From Text to Map: AI-Based Graphic Translation of Information

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Abstract

This study investigates the potential of artificial intelligence in translating historical textual registers into graphic reconstruction, exploring interdisciplinary approaches that integrate historical studies and GeoAI. The case study focuses on the “Calcato” of Gandino, a mid-18th-century textual register accompanied by a large-scale territorial map. Produced by land surveyors “treading the ground”, the register describes property boundaries as closed polylines, whose vertices correspond to fixed landscape markers and whose segments are defined by length and orientation. As the map represents a later graphic transposition rather than a direct survey output, it provides the basis for this research: replicating that translation process through computational tools. Following an initial exploratory phase to validate the concept, conversational AI models were used to transcribe the historical text and compute vectors to generate local coordinate tables necessary for reconstructing the geometries of the described areas. The method was tested on cases with varying levels of complexity, comparing the results with the corresponding map representations. A final phase extended the analysis to registers from different historical periods to enable further testing and comparison. The results demonstrate the feasibility of transforming archival textual data into spatial representations, supporting qualitative analysis and the study of historical and territorial transformations.

1. Introduction

In an era marked by the transition from traditional analytical models to generative ones, Artificial Intelligence (AI) has moved beyond the confines of pure computer science to become an integral component across numerous fields of scientific research. This development has triggered a significant wave of experimentation aimed at testing new methodological approaches, tools, and software within heterogeneous professional contexts. In the field of geospatial sciences, this evolution has reached its peak in GeoAI, a multidisciplinary sector that integrates the computational power of AI with the specificities of geographic data. The ability of these systems to manage and process massive datasets, characterized by increasingly high spatial, temporal, and spectral resolutions, has paved the way for previously precluded investigations, stimulating new approaches and yielding remarkable results.

Within this experimental landscape, GeoAI has demonstrated a transformative impact across multiple research strands (Mai et al., 2025; Hu et al., 2024), acting as a catalyst for innovative solutions in highly diverse domains. In the field of Urban Computing (Haldorai et al., 2024), for instance, AI-powered predictive analysis stands out among many applications, enabling the optimization of transport system efficiency or the monitoring of urban environmental sustainability (Adduri and Ali, 2025) by integrating remote sensing data and imagery. Similarly, within Earth System Science, it supports the understanding of complex dynamics, providing potential answers to widespread challenges such as greenhouse gas emission monitoring (Chen et al., 2026) and water resource management (Razavi-Termeh et al., 2026). In the field of geospatial semantics, the use of knowledge graphs and Natural Language Processing (NLP) represents a central theme. These technologies simplify the connection between diverse data, optimizing information retrieval, and toponym resolution within textual documents (Zekun et al., 2023). A primary role in this transition is occupied by Remote Sensing, which constitutes the documentary basis for much of our territorial knowledge. Here, the application of AI has revolutionized traditional tasks such as scene classification (Bazi et al., 2021), geospatial objects and change detection (Calantropio et al., 2021), etc. This drive for innovation has also found ample growth opportunities in the domain of cartography (Zhang and Zhu, 2024), where GeoAI no longer acts merely as an analytical tool but as an active agent in content production. Indeed, contemporary cartography increasingly presupposes the use of intelligent systems to address various methodological challenges. Among the various applications, the automated extraction of features, such as building footprints or road networks, is particularly noteworthy (Jiao et al., 2022; Chen et al., 2025). In this same context, within numerous research paths, recent experimentations have explored the potential of map style transfer and automated vector generation (Taparia et al., 2024), moving from simple images to digital maps that are more precise, flexible, and easily editable. A further and stimulating emerging field of research is Text-to-Map, namely the generation of maps starting from natural language descriptions (Przymus and Szymański, 2023). Although it represents the point of maximum convergence between computer vision and semantic understanding, the theme still presents enormous margins for expansion and depth.

