

# **Title:** Large finite structures with few $L^k$ -types

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**Abstract:** For any  $k \geq 3$ , we prove the following results on theories in the  $k$ -variable fragment  $L^k$  of first-order logic:

1. The so-called  $L^k$ -invariant is not recursively invertible.
2. There is no recursive bound on the size of the minimal model of a complete  $L^k$ -theory in terms of its  $k$ -size, that is, the number of its  $L^k$ -types.
3. Assume that NPTIME is not contained in PTIME/poly. Then there is no PTIME-computable canonization function for  $L^k$ -equivalence.

Our results answer questions of Dawar and Dawar, Lindell, and Weinstein.