Polynomial-size Kernels for Problems Parameterized Above Tight Lower Bounds

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In this talk, we consider discrete optimization problems parameterized above tight lower bounds (PATLB) in the framework fixed-parameter algoritmics. We will discuss a probabilistic Strictly Above/Below Expectation Method introduced by G. Gutin, E.J. Kim, S. Szeider and A. Yeo (IWPEC'09) and its applications to solve the following three open problems by obtaining polynomial-size kernels for all of them:

(1) the Linear Ordering Problem PATLB (IWPEC'09),

(2) Max r-SAT PATLB for each fixed $r \geq 2$ (a journal version of SODA'10 paper),

(3) the Betweenness Problem PATLB (http://arxiv.org/abs/0907.5427).

Problems (1) and (2) were raised by M. Mahajan, V. Raman, and S. Sikdar, J. Computer and System Sciences 75 (2009), 137-153 and Problem (3) by B. Chor (see R. Niedermeier, Invitation to Fixed-Parameter Algorithms, Oxford University Press, 2006).

The results considered in the talk were obtained in collaboration with N. Alon, E.J. Kim, M. Mnich, S. Szeider and A. Yeo.