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Semantic Segmentation-based approach to the analysis of old maps

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Abstract:

Archives around the world contain millions of digitised old maps from the late Middle Ages to the recent past. They are invaluable data sources but complicated to work with individually or systematically, e.g., single rasterised maps used in historical GIS or set of maps prepared at smaller scales and frequently over multiple generations (van Wissen et al, 2024). These maps are mostly only accessible as raster maps and require much manual work to prepare them to construct a georeferenced raster map or vectorised map suitable for spatial analysis. Both technical and conceptual issues and potentials bar more effective use of these data sources. This presentation describes an innovative project that creates an accessible interface with semantic segmentation computational capacities for the first time to analyse old maps, apply interpreted categories/classes to additional maps, work with the same regions on different map series, and produce vectorised data sets for presentation and further research.

Recognising the centrality of researchers in interpretative work with digitised old maps (Uhl et al, 2019) and the confluences between technical and conceptual issues, our goal in the continuing project (Annanias, 2023) is to create a human-in-the-loop process for data acquisition, preparation and guided analysis that is more efficient using rasterised old map sources and that can works with user-defined categories for different kinds of map features.

The possibilities rest on the interactive implementation of neural-network and AI-software tools that merge in a novel approach these approaches whilst assuring interaction with the research enables an interpretative process. We will use few-shot and zero-shot learning approaches from computer vision research to make it possible for researchers to interact with rasterised old maps and delineate an interpretative set of categories for map features to guide the analysis of an old map, or series of old maps. The results can be re-used and modified for additional maps, enabling researchers to reuse and build out from successes to more systematic studies involving as many maps as required. The open-source tools and open access web application the project creates can be installed to work within existing institutional and legal frameworks related to data ownership and access.

The final result will be an open-source tool to support improved and completely novel analysis with historical cartographic data sources.

The organisation of the project follows the division of the functionality into 1) acquisition and management of data sources, 2) rectification and georeferencing, 3) interactive interpretation, 4) creation of categories, 5) documentation and scripting and 6) export. Project activities reflect this organisation. The presentation provides an overview of the project and key functional and interface elements at an early stage of the project.

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