HISCOM

Historical Travel and Communications in Finland c. 1650–1917

Based at the University of Helsinki and funded by the Research Council of Finland (2023–2027), HISCOM will produce new data and assessments of the historical structure and character of the Finnish travel and communi-cations network from the Early Modern Period to the early twentieth century.

DIGITIZING ROAD NETWORKS & FAIR DATA PRACTICES

In HISCOM we explore methodological innovations for large-scale digitization of historical travel and transport connections in Finland. A major output of the project will be an Open Access Historical Geographic Information Systems (HGIS) database of historical roads, principally digitized from Early Modern map sources. The project investigates and tests transferrable workflows for producing FAIR (Findable, Accessible, Interoperable, Reusable) HGIS data, with a particular focus on interoperability and reusability.

These principles are maximized by adapting chronological map regression tested previously in international HGIS projects. Modern National Land Survey of Finland vector polyline road data is visually compared against the oldest and spatially most accurate georeferenced Early Modern maps available in Finland (e.g., the Senate Atlas of 1870–1907). Matching roadlines are extracted and tagged with attribute information such as road class.

This provides a high-precision baseline data for further work, with gaps in the historical road network filled in manually with reference to map sources complemented with GIS data relating to landscape contexts, and can be used in turn as the reference dataset for similarly reconstructing the next, older, temporal layer. The end result will enable diachronic comparisons and empower computational analyses of the overall road network's characteristics.

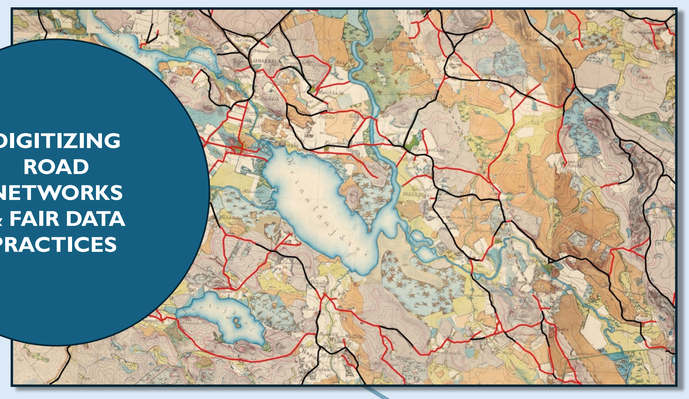

Figure 1. *Detail of a georeferenced Senate Atlas page (The National Archives of Finland), with matching modern roads in black and reconstructed roads in red.*

SPATIAL AND NETWORK ANALYSIS

We deploy a sequence of computational approaches to understanding connectivity across historical landscapes. The digitized road data is well suited for a variety of GIS and spatial network analyses, with relevance for the wider field of Finnish and European socio-economic history. The project will explore ways to model historical connectivity through the road network at different spatial scales of analysis.

Furthermore, borrowing from concepts developed in electronic circuit theory and in ecological studies of animal movement across different terrains, HISCOM will seek to create comprehend-sive perspectives of the impact of the physical landscapes on human move-ment. We will explore what structures emerge in the overland travel network, and what their relationship is to the physical landscape and to the development of towns and commercial centers in different parts of Finland.

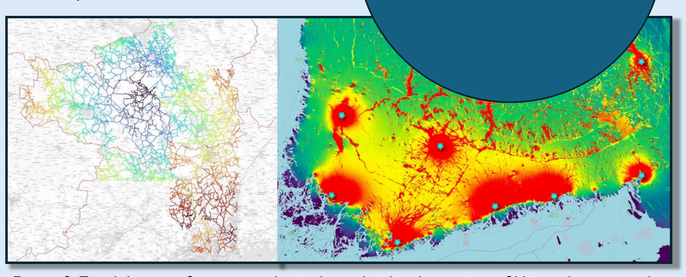

Figure 2. *Travel distances from a central point located within the province of Häme along a sample of the Early Modern road network can be represented as a colour scale (left); circuitscape modeling of travel flow potential between select medieval military-administrative centers, based on Aster V3 Global Digital Elevation Model and adjusted for waterbodies and postglacial ridges, visualizes the impact of large-scale geographical structures on long-distance movement (right).*

MICROHISTORIES AND LOCAL COMMUNITIES

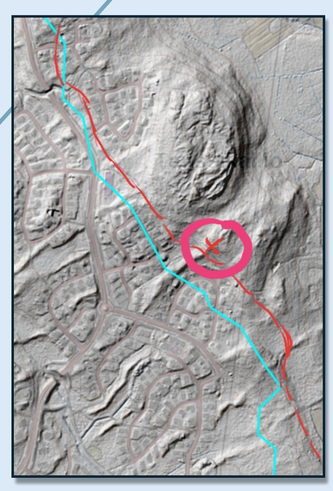

Figure 3. *Ground truthing GIS data: the blue line represents the route as digitized from the Senate's cartographic material, while the red line represents the correct old route found in the terrain, complete with a 19th century memorial stone marked with an X.*

Large-scale analyses will inform and contextualize microhistorical studies of communities that lived within specific travel and communications landscapes. In turn, a close reading of local landscapes enables verifying the results of human and machine-assisted digitization methodologies by ground truthing routelines derived from historical cartographical sources.

Through local case studies such as at Hyvinkää, halfway between the southern Finnish urban centers of Helsinki and Hämeenlinna, we can investigate a rich cross-section of network features, from major routes to small paths and seasonal winter roads, and their use by the local communities. How did overland travel interact with waterborne communication routes, and how did the demographic and travel landscapes develop across time? What of technological developments, such as the establishment of the railways?

