# Decomposable Submodular Function Minimization via Maximum Flow

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*Abstract* :
We bridge discrete and continuous optimization approaches for decomposable submodular function minimization. We provide improved running times for this problem by reducing it to a number of calls to a maximum flow oracle. When each function in the decomposition acts on O(1) elements of the ground set V and is polynomially bounded, our running time is nearly linear.
We achieve this by providing a simple iterative method which can optimize to high precision any convex function defined on the submodular base polytope, provided we can efficiently minimize it on a certain cut polytope. We solve this minimization problem by lifting the solutions of a graph cut problem, which we obtain via a new efficient combinatorial reduction to maximum flow. This reduction is of independent interest and implies previously unknown bounds for the parametric minimum s,t-cut problem in multiple settings.