# FPT results through potential maximal cliques

Fedor V. Fomin – University of Bergen
Mathieu Liedloff – Université d'Orléans
Pedro Montealegre – Université d'Orléans
Ioan Todinca– Université d'Orléans

**Abstract:**

In many graph problems, like Longest Induced Path, Maximum Induced Forest, etc., we are given as input a graph $G$ and the goal is to compute a largest induced subgraph $G[F]$, of treewidth at most a constant $t$, and satisfying some property $\mathcal{P}$. Fomin et al. [1] proved that this generic problem is polynomial on the class of graphs $\mathcal{G}_{\text{poly}}$, i.e., the graphs having at most $\text{poly}(n)$ minimal separators for some polynomial poly, when property $\mathcal{P}$ is expressible in counting monadic second order logic (CMSO). The algorithm is based on the enumeration of potential maximal cliques.

Here we extend this result in two directions:

- The generic problem can be solved in time $\mathcal{O}^*(4^{\text{vc}})$ or $\mathcal{O}^*(1.7347^{\text{mw}})$, where vc and mw correspond to the *vertex cover* and the *modular width* of the input graph.
- Consider the class $\mathcal{G}_{\text{poly}}+kv$, formed by graphs of $\mathcal{G}_{\text{poly}}$ to which we may add a set of at most $k$ vertices with arbitrary adjacencies, called *modulator*. We prove that the generic optimization problem is fixed parameter tractable on $\mathcal{G}_{\text{poly}}+kv$, with parameter $k$, if the modulator is also part of the input.

## References

[1] Fedor V. Fomin, Ioan Todinca, and Yngve Villanger. Large induced subgraphs via triangulations and CMSO. In SIAM, editor, *Proceedings of SODA 2014*, 2014. See also http://arxiv.org/abs/1309.1559.