

Approximation algorithms for the minimum rainbow subgraph problem

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Abstract

Our research was motivated by the pure parsimony haplotyping problem: Given a set \mathcal{G} of genotypes, the haplotyping problem consists in finding a set \mathcal{H} of haplotypes that explains \mathcal{G} . In the pure parsimony haplotyping problem (PPH) we are interested in finding a set \mathcal{H} of smallest possible cardinality.

The pure parsimony haplotyping problem can be described as a graph colouring problem as follows:

The minimum rainbow subgraph problem

Given a graph G , whose edges are coloured with p colours. Find a subgraph $F \subseteq G$ of G of minimum order with $|E(F)| = p$ such that each colour occurs exactly once.

In this talk we will present polynomial time approximation algorithms for the minimum rainbow subgraph problem:

- Applying the greedy algorithm we obtain an approximation algorithm with an approximation ratio of $\Delta(\mathbf{G})$ for graphs with maximum degree $\Delta(G)$.
- Based on matching techniques we present an approximation algorithm with an approximation ratio of $\frac{5}{3}$ for graphs with maximum degree 2.