In this context, several development directions are emerging: on one hand, the use of generative models for the aesthetic synthesis of historical maps or hypothetical geographic scenarios; on the other, the increasing significance of LLM-based frameworks, such as MapGPT (Zhang et al., 2024), which operate as intelligent assistants capable of translating textual instructions into complex cartographic workflows and high-complexity spatial queries. This potential appears even more compelling when intersected with the world of historical studies and archival documents (Haris et al., 2024; Wang et al., 2025). The AI-assisted interpretation and graphic reconstruction of ancient texts, which often require the translation of semantic descriptions into geographic coordinates, constitute a still unexplored field, capable of giving life to interdisciplinary insights and experiences of particular interest.

It is precisely within this latter branch of GeoAI that the present work is situated. The opportunity arose within the framework of the PRIN (Project of Relevant National Interest) initiative

Crafted in Stone / Recorded on Paper, which aims to collect and promote knowledge of buildings and archival heritage related to the "good" governance of cities (Guzzetti et al., 2024). In the course of this work, and specifically during the study of historical materials held in the Historical Municipal Archives of Gandino, a particularly noteworthy and unusual historical item was identified: the "Calcato" of Gandino. It consists of two parts: a textual register collecting descriptions of the territory and assets of the municipality of Gandino, and the relative map that graphically reconstructs the aforementioned descriptions. The reading and analysis of this precious element of the municipal archive soon stimulated ideas and further investigations. The work described here is the result of this occasion, which offered an opportunity to test an interdisciplinary approach, combining artificial intelligence with expertise from the fields of cartography, historical-territorial and archival studies. The project thus served to highlight the potential of such combination and collaboration in supporting the fruition of archival heritage and the enhancement of the information it holds.

2. The "Calcato" of Gandino

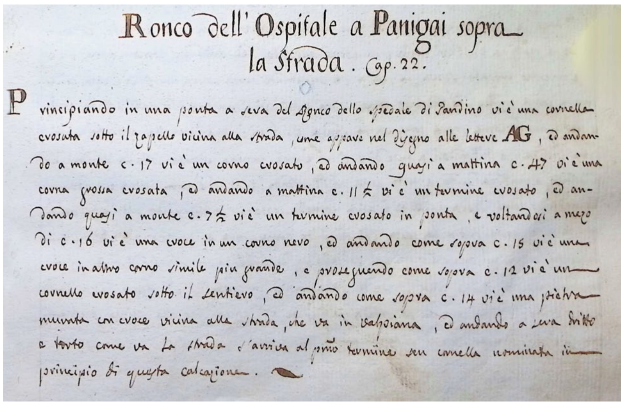
The municipality of Gandino is a town located on the eastern edge of the Seriana Valley, in the province of Bergamo (Italy). The "Calcato" of Gandino emerged from archival research conducted within the Historical Municipal Archive. From a historical perspective, this archival source raises a number of issues that deserve further investigation, particularly in light of its close connection with local historical developments and the management of municipal land (Pederzani, 2023).

By the fifteenth century, municipal regulations had already established the need for five appointed officials tasked with surveying and confirming the boundaries of the territory, first defined between 1230 and 1237. These officials were known as "calcatori", as their task involved physically "treading" the land, measuring it through a medieval technique based on direct movement across the terrain and the identification of clearly recognisable landmarks. (Marchetti, 1996) This approach differed considerably from both ancient surveying methods, by then evidently no longer in use, and the techniques adopted by modern surveyors in Lombardy (Sandri, 1983). For each area to be measured, the process of "treading" followed a circular route which, in practice, resulted in a closed broken line referred to as a 'serada' (meaning 'closed') (1).

Figure 1. One of the "termini" preserved in the territory.

The vertices of this line corresponded to the "termini" of the original path and were, for the most part, rocks engraved with crosses, some of which can still be traced in the landscape today (Figure 1). Additional reference points included corners of buildings, paths and ruts; and natural elements such as streams. Each segment of the resulting polyline was documented in terms of both distance and orientation, with reference to the cardinal directions and, occasionally, to specific morphological characteristics of the terrain. The purpose of these operations was legal and judicial reasons, and the "calcatori" were required to produce written records documenting the limits of public land, known as "calcati". The analogy with modern cadastral systems naturally arises. Although differences exist, particularly regarding the objects described (limited to public property) and the techniques employed, the similarities in terms of purpose and general approach are striking.

