
LÁSZLÓ VÉGH, London School of Economics

The circuit imbalance measure and its role in linear programming

The talk will give an overview of some recent progress on the strongly polynomial solvability of linear programs (LPs), extending classical results of Tardos, and Vavasis and Ye. A key concept turns out to be the ‘circuit imbalance measure’ κ_A of a matrix: this is the largest ratio between the absolute values between the nonzero entries of a support minimal vector in the kernel of the matrix. We explain different approaches to solve an LP given by an $n \times m$ constraint matrix A in time $\text{poly}(n, m, \log \kappa_A)$ (but independent of the cost and right hand side vectors), based on proximity results as well using layered-least squares interior-point methods. We give a combinatorial characterization of the column rescaling that obtains the smallest possible circuit imbalance value, as well as an efficient algorithm to find an approximately optimal rescaling; this yields a new class of LPs that can be solved in strongly polynomial time. The talk is based joint works with Daniel Dadush, Sophie Huiberts, and Bento Natura.