

Communities in Medieval Troper Networks are Shaped by Carolingian Politics

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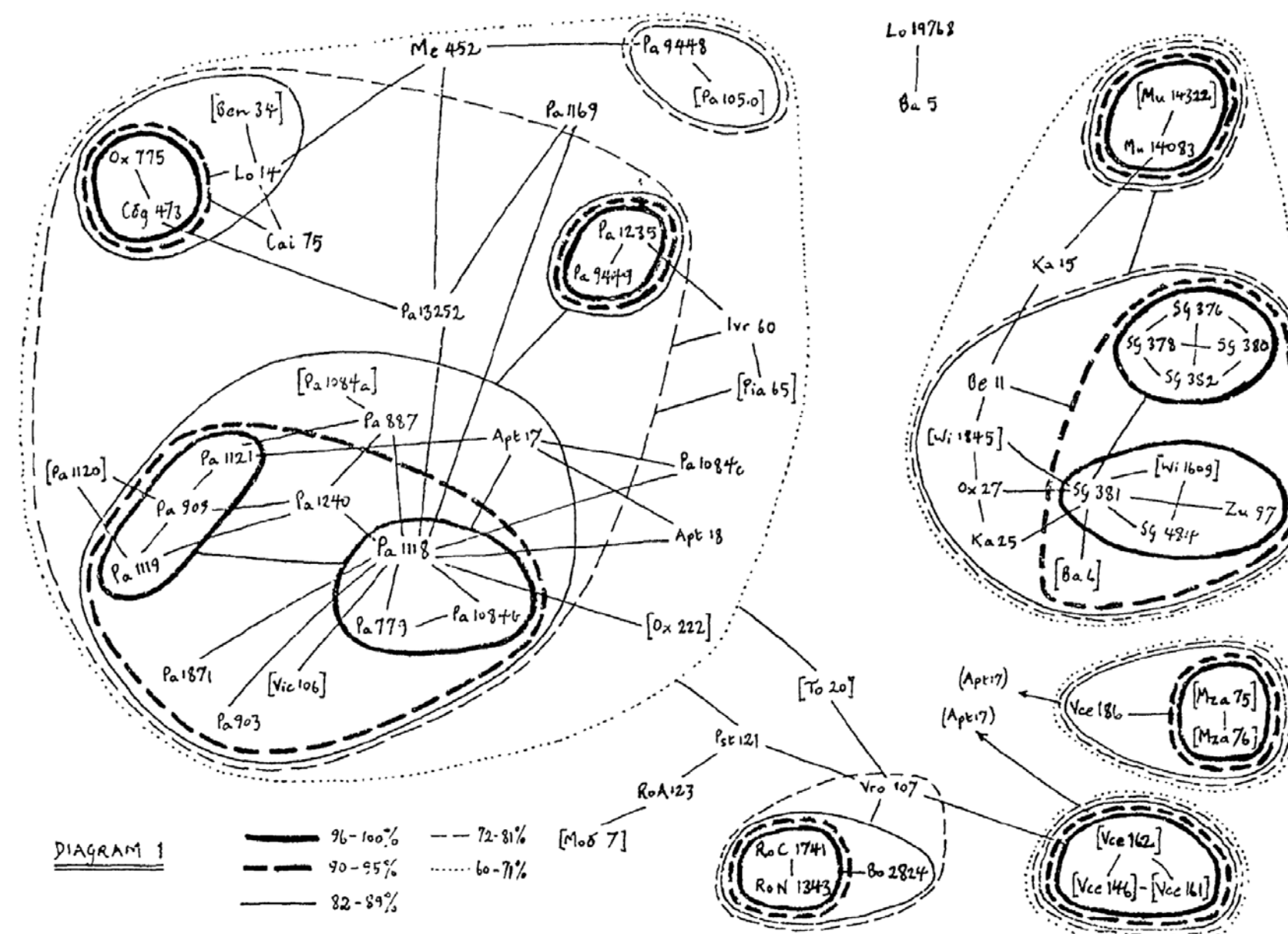
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Research Questions & State of the Art

How do individual tropes [2] spread geographically, and how can different manuscripts be grouped based on shared content?

Previous approaches have manually computed troper similarities based on concordant trope elements and used them for clustering from which the groupings can be read in detail [3].

While the time of creation of surviving medieval manuscripts is not necessarily identical to the time of origin of the chants they contain, the geospatial distribution of different chants within all extant manuscripts of various provenances offers clues about potential historical layers of their origin [5].



Data

Our data contains entries from volumes I (Christmas) and III (Easter) of the **Corpus Troporum** (CT) project [4], representing a central part of the cycle of proper tropes. Other volumes are in preparation. The data was transcribed semi-automatically and is available at [1]. It contains as of today:

- Trope elements from 100 tropers (manuscripts)
- Tropes for 49 different primary chants
- Number of unique trope elements: 1 413

