

GRAPH RECONSTRUCTION FROM NEIGHBORHOOD DATA AND PARTIAL EDGE KNOWLEDGE

Does collaboration to analyze distributed graphs reveal sensitive information about private subgraphs ?



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1.PRIVACY-PRESERVING GRAPH ANALYSIS

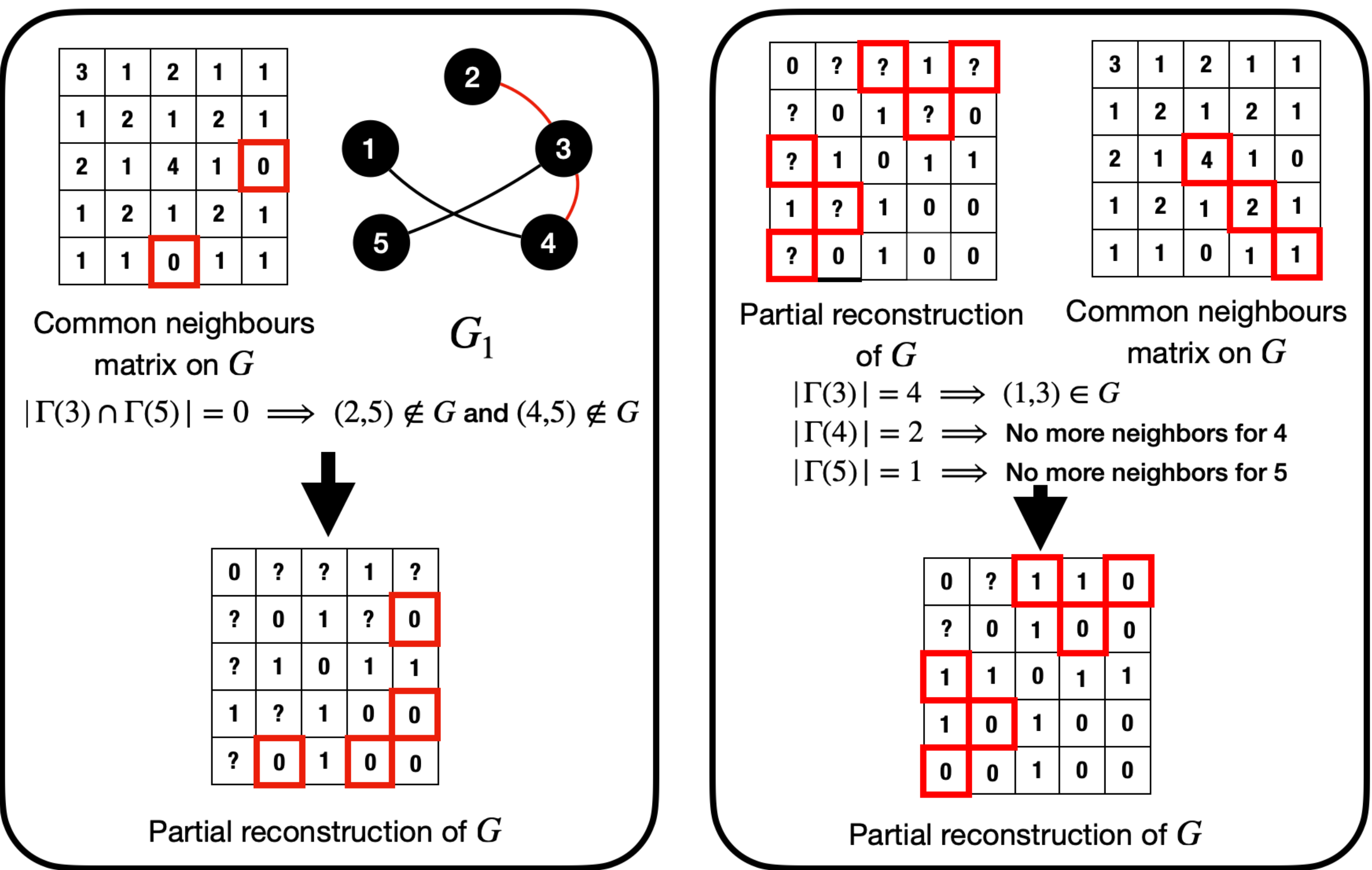
To overcome the limitations of isolated analysis, collaborative graph analysis allows graph owners to securely combine their distributed graph data for a more comprehensive understanding. Since such graph owners might want to keep their graphs private (intellectual property, users privacy), **privacy-preserving methods for collaborative graph analysis** [1, 2] have been proposed in order to benefit from the abundance of data without revealing the private structure of individual graphs.

