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Fair Division Beyond Monotone Valuations

This talk will address discrete fair division under valuations that are not necessarily monotone. Our focus will be on the following two corollaries:

1. Universal existence of proximately dense subgraphs: Given any graph G=(V, E) and integer k (at most |V|), there always exists a partition V_1, V_2,…, V_k of the vertex set such that the edge densities within the parts, V_i, are additively within four of each other.
2. Universal existence of proximately equitable graph cuts: Given any graph G=(V, E) and integer k (at most |V|), there always exists a nontrivial partition V_1, V_2,…, V_k of the vertex set such that the cut function values of the parts, V_i, are additively within 5D+1 of each other; here, D is the maximum degree of G.

Joint work with Paritosh Verma: https://arxiv.org/abs/2501.14609