DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
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COMPUTER SCIENCE COLLOQUIUM

Wiener Index and Diameter of a Planar Graph in Subquadratic Time

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Abstract:

Consider the problem of computing the sum of distances between each pair of vertices of an unweighted graph. This sum is also known as the Wiener index of the graph, a generalization of a definition given by H. Wiener in 1947. A molecular topological index is a value obtained from the graph structure of a molecule such that this value (hopefully) correlates with physical and/or chemical properties of the molecule. The Wiener index is perhaps the most studied molecular topological index with more than a thousand publications. It is open whether the Wiener index of a planar graph can be obtained in subquadratic time. In my talk, I will solve this open problem by exhibiting an $O(n^2 \log\log n/\log n)$ time algorithm, where n is the size of the graph. A simple modification yields an algorithm with the same time bound that computes the diameter (maximum distance between any vertex pair) of a planar graph. I will also sketch the main ideas involved in obtaining $O(n^2(\log\log n)^4/\log n)$ time algorithms for planar graphs with arbitrary non-negative edge weights.

Host: Jørgen Bang-Jensen