Method

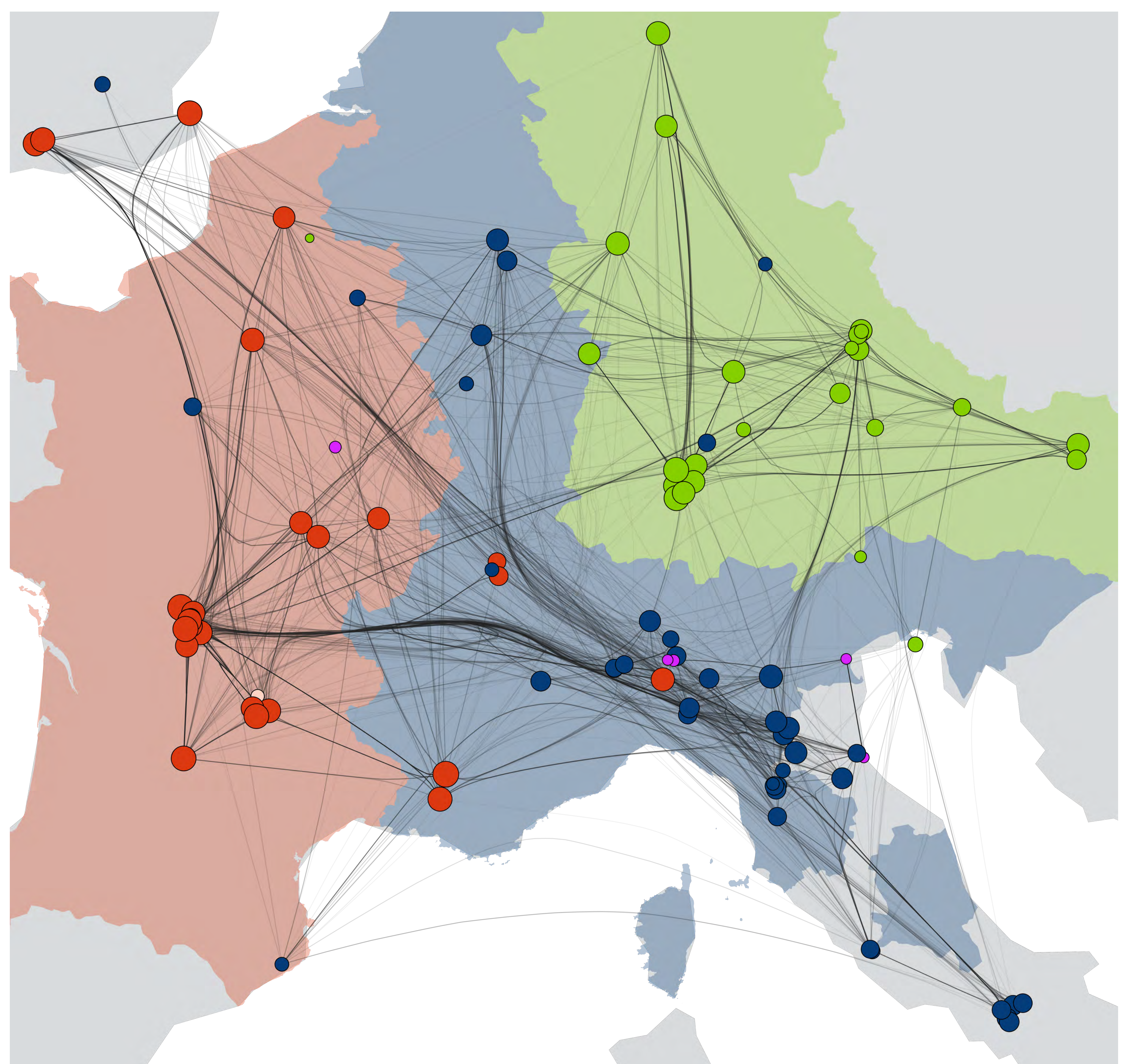
We constructed a monopartite graph with tropers as nodes, mapping them to their geographical locations of origin according to CT, using **networkx**, **d3**, and **topojson**. Generalizing the approach of [3], we used the Jaccard distance instead of a minimization approach and weighted edges according to pairwise manuscript similarities.

Observations

1. Five different **communities** were found by the Louvain algorithm. (●: N=27; ●: N=42; ●: N=25; ●: N=5; ●: N=1)
2. The three largest communities (●, ●, ●) align with the **three parts of the Carolingian Empire** after its first division with the Treaty of Verdun (843 CE).
3. The bundled paths suggest that there is a higher overall similarity between manuscripts of the territory of **Lothar I and Charles II** (● & ●).
4. In contrast, Eastern manuscripts (●) exhibit strong internal similarities but distinguish themselves more prominently from the other two groups.

Discussion

The repertoire associated with the (middle) Lotharingian region spans dominantly from Italian up to English provenance. The image of an axis [5] applies not only in visual terms but also by having the highest weighted group betweenness score by far (0.26, next highest 0.02), which indicates its connecting role between the other repertoire groups. However, the visual representation highlights repertoire overlaps but does not trace the actual paths and direction of the melody transmission. Also, the method we apply has some shortcomings, as it for example does not consider the order of trope elements in a manuscript.

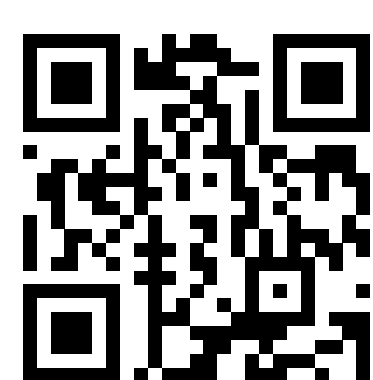


Troper network on the political landscape. Nodes represent manuscripts, node sizes reflect the number of trope elements they contain, & colors display computed manuscript communities. Link opacity depicts repertoire similarity. Colored areas show approximate political regions in the year 853 (geodata from [6]), the territories of Charles II (●), Lothar I (●) & Louis II (●).

Interactive visualization

You can interact with the network, find the source code, and download the data at the following website:

<https://trope.network>



Funding



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Future Research

In this study, we only consider the similarity of the whole repertoire of each of the two manuscripts. A more detailed examination of the tropes for individual chants will provide further insight into their complex dissemination. We are working on a statistical model based on information about the transmitted tropes repertoires, allowing us to make inferences about their affiliation with particular temporal layers, and further contextualize our findings with previous scholarship that relates the trope repertoire to political circumstances of the time [5].

References

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