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14. Mathematical Aspects of Computer Science

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Felsner, Stefan, Freie Univ. Berlin, Germany
The Linear-Extension-Diameter
The *distance* between two permutations of the same set X is the number of pairs of elements being in different order in the two permutations. Given a poset $P = (X, \leq)$, a pair L_1, L_2 of linear extensions is called a *diametral pair* if it maximizes the distance among all pairs of linear extensions of P. The maximal distance will be called the *linear extension diameter* of P and is denoted $led(P)$. Alternatively $led(P)$ is the maximum number of incompararable pairs of a two-dimensional extension of P. We discuss upper and lower bounds for $led(P)$. These bounds relate $led(P)$ to well studied parameters like dimension and height. We prove that $led(P)$ is a comparability invariant and determine the linear extension diameter for the class of generalized crowns. For the Boolean lattices we have partial results. We also study heuristic ideas for approximating $led(P)$. This leads to some new interesting classes of linear extensions.