Multilinear inequalities with singular kernels

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Abstract

In this series of talks we will focus on various multilinear inequalities involving singular integral kernels. One motivation for the investigation of these objects comes from the study of so called fractional Leibniz rules, which extend the rule for differentiating a product to fractional derivatives and play an important role in nonlinear partial differential equations; singular multilinear inequalities have also found applications in other areas, including enumerative combinatorics and ergodic theory.

A typical problem we will consider amounts to bounding an m-linear form obtained by integrating the tensor product of n-dimensional input functions and one k-dimensional singular integral kernel over a suitable subspace of the direct sum of the domain spaces. The case when $k = (m-1)n$ and the kernel is smooth is classical as it reduces to the study of multilinear operators of Coifman-Meyer type. We will discuss its counterpart involving rough kernels, which is much less understood. We will also focus on some instances of forms involving lower-dimensional singular integral kernels, in particular on those that possess a certain cubical structure. The talk is based on joint works with L. Grafakos and D. He and with P. Durcik and C. Thiele.