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## The inverse conjecture for the Gowers norms.

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Gowers norms are an important tool in solving linear equations in subsets of the integers. For example : a subset whose associated balanced function has small Gowers  $U_k$  norm behaves like a random set when counting the number of  $k + 1$  term arithmetic progressions (this is a special case of  $k - 1$  linear equations in  $k + 1$  variables). It is therefore crucial to understand functions with large Gowers  $U_k$  norm. It was conjectured that such functions correlate with objects called  $k - 1$  step nilsequences. In recent work with Green and Tao we settle this conjecture. This was the last piece missing in the Green-Tao program for counting the asymptotic number of solutions to rather general systems of linear equations in primes (not including  $x - y = 2$ , unfortunately). I will discuss the motivation for this conjecture as well as some aspects of the proof.