TECHNISCHE UNIVERSITÄT
ILMENAU

FAKULTÄT FÜR INFORMATIK UND AUTOMATISIERUNG
INSTITUT FÜR THEORETISCHE INFORMATIK

INSTITUTSSEMINAR

Am Donnerstag, dem **13. Januar 2022**, spricht um **11:00 Uhr** im Raum **Z 2073**

Herr M. Sc. Arindam Biswas

zum Thema:

"Sublinear-Space Algorithms for Hitting Set, Max SAT and Min-Ones SAT"

Zusammenfassung:

Over the years, much research has been conducted on ways of dealing with the apparent intractability of NP-hard problems. The two most well known frameworks utilized to this end are approximation and parameterization. In these frameworks, the overall idea is that one can compute solutions for hard problems in (close to) polynomial time if one either settles for solutions of slightly suboptimal quality, or if one can impose certain constraints on the input instances. The majority of work conducted in this direction puts emphasis on time efficiency, while mostly disregarding space efficiency.

Common examples of approximation or parameterized algorithms use amounts of work memory that are polynomial in the input sizes. This is not unreasonable, when one observes that it becomes difficult to perform primitive operations on graphs such as computing breadth-first traversals or maximal independent sets, when one only has sublinear amounts of work memory available. In fact, certain order-dependent variants of these primitives are known to be P-complete to compute, making it unlikely that one can carry them out in sublinear space.

In this talk, we show that despite the constraints, the region of algorithmic complexity just above logarithmic space is quite rich: one can devise sublinear-space approximation and parameterized algorithms for a number of NP-hard problems.

We look at the following algorithms.

- An $O(d\delta^2 \log n)$-space $n^{O(d\delta^2)}$-time d-approximation algorithm for HITTING SET restricted to sets of size at most d and element multiplicity δ.
- A $O((d^2 + (d/\varepsilon)) \log n)$-space $n^{O(d^2 + (d/\varepsilon))}$-time $((d/\varepsilon) n^\varepsilon)$-approximation scheme for HITTING SET restricted to sets of size at most d.
- A $\max\{\sqrt{n} \log n, (r/\varepsilon) \log^2 n\}$-space $n^{O(r/\varepsilon)}$-time $(1 - \varepsilon)$-approximation scheme for MAX SAT instances with planar incidence graphs and at most r literals per clause.
- An $O(k \log n)$-space $(d^k n^{O(1)})$-time parameterized algorithm to compute solutions of size at most k for MIN-ONES SAT (a generalization of HITTING SET) instances with at most d literals per clause.

Alle Interessenten sind herzlich eingeladen.
Bitte beachten Sie das aktuelle Infektionsschutzkonzept der TU Ilmenau.

Univ.-Prof. Dr. Dietrich Kuske — Ilmenau, 10.01.2022