Today, only a limited set of these records survives, housed in the archives of a few municipalities in the Valle Seriana area(2) (Nicefori et al., 1999). Three known versions of the document are conserved in the Historical Municipal Archive of Gandino, dating from at least 1435–1523, 1567, and 1747(3). The version examined in the present study is the mid-eighteenth-century one. It differs from earlier versions in that, in addition to the textual record, it also includes a map, an element not typically present in this type of document(4).



Ronco dell'Ospitale a Panigai sopra la Strada. Cap. 22.

Principiando in una ponta a sera del Ronco dello Spedale di Gandino vi è una cornella crosata sotto il capello vicina alla strada, come appare nel disegno alle lettere AG, ed andando a monte c. 17 vi è un corno crosato, ed andando quasi a mattina c. 47 vi è una corna grossa crosata, ed andando a mattina c. 11½ vi è un termine crosato, ed andando quasi a monte c. 7½ vi è un termine crosato in ponta, e voltandosi a mezo di c. 16 vi è una croce in un corno nero, ed andando come sopra c. 15 vi è una croce in altro corno simile più grande, e proseguendo come sopra c. 12 vi è un cornello crosato sotto il sentiero, ed andando come sopra c. 14 vi è una pietra munita con croce vicina alla strada, che va in Valgoiana, ed andando a sera dritto e torto come va la strada s'arriva al primo termine sen cornella nominata in principio di questa calcazione.

Figure 2. One chapter from the eighteenth-century textual register. "Ronco dell'Ospitale a Panigai sopra la Strada".

Comprising 139 pages, the eighteenth-century register represents a continuation of the documentary tradition established in the fifteenth century. The document is structured into eighty chapters, each referring to a distinct location and their order mirrors the path physically followed during the surveying activities (Figure 2). Measurements are expressed using the agrarian unit known as the "cavezzo", conventionally equal to 2.627 metres, or six "braccia" of approximately 0.53 metres each. The document was drafted by the notary Bernardino Gregorio of Gandino, active in Bergamo. From the text, we understand that, in 1747, the town council assigned

[1] For "serada", see: https://www.lombardiabeniculturali.it/archivi/complessi-archivistici/MIBA002E8B/.

[2] https://www.lombardiabeniculturali.it/archivi/complessi-archivistici/MIBA002E8B/.

[3] https://www.archiviedocumenti.it/archivi/?str=109&prg=31; ASCG - Archivio Storico Comunale Gandino (Bg), 107, 113, 115.

[4] *Calcato de' Beni tutti della Spett.le Communità di Gandino 1747*, "Omnia Gandini arvorum confinia, Lector / Nec non mensuras iste libellus est", ASCG, 115.

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Pietro Antonio Ferrari “de’ Domo D’Ossola Status Novariae“[5] (Abbattista Finocchiaro, 2023) the task of carrying out new measurements, with the explicit objective of producing a drawing, based on the observation of existing reference points (“termini”), on the consultation of earlier documentation, and on the collection of new data. They talk about a “Typum” (Bianchi, 1993). This process ultimately led to the production of the “novum ichnograficum universalem Typum”[6], a large-scale topographic map measuring 1.83 by 3.10 metres (Figure 3). The map is the defining feature of the 18th-century version of the “Calcato”. It represents an almost unique case within Lombardy, and possibly even at the national level, and is further noteworthy for its remarkable dimensions (Zappa, 1991/1992; Pagani, 2021).

Figure 3. Digital copy of the map of the “Calcato”.

Its considerable dimensions, and the decorative and ornamental elements, suggest that the map was conceived as a meaningful and symbolic artefact by the municipal authorities, conceived as a reference for the local community. These features point to a consciously political dimension of the project. For contemporary administrators, the accurate large-scale representation of the municipal territory likely responded both to the need to assess inherited land assets and to the intention of supporting informed local governance strategies (Selva, 2013). Despite the potentially different motivations underlying its production, the map has become, especially today, a fundamental tool for interpreting the information contained in the register, which would otherwise be difficult to reconstruct geometrically. The map is not the result of a topographic survey, but as a later graphical rendering of the information contained in the written register (Figure 4).

