CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL
Institut für Informatik, Arbeitsgruppe Algorithmen und Komplexität
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17. April 2019

Aufgaben zur Vorlesung »Approximative Algorithmen«

Blatt 2

Hausaufgabe 2.1 (6 Punkte)
The residue field GF[2] has the elements $\{0,1\}$ and additions are performed modulo 2. This means, $0+0 \equiv 0, 0+1 \equiv 1 \equiv 1+0$, and $1+1 \equiv 0$. Multiplication works as usual.

We are given n variables $x_1, \dots, x_n$ and m sums over these variables, where each variable appears exactly once in each sum with a coefficient from GF[2]. Moreover, there is a right-hand side from GF[2]. For example:

$$\begin{aligned} 0 \cdot x_1 + 1 \cdot x_2 + 1 \cdot x_3 &\equiv 1 \\ 1 \cdot x_1 + 1 \cdot x_2 + 1 \cdot x_3 &\equiv 0 \\ 1 \cdot x_1 + 0 \cdot x_2 + 0 \cdot x_3 &\equiv 1 \\ x_1, x_2, x_3 &\in \mathbb{Z}/2\mathbb{Z} \end{aligned}$$

Develop a randomized algorithm for finding setting the variables such that, at least $\mathrm{OPT}/2$ equations are satisfied in expectation. Turn this algorithm into a deterministic one using the method of conditional expectations.

Hausaufgabe 2.2 (4 Punkte)
In the max-cut problem, a graph $G = (V,E)$ is given and we look for a partition $A \dot{\cup} B = V$ of the vertices, such that many edges go between A and B. More formally, we maximize $|\{(u,v) \in E \mid u \in A, v \in B\}|$.

How can this problem be solved using the algorithm from 2.1?

Abgabe: 23. April 2019, 10:00 Uhr.