Hitting minors on bounded treewidth graphs

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For a finite collection of graphs $\mathcal{F}$, the $\mathcal{F}$-M-DELETION problem consists in, given a graph G and an integer k, decide whether there exists $S \subseteq V(G)$ with $|S| \leq k$ such that $G \setminus S$ does not contain any of the graphs in $\mathcal{F}$ as a minor. This problem has a big expressive power, as it captures, in particular, VERTEX COVER ($\mathcal{F} = \{K_2\}$), FEEDBACK VERTEX SET ($\mathcal{F} = \{K_3\}$), and VERTEX PLANARIZATION ($\mathcal{F} = \{K_5, K_{3,3}\}$).

We are interested in the parameterized complexity of the $\mathcal{F}$-M-DELETION problem when the parameter is the treewidth of G, denoted by tw. Our objective is to determine, for a fixed $\mathcal{F}$, the asymptotically smallest function $f_{\mathcal{F}}$ such that $\mathcal{F}$-M-DELETION can be solved in time $f_{\mathcal{F}}(\mathsf{tw}) \cdot n^{\mathcal{O}(1)}$ on n-vertex graphs.

In this talk I will survey several results and techniques that we have obtained in the last years about this problem [1], as well as a recent result that provides a tight dichotomy on the function $f_{\mathcal{F}}$ when $\mathcal{F}$ consists of a single connected graph H.

References

[1] J. BASTE, I. SAU, AND D. M. THILIKOS, *Hitting minors on bounded treewidth graphs*, CoRR, abs/1704.07284, 2017.