WIDTH PARAMETERS, DP ALGORITHMS, AND OBSTRUCTIONS

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"In the beginning there was bandwidth..." And then there was treewidth, pathwidth, branchwidth, cliquewidth, rankwidth... Beside being elegant mathematical concepts, the width parameters of graphs have (at least) two important algorithmic implications: the existence of efficient dynamic programming algorithms solving many difficult problems on graphs with constantly bounded width, and opening to questioning the polynomial time definition of "efficiency". In the first part of my talk, I will say a few words about these issues.

Many classes of graphs admit concise description by excluding certain substructures. These obstructions can be defined in several ways. One of those is topological minor containment. *Topological minors* preserve many graph properties, including the bound on some width parameters. Robertson-Seymour Theorem guarantees finitness of the set of the corresponding obstructions. While any particular obstruction set may be quite large, several obstruction sets have been explicitly constructed, arguably the most famous being obstructions to planarity $\{K_5, K_{3,3}\}$. *Vertex minors* preserve a bound on rankwidth parameter. I will show the obstruction set for graphs with linear rankwidth at most 1, and discuss efficient algorithms solving hard in general problems on such graphs.

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