Heterogeneous Graphlets

(informal def.) A typed/labeled/colored induced subgraph

1. Generalized the notion of graphlet to heterogeneous/labeled graphs
2. Described a computational framework for computing them that leverages new typed combinatorial relationships to obtain many counts in $o(1)$ constant time & avoid enumeration
3. Proposed algorithm with worst-case time complexity that matches the best known algorithm for untyped graphlets
4. Demonstrated the effectiveness of heterogeneous graphlets

Main Contributions

Example: Given an edge with types $\phi_i$ and $\phi_j$ select type $t$ and $t'$, then compute counts in $o(1)$ using new equations involving $k-1$ node typed graphlet counts:

Clique-based Graphlets
(use $k$-node typed cliques)

Typed chordal-cycle center orbit count:

$$ f_{ij}(g_{11}, t) = \begin{cases} \left( \frac{|T_{ij}^t|}{2} \right) - f_{ij}(g_{12}, t) & \text{if } t = t' \\ \left( |T_{ij}^t| \cdot |T_{ij}^t| \right) - f_{ij}(g_{12}, t) & \text{otherwise} \end{cases} $$

# $4$-cliques with type vector $t$