INTERREGIONAL CASE STUDIES

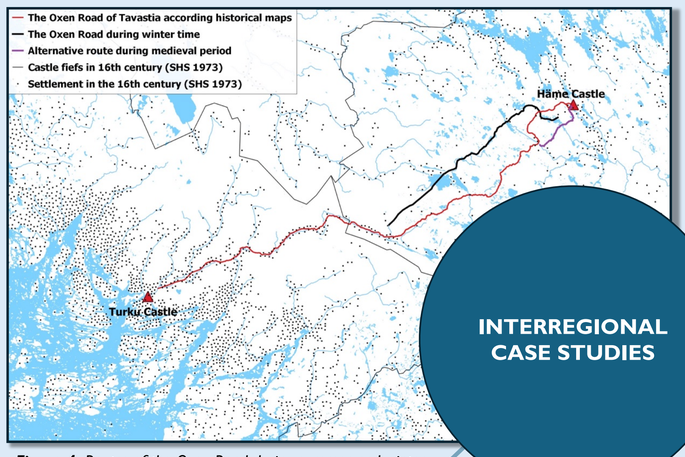

Figure 4. *Routes of the Oxen Road during summer and winter.*

One of the project's most interesting regional case studies is the costal to inland connection created by the Oxen Road of Tavastia, one of the most important roads in Finland during the Middle Ages and the Early Modern Period. The route connected the Turku and Häme Castles and was possibly established as a trade route already in the Viking Period. The approximate route of the road is known from 16th century textual sources. The southern portion of the Oxen Road follows Aurajoki-, Savijoki- and Pamionjoki-river valleys. Its northern portion passes through sparsely populated highlands. In the wintertime the road used an alternative route that passed over frozen lakes and wetlands.

The significance of the Oxen Road changed over time. We hope that combining interdisciplinary approaches – including historical maps and written sources, GIS-based analysis, and archaeological data – will produce new understandings about historical traffic and communications between coastal and inland centers.

OBJECT ARCHAEOLOGY

Roads and paths are usually been seen as structures in the landscape, but they can also be expressed through archaeological finds assemblages and studied with traditional archaeological means. Old roads that passed through wilderness are usually located in easily traversable terrain, on eskers or on flat moraine areas. Frequently used paths can be identified from metal-detected finds. Roads from medieval period onwards, for example, are covered by nails from horseshoes. Although most of the finds from old roads are connected to horses, lost personal items are also common. Dating and quantifying objects recovered at or near roads yields information about how intensively they were used during different periods.

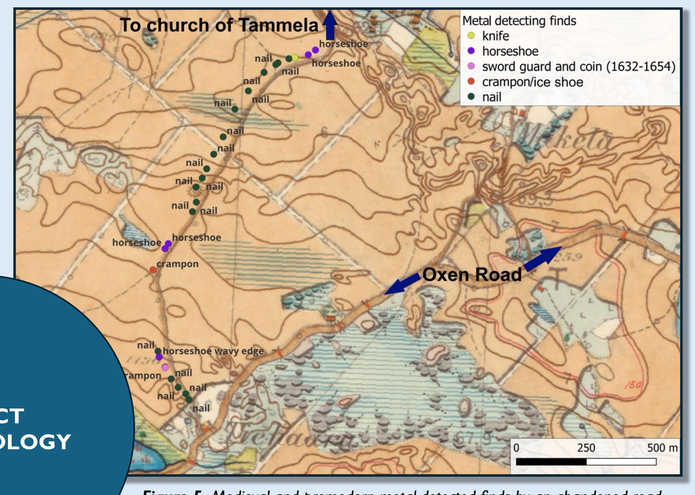

Figure 5. *Medieval and premodern metal-detected finds by an abandoned road (Pekka Fabritius and Sami Stenholm). Background: georeferenced Senate Atlas, Tammela XII 24, 1884 (The National Archives of Finland).*

MACHINE LEARNING AND IMAGE SEGMENTATION

We will explore possibilities for cartographic and image analysis using cutting-edge deep learning methods. The focus in this sub-project is on using image segmentation and advanced deep learning to extract features like roads, bridges, and pathways from digitized historical maps. Segmentation divides the map into regions based on characteristics such as color or texture, which can be converted to vector data for easier analysis.

The aimed for results hold the potential to have broad implications for work on Finnish historical map sources. We will investigate how image segmentation methods can be adapted for extracting data from historical maps, and what new techniques can be developed to overcome the limitations and constraints of current approaches.

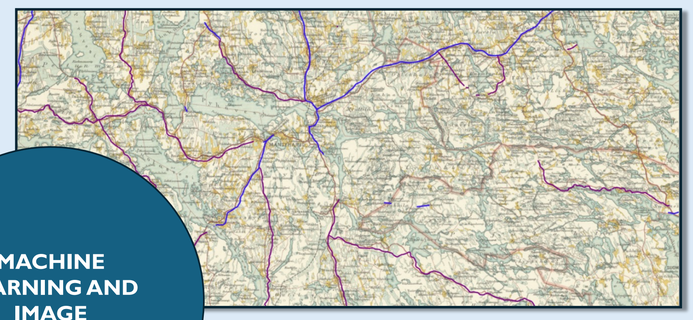

Figure 6. *Testing the automatic matching of modern GIS vector road polylines with cartographic symbology in a georeferenced page from the Economic Map of Finland (1911–1970) atlas.*

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