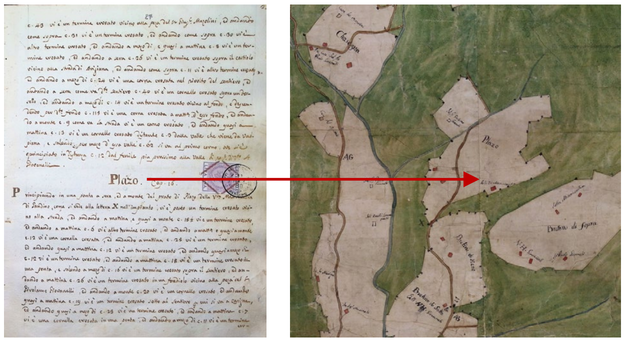

Figure 4. Chapter of the register and the corresponding area.

Even so, a clear link between Ferrari’s map and the textual register can be identified by capital letters (e.g., A; AB) appearing in both sources. Additional symbols indicate the “termini” along the edges of the various areas. Regarding the description of the segments that make up the geometries, both documents rely on the same system of reference, namely the compass rose.
These conditions formed the basis of the present research, which aims to generate new graphical outputs, namely territorial maps, starting from textual registers, by leveraging the potential of artificial intelligence. The objective is to evaluate whether it is possible to replicate the process carried out by Pietro Antonio Ferrari in the mid-eighteenth century, who produced the map in six months using the information contained in the register, ultimately offering a clearer and more accessible means of interpreting those data.

3. From the ancient text to its graphic representation

This work falls within the research field concerned with the generation of maps from natural language using AI. More specifically, the study investigates the potential of Large Language Models (LLMs) for the graphical transposition of information and measurements recorded in the calcati (textual registers) preserved in the Municipal Historical Archive of Gandino. The objective is to exploit the communicative immediacy of geometric reconstructions, generated by AI, to facilitate the interpretation of the descriptions contained in these documents, which are often particularly complex.
Building on preliminary results (Figure 5) obtained in earlier experiments (Biolo et al., 2025), the research focuses on the development of a structured workflow, with particular attention to the combination of input data, instructions, and LLM-based processing. The study began with the eighteenth-century version of the “Calcato” of Gandino, which includes a corresponding map and therefore allows verification of the outputs during the initial stages of experimentation. Subsequent steps involved the use of a chapter from the sixteenth-century version, for which no corresponding map exists, with the aim of reconstructing the earlier configuration of selected area.

5 Ferrari is named as “national milanese essercitante la Geometria ed agrimensore già ed in Bergamo e nel Distretto sperimentato perfetto in tale arte …”, ASCG, 115, c. 106.
6 ASCG, 115, c.2.

Figure 5. Initial results of the preliminary tests carried out on the “Bagotto” area.

The work does not aim to produce outputs suitable for metric evaluations, also considering the nature of the source data. Rather, the research seeks to explore the usefulness of an interdisciplinary approach that leverages commonly available LLMs to graphically reconstruct information that today survives only in written archival documents, making it more readily accessible for qualitative analyses and for understanding historical and territorial transformations.

