On the Parameterized Complexity of Minimum/Maximum Degree Vertex Deletion on Several Special Graphs

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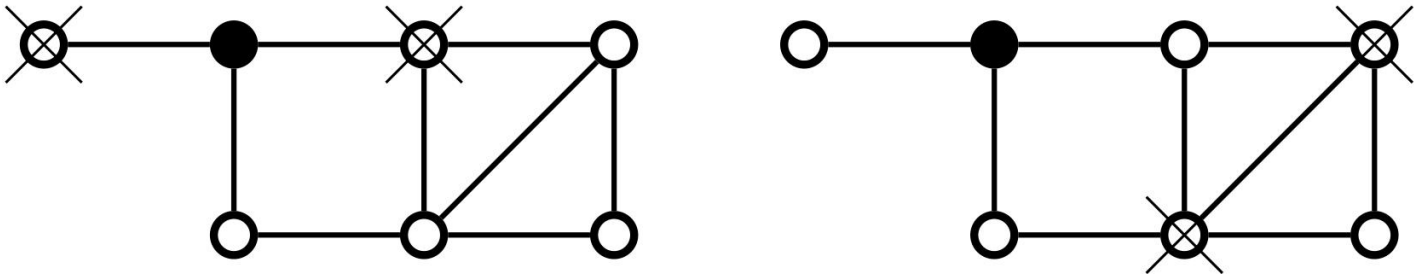
Problems & Ideas

- We studied the following problems.
  - Minimum/Maximum Degree Vertex Deletion (MinDVD/MaxDVD): given a graph and a distinguished vertex, determine if it is possible to delete at most k vertices so that the given distinguished vertex has the unique minimum degree.
- Ideas: The computational complexity of the two problems have been studied in the literature. However, little is known about their parameterized complexity restricted to important special graphs. We fill the gap by utilizing the paradigam of parameterized complexity theory to explore MinDVD and MaxDVD problems restricted to several speical graphs.



An illustration of MinDVD (left) and MaxDVD (right).

Main Contributions

- Contributions:
  - We first study the parameterized complexity of Minimum/Maximum Vertex Deletion problem restricted to split graphs, degenerate graphs, and planar graphs.
  - We obtained fruitful results including NP-hardness, W[2]-hardness, fixed-parameter tractability, and polynomial-time solvability results for the two problems studied.
  - Our exploration provides a complete picture of the parameterized complexity of the above two problems restricted to several important special graphs

	split graphs					planar graphs
	general	$K_{1,6}$-free	$K_{1,5}$-free	$K_{1,4}$-free	$K_{1,3}$-free	
MAXDVD	W[2]-hard (κ, Thm. 2) $O^*(2^{\overline{\kappa}})$ (Thm. 5) FPT ($\lvert C\rvert$, Thm. 3, Cor. 3), $O^*(2^{\lvert I\rvert})$ (Thm. 4)	NP-hard (Thm. 6)			P (Thm. 7)	NP-hard (Thm. 10) (planar & bipartite)
MINDVD	W[2]-hard (κ, Cor. 1) $O^*(2^{\overline{\kappa}})$ (Thm. 5) $O^*(2^{\lvert C\rvert})$ (Cor. 2) FPT ($\lvert I\rvert$, Thms. 1, 3, Cor. 3)	NP-hard (Thm. 8)	open		P (Thm. 9)	P (Thm. 11, Cor. 4)

A summary of our concrete results.