Improving the Core Resilience of Real-world Hypergraphs
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Summary

- Novel Problem: Improvement of core resilience in hypergraphs.
- Proposed Method: COREA - a fast, effective, and theoretically sound method in improving core resilience via hyperedge addition.

Proposed Concepts & Observations

(a) Proposed Concepts:
1. Anchor(s): of hyperedge \( e \) is/are the nodes having the lowest core number in \( e \).
2. Core Strength (CS): of node \( v \) measures the robustness of \( v \) in keeping its core number against hyperedge removals.
3. Core Influence (CI): of node \( v \) measures how \( v \) contributes to the core number of its neighbors.

(b) Experimental Observations
- Datasets: 10 hypergraphs from 5 domains
- Most nodes have low core strengths, leaving room for robustness improvement.

Proposed Method: COREA

- Step 1: Candidate Construction: construct candidate hyperedges that guarantee to preserve all core numbers.
- Step 2: Candidate Selection: select the best candidate hyperedges.

Experiments

- COREA Improvement:
- Code and Datasets:
- Competitors: extensions of MRKC [1], a graph-based method, to hypergraphs.
- EXP 1. Performance:
- EXP 2. Time-Performance Trade-off:
- EXP 3. Application - Finding influential nodes:

Theoretical Merits

- \([Correctness]\) COREA returns candidate hyperedges preserving all core numbers.
- \([Invariance]\) COREA always returns the same number of candidate hyperedges.
- \([Exhaustiveness]\) COREA returns the maximum number of candidate hyperedges.