3.1 The text transcription

In the initial phase, the activities focused on the methods for providing input data. To avoid possible differences in document interpretation among the various LLMs involved in the subsequent phase, the transcription of the “Calcato” chapters was entrusted to AI.
This activity was treated separately from the graphical transposition process, with the aim of ensuring greater control over the quality of the transcription output. It was not assumed that the AI model best suited for map generation would also be the most effective for reading and interpreting handwritten manuscripts. Within this framework, the field of Optical Character Recognition (OCR), and more specifically Handwriting Text Recognition (HTR), based on Large Language Models was investigated. Compared to traditional tools, an AI-driven approach enables the integration of visual recognition and semantic understanding, improving the handling of ambiguities and gaps that are common in historical texts. However, recent studies highlight that such models still exhibit heterogeneous performance; for this reason, multiple LLMs were tested (Crosilla et al., 2025). A review of the state of the art revealed the remarkable capabilities of several systems, including widely used ones (Childers, 2025; Byatnal, 2026; Dilmegani, 2026). Considering the project objectives and the accessibility of these solutions, to enable the replicability of the approach, these models were selected for the testing phase.
Based on the collected data, transcription experiments were conducted using ChatGPT 5.2, Claude Sonnet 4.5, and Gemini-3 PRO. All these models were tested on two chapters of differing length and complexity. The excerpts are drawn from the 1747 register, which, as previously noted, is a manuscript in Italian, albeit with marked local features (Bergamasco dialect). The register pages, previously digitised using a planetary scanner at 300 dpi, were exported in JPG format while preserving high resolution to facilitate accurate reading. Moreover, all reproductions were introduced using the same prompt, to minimise potential interpretative differences.
The test results were clear, as shown in Table 1: Gemini-3 PRO proved to be by far the most effective solution, accurately reproducing the content of the text in both cases. Errors were minimal and limited to portions of text that were not critical for comprehension or correct use of data.

	ChatGPT - 5.2	Claude Sonnet 4.5	Gemini - 3 PRO
Chapter 1	17/178 9,6 %	26/178 14,6 %	0/178 0,0 %
Chapter 2	43/270 15,9 %	37/270 13,7 %	3/270 1,1 %

Table 1. Incorrectly transcribed words vs. total words in the chapter (and percentage).

This approach was therefore adopted for all chapters selected for the subsequent phase, including a section drawn from the sixteenth-century register (Figure 6). Despite the suboptimal condition of the document and the limited legibility of the text, as well as the different language (latin, given the formal nature of the content), Gemini-3 PRO proved to be equally effective.

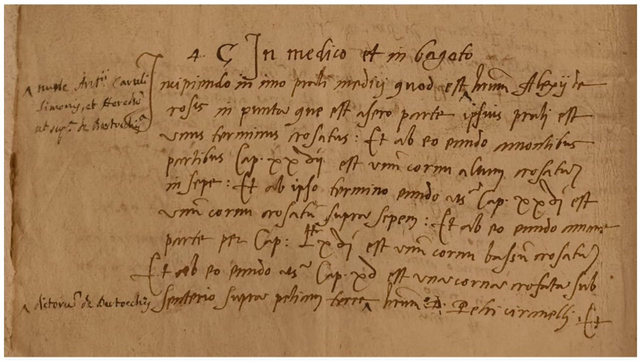

Figure 6. Extract from the 1567 textual register. The chapter is related to the “Bagotto” area.

Once the material preparation phase was completed, the study proceeded to the next stage, namely the definition of prompts and the experimentation of the graphical generation process.

3.2 Iterative prompt design and testing

In the subsequent phase of the work, testing focused on the graphical translation of information, using the eighteenth-century “Calcato” as a reference. Consistent with the aim of developing a streamlined and easily replicable approach, commonly used LLMs were again employed: ChatGPT PRO 5.4, Claude Sonnet 4.5, and Gemini 3 PRO, maintaining the previously tested set. However, in this phase it was not sufficient to simply identify the most performant LLM, given the complexity of the task.

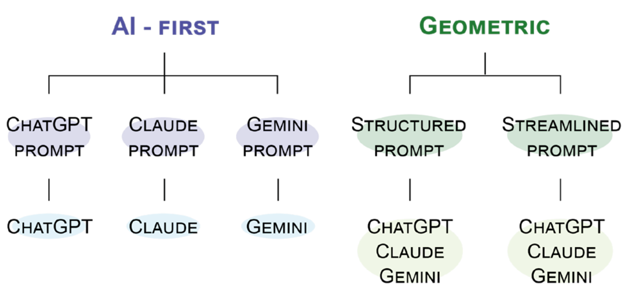

Figure 7. Summary chart of the combinations tested.