We join the lineage of other works [3] and show how the outputs of such protocols might **indirectly reveal information about the private graphs**.

3.OBJECTIVES

- How accurately can the dishonest party **reconstruct the union graph** based on the common neighbors matrix and the partial graph ?
- How accurately can the dishonest party leverage the previous reconstruction of the union graph to **retrieve the other private graph** ?

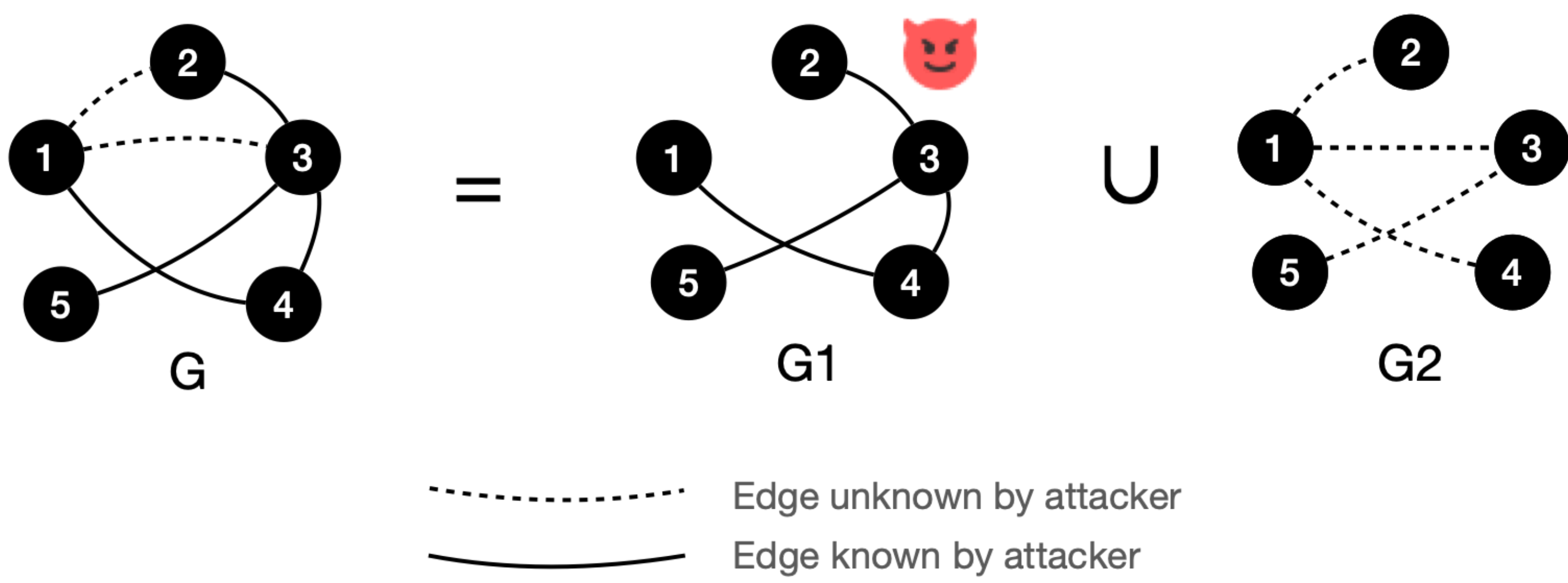
4.DETERMINISTIC GRAPH RECONSTRUCTION



2.CONTEXT

Consider two transportation agencies owning graphs that represent different locations (nodes), and the routes between them (edges).

