On the Submodular Function Minimization

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Submodularity is an important property of functions in a variety of fields such as discrete optimization, combinatorial optimization, artificial intelligence and probability. Some examples of submodular functions are cut capacity functions, matroid rank functions, and entropy functions. Minimizing submodular functions problem has recently attracted significant attention in the field of combinatorial optimization. This problem appears in many applicable areas such as image segmentation, natural language processing, speech analysis, machine learning, wireless and power networks. Therefore, faster ways to solve this problem is still an important topic for researchers. Here, we consider a condition under which we enable find a minimizer of a submodular function in less time complexity compared to existing algorithms.

This is a joint work with Saeed Hanifehnezhad.

Induced Cycles in Circulant Graphs

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Let $\mathbb{F}(n)$ denote the maximum non-negative integer m for which all circulant graphs on C_m are C_n-free. We show that

$$\mathfrak{F}(n) = 12k + \lceil \frac{3i}{2} \rceil - \delta_{1,\lfloor \frac{i}{2} \rfloor} - 1$$

for any positive integer $n > 2$, where k and i are defined as $n = 8k + i$ with $i \in \{0, \ldots, 7\}$, and δ denotes the Kronecker delta.

On Nonnegative Signed Domination Parameters in Graphs

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Let $1 \leq k \leq n$ be a positive integer. A *nonnegative signed k-subdominating function* is a function $f : V(G) \to \{-1, 1\}$ satisfying $\sum_{u \in N_G[v]} f(u) \geq 0$ for at least k vertices v of G. The value $\min \sum_{v \in V(G)} f(v)$, taking over all nonnegative signed k-subdominating functions f of G, is called the *nonnegative signed k-subdomination number* of G and denoted by $\gamma_{ks}^{NN}(G)$. If $k = |V(G)|$, then $\gamma_{ks}^{NN}(G) = \gamma_s^{NN}(G)$ is the *nonnegative signed domination number*, introduced by Huang, et.al. In this paper, we investigate several sharp lower bounds of $\gamma_s^{NN}(G)$, which extend some presented lower bounds on $\gamma_s^{NN}(G)$.

We also initiate the study of the nonnegative signed k-subdomination number in graphs and establish some sharp lower bounds for $\gamma_{ks}^{NN}(G)$ in terms of the order and the degree sequence of a graph G.