The work instead revolved around the combination of three distinct components: the LLM, as the tool used to process the data; the strategy, understood as the method and approach to the problem; and the prompt, namely the definition of the command to be provided to the AI, constructed according to the chosen strategy. The combination of these elements produced a series of configurations, which were then tested across multiple chapters of the textual register to assess their effectiveness. Two different strategies were defined: one termed “geometric” and the other “AI-first.” These were associated with two and three different prompts respectively, which were then tested across the various LLMs, resulting in a total of nine different combinations (Figure 7).

The “AI-first” approach, in line with the experimental nature of the study, leaves full control to the AI. In this case, the starting point was the LLMs themselves, which were asked to construct their own prompts based on approximately ten sample areas provided both as text (chapters of the register) and as extracts from the map. The idea was to present both the input and the expected output, namely the graphical reconstruction. Based on this material, and a standard instruction, the three AI models independently developed their own strategies and prompts for the graphical translation of the “calcazioni”. The prompts, left unmodified by the operator, in order to preserve the “AI-first” philosophy, were then tested on some case studies of varying complexity. The operations were conducted vertically, meaning that each prompt was tested only with the model that had generated it, resulting in three configurations. Overall, the results suggest that these large language models struggled to establish effective rules on their own to solve the problem, mainly because the input datasets contain many degrees of freedom and very few constraints.

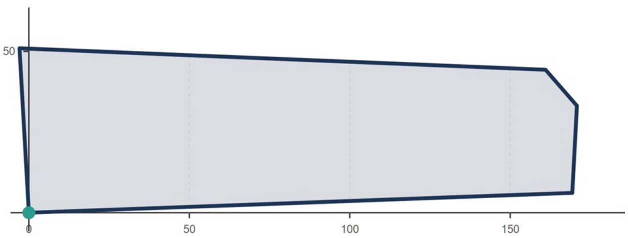

Figure 8. Graphical transposition of the “Bagotto” area carried out using Gemini PRO (“AI-first” approach).

The outputs tend to be more rigid and regular (Figure 8), except for the reconstructions produced by ChatGPT, which appear more correct. When applied to more structured case studies, further experimentation would be worthwhile, as this approach remains highly interesting in that it reveals the underlying reasoning processes of the different LLMs.

The “geometric” approach, building upon previous experimentation, is based on a series of key steps: extracting vectors (length and direction) from the text, computing the coordinates of each vertex of the polyline, and applying any necessary corrections to ensure closure, ultimately leading to the definition of the final geometry. This strategy was implemented through two different prompts, one more structured and one more streamlined. Both were tested with the three AI models, resulting in six configurations, which were applied to both simple and more complex areas. Drawing on earlier tests, efforts were made to increasingly contain AI reasoning by imposing constraints and setting rules for data processing and handling of ambiguities in the text. This iterative process, involving multiple attempts aimed at continuous refinement, led to the development of a structured prompt. Contrary to expectations, however, tests conducted with this structured version produced results that were overly rigid and, in some cases, incorrect, failing to account for the irregularities of the areas. The attempt to force the AI into an excessively predefined and controlled framework thus proved counterproductive.

