

## Tutorial 7: Query evaluations on bounded treewidth graphs

- (1) An independent set of a graph  $G = (V, E)$  is a set  $S \subseteq V$  such that every two vertices in  $S$  are not adjacent. Describe an algorithm for the following problem  $\text{INDEPENDENT-SET}_k$ .

**Input:** A graph  $G$  of treewidth  $\leq k$  and an integer  $M$ .

**Task:** Determine whether  $G$  has an independent set of size  $\geq M$ .

- (2) Describe an algorithm for the following problem  $\text{3-COLOURABILITY}_k$ .

**Input:** A graph  $G$  of treewidth  $\leq k$ .

**Task:** Determine whether the vertices in  $G$  can be coloured with Red, Blue, Green such that every two adjacent vertices have different colours. f

- (3) Write the MSO sentences for the graph properties as defined in the problem  $\text{CLIQUE}$ ,  $\text{VERTEX-COVER}$ ,  $\text{DOMINATING-SET}$ ,  $\text{3-COLOURABILITY}$  and  $\text{INDEPENDENT-SET}$ .