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Sarah Wolff* (wolffs@denison.edu). *The Ballots are Missing, Who Won the Election? Inferring Rankings from First Order Marginals.*

Motivated by applications in rankings-based elections we consider the question of recovering election results from first order marginals. For example, in an election between three candidates, a voter ranks the candidates in her preferred order, and a function $f : S_3 \rightarrow [0, 1]$ gives the normalized count of the votes for each ranking. The first-order marginals in this situation tell how many people chose each candidate in first place, second place, and third place. Given this information, can one uniquely recover the original function f ? First considered by Shah and Jagabathula, they determined that one can recover a k -sparse function f so long as it satisfies three constraints: the nonzero values of f are distinct, each permutation ρ in the support of f has a unique edge, and no subset of function values sums to another function value. We relax the third condition to find that recovery is still possible if the function satisfies only the first two conditions. Capturing the first order marginals using a ‘first-order matrix’ allows us to rephrase the question in terms of the combinatorial structure of the matrix. We give an explicit characterization of the structure, which in turn allows us to determine the original function. (Received September 25, 2017)