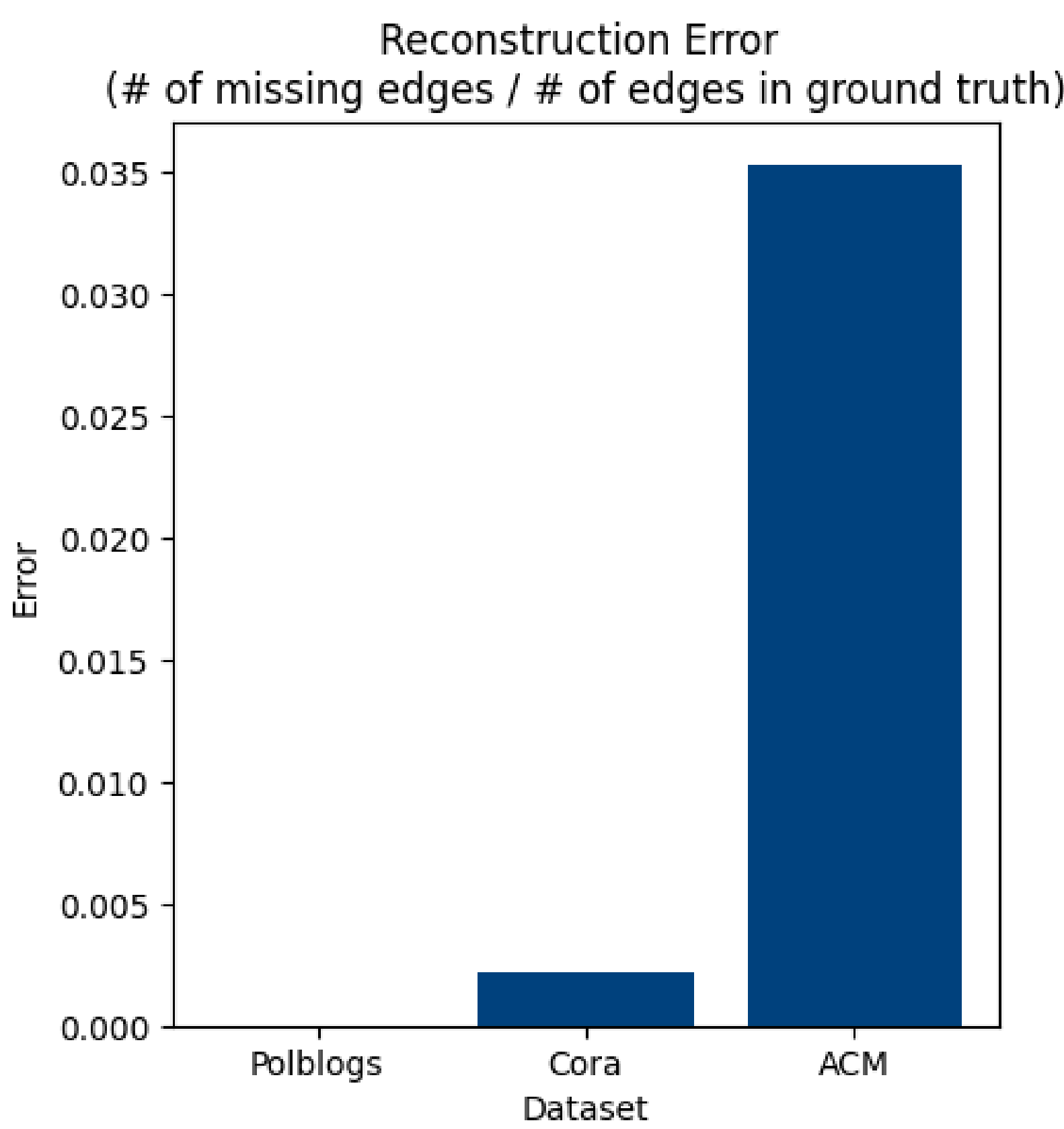
- All locations (nodes) belong to both graphs
- Each agency has its own network of routes between locations (i.e. the edges are distributed between the two graphs such that each edge belongs to the first, the second or both)



To provide seamless navigation and more diverse route options, both parties can collaborate **privately** to identify common connections between the locations. This information will pinpoint routes needing improvement, enhancing the user experience without compromising sensitive network data.

3	1	2	1	1
1	2	1	2	1
2	1	4	1	0
1	2	1	2	1
1	1	0	1	1

5.ANALYSIS



6.CONCLUSION

- Simple algorithms can be applied to retrieve the union graph
- Future directions: characterization of the reconstructibility of graphs, reconstruction of the other private graph (link prediction, graph completion)