Improved Algorithms for Largest Cardinality 2-Interval Pattern Problem

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Abstract. The 2-Interval Pattern problem is to find the largest constrained pattern in a set of 2-intervals. The constrained pattern is a subset of the given 2-intervals such that any pair of them are R-comparable, where model $R \subseteq \{<, \sqsubset, \between\}$. The problem stems from the study of general representation of RNA secondary structures. In this paper, we give three improved algorithms for different models. Firstly, an $O(n \log n + \mathcal{L})$ algorithm is proposed for the case $R = \{\between\}$, where $\mathcal{L} = O(dn) = O(n^2)$ is the total length of all 2-intervals (density d is the maximum number of 2-intervals over any point). This improves previous $O(n^2 \log n)$ algorithm. Secondly, we use dynamic programming technique to obtain an $O(n \log n + dn)$ algorithm for the case $R = \{<, \sqsubset\}$, which improves previous $O(n^2)$ result. Finally, we present another $O(n \log n + \mathcal{L})$ algorithm for the case $R = \{\sqsubset, \between\}$ with disjoint support(interval ground set), which improves previous $O(n^2\sqrt{n})$ upper bound.