This observation led to the development of a more streamlined prompt, still grounded in the “geometric” approach, defined by the user (i.e., not AI-first) but allowing greater freedom of reasoning for the system. Based on the core principles of the geometric method, a set of rigorous yet non-restrictive instructions was defined, avoiding any bias in terms of preferred interpretation or workflow. The constraints were limited to essential aspects, such as ensuring polyline closure, preventing self-intersections, and preserving vector lengths. Achieving this balance proved challenging, given the nature of the data. In addition to the strong constraints imposed on the LLMs, the prompt also provided a general framing of the problem, including: a brief description of the nature, historical context, and original purpose of the text; an explanation of the “calcazione” technique; and information on the unit of measurement and the system used to define vector orientation. The expected outputs were clearly specified in advance, namely the graphical reconstruction, accompanied by a table reporting the results of the calculations: vertex labels with corresponding vector information (length and direction), as well as the x and y coordinates of each vertex. The results obtained with the streamlined geometric prompt were the most satisfactory. It must be emphasized that the derived geometries remain approximations of the actual configuration of the communal properties described, particularly where the boundaries of the area coincide with paths and other morphological features. The inaccuracy also stems from the limited accuracy of the source data and the high degree of freedom inherent in the geometric problem addressed by the AI. For this reason, the results should be understood as supporting qualitative rather than quantitative analysis. In particular, ChatGPT PRO 5.4 and Claude Sonnet 4.5 produced the best, and comparable, results. They also demonstrated better handling of shared boundary elements between adjacent areas, an aspect of particular importance that warrants further investigation. These LLMs also proved more stable outside their PRO versions (or “extended reasoning” mode in the case of Claude). Additionally, Claude offers the possibility to store prompts as “skills,” i.e., reusable reasoning modules within the user account that can be modified, exported, and shared.

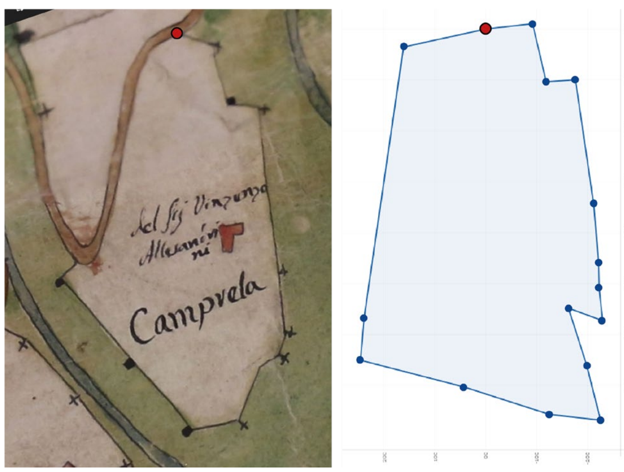

Figure 9. Map and reconstruction of “Camprella” area (Claude Sonnet 4.6, geometric approach).

The workflow development phase and the data processing phase progressed in parallel, as it was necessary to test the various configurations iteratively. After identifying the most effective setup, further tests were conducted on additional areas to validate and expand the study, as partially reported in the following section (Figures 9 and Figure 10).

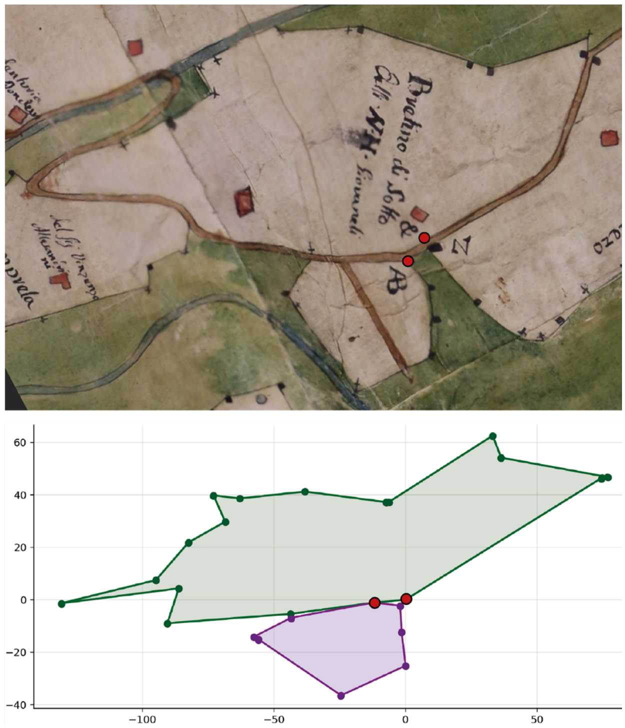

Figure 10. Map and reconstruction of "Bretino di Sotto" (green) and "Ronchetto" (purple) areas (ChatGPT PRO 5.4, geometric approach).

