

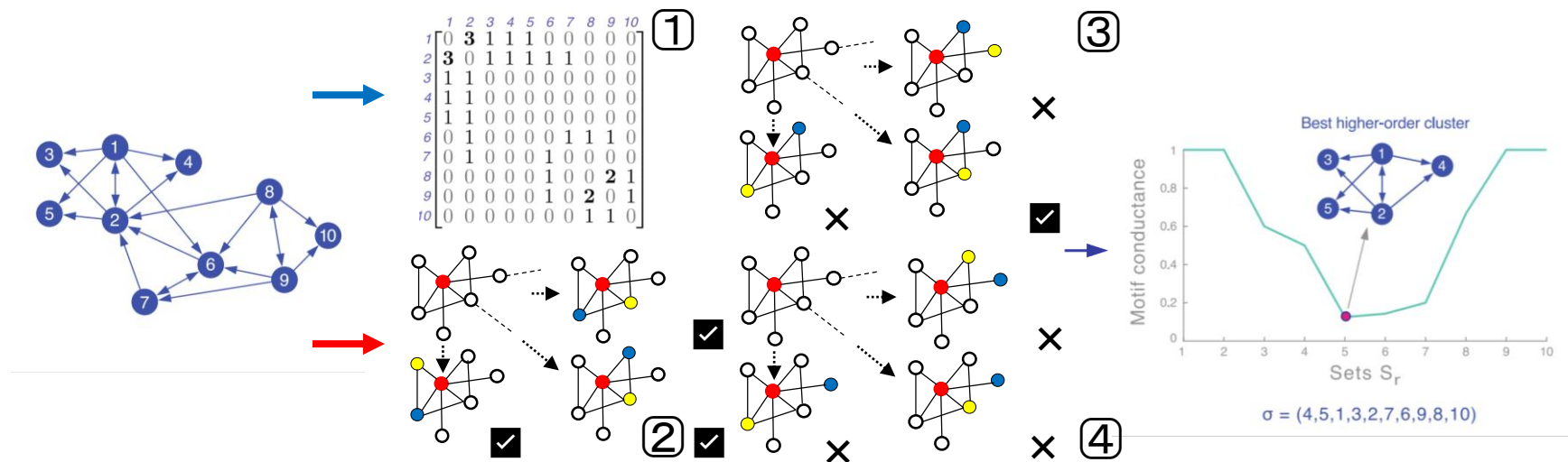
# Index-free Triangle-based Graph Local Clustering

**Zhe YUAN, Zhewei WEI, Fangrui LV, Ji-rong WEN**

Frontiers of Computer Science, DOI: [10.1007/s11704-023-2768-7](https://doi.org/10.1007/s11704-023-2768-7)

# Problems & Ideas

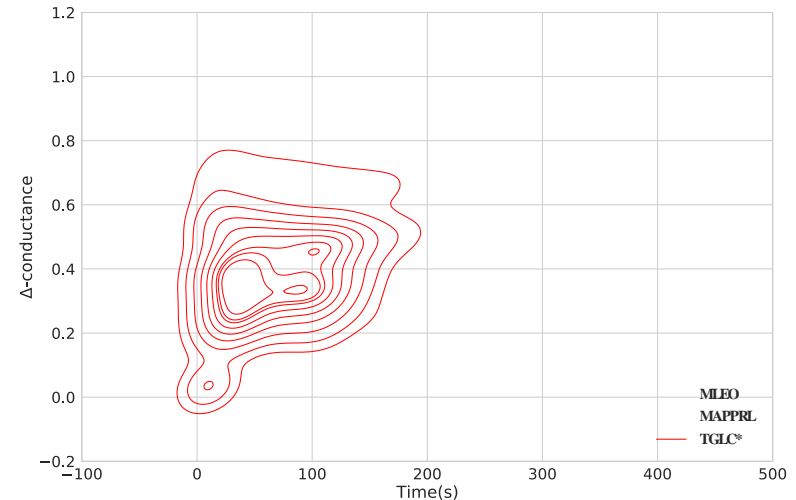
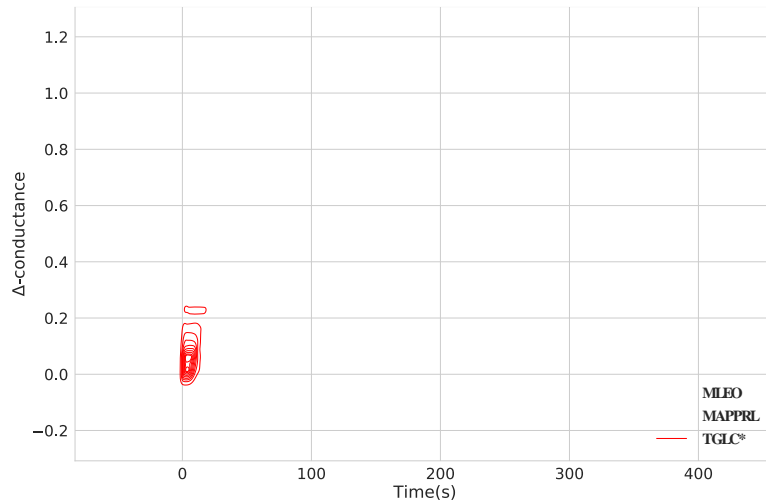
- Problems of motif-based higher-order graph local clustering:
  - Motif-based reweighting and weighted graph local clustering are considered as two sequential procedures.
  - Existing higher-order graph local clustering approaches tend to fail on massive and dynamic graphs.
- Ideas: Design the correct and efficient sampling operation to conduct higher-order random walks on the raw graph from the seed node with not precomputing the graph weighted matrix.



Index-free rejection sampling. Left: Raw graph. Middle: ① is the graph weighted matrix which is hard to compute; ②–④ are sampling situations, the red node is the seed node, the yellow and blue nodes are candidates proposed by our method; if these nodes form a triangle, it is an acceptance and a higher-order random walk. Right: the standard sweep process.

# Main Contributions

- Contributions:
  - The first index-free purely local motif-based graph local clustering algorithm in Monte-Carlo manner with self-adaptive rejection sampling schema to be applicable on massive graphs.
  - A novel visualization layout to better demonstrate the empirical comparisons by defining the performance distribution and its density.
  - A new perspective on higher-order graph local clustering problem, highlighting that, the relative magnitude are more crucial for local clustering outcomes.



The visualization results demonstrating the advantages of our method on effectiveness and efficiency compared to other methods. Left: the PDF on moderate scale graph DBLP. Right: the PDF on massive scale graph LiveJournal.