will be illustrated by many pictures.

Part of this work is joint with Ohad N. Feldheim.