

abstract

COMPUTER SCIENCE AND DISCRETE MATHEMATICS SEMINAR I

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

We prove a complexity dichotomy theorem for all non-negatively weighted counting Constraint Satisfaction Problems ($\#CSP$). This caps a long series of important results on counting problems including unweighted and weighted graph homomorphisms and the celebrated dichotomy theorem for unweighted $\#CSP$. Our dichotomy theorem gives a succinct criterion for tractability. If a set F of constraint functions satisfies the criterion, then the $\#CSP$ problem defined by F is solvable in polynomial time; if F does not satisfy the criterion, then the problem is $\#P$ -hard. We furthermore show that the question of whether F satisfies the criterion is decidable in NP.

Surprisingly, our tractability criterion is simpler than the previous criteria for the more restricted classes of problems, although when specialized to those cases, they are logically equivalent. Our proof mainly uses Linear Algebra, and represents a departure from Universal Algebra, the dominant methodology in recent years.

Joint work with Jin-Yi Cai and Pinyan Lu.