Overall, the use of the 1747 "Calcato" as a case study for workflow development proved to be the most reliable choice, as the existing map could be used as a benchmark to evaluate the extracted geometries. This validation was particularly important given the limited precision of the measurements reported in the texts, due to the surveying methods and instruments of the time, as well as the complexity of the surveyed objects: communal properties (often of considerable extent) located within a territory characterized by significant elevation changes.

3.3 AI for historical and territorial transformation analysis

The eighteenth-century "Calcato" is the only one among those preserved in the Archive of Gandino to be accompanied by a map. an extremely valuable resource for understanding the geometries of the communal properties recorded in the register. The two earlier versions, dating respectively to the fifteenth and sixteenth centuries, consist solely of textual documents, drafted with the same structure and referencing system as the 1747 record. First, the measurements are based on the same surveying technique (the "calcazione") and are reported using the same approach, namely polylines described through the vectors that compose them. Moreover, these registers are also organized into chapters, each describing a different communal property, in which the same capital letters can be identified, used to denote the starting points of the various measurements (e.g., A; AB). These references remain consistent across different historical periods, ensuring a degree of continuity among the various versions.

This parallelism among the textual registers makes it possible to apply the same workflow to the data extracted from the 1567 document (whose precise title is "Calcato del Comune di Gandino 1567"), with the aim of testing the approach as a support tool for analysing the evolution of these areas over time. One of the chapters of this register, the "Bagotto" area, was processed using the geometric approach, employing the light prompt to give shape to its otherwise highly unclear descriptions (Figure 5). As previously noted, the text was effectively transcribed and subsequently translated from latin using Gemini 3 PRO. Once the text was prepared, the subsequent steps followed the same procedure adopted for the chapters related to the 1747 "Calcato". A single variation was introduced into the workflow: during the data input phase, Claude (Sonnet 4.6) and ChatGPT (PRO 5.4) was provided with two texts referring to the same area, one from 1747 and one from 1567, explicitly stating their correlation and the shared reference point defined by the capital letter. Once again, the two LLMs produced very similar results for both the 1567 and 1747 datasets. The shapes are elongated, but there are clear differences between the two historical periods (Figure 11). Although the discrepancies may appear significant, the resulting shapes accurately reflect what is described in the two texts. Indeed, by following the surveyor's instructions and manually reconstructing the perimeters of the two polylines on paper, the outcome closely resembles that produced by the AI models. This further demonstrates that the workflow tested and validated using the 1747 "Calcato" functions correctly.

This situation opens up a series of considerations, suggesting that the discrepancies may be the result of two possible conditions. On the one hand, the boundaries may have undergone substantial modifications, a plausible scenario given that nearly two centuries separate the two measurements. On the other hand, the gap may simply reflect differences in the level of measurement precision. Although the extracted geometries cannot be directly compared, this study opens the way for further historical investigations related to these two possible explanations. It would certainly be worthwhile to continue this type of experimentation in order to assess the recurrence of similar conditions.

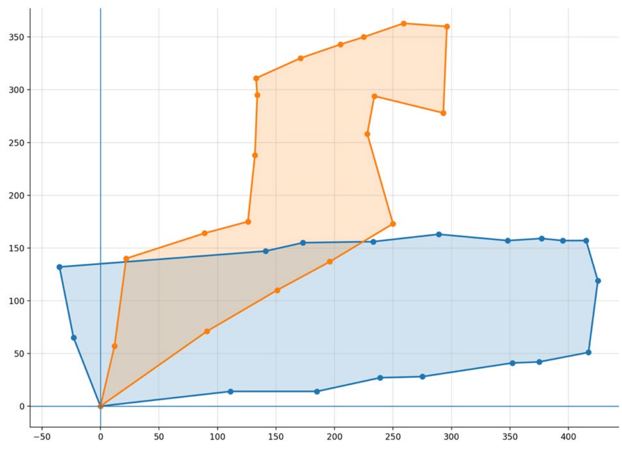

Figure 11. Shapes recreated using ChatGPT (5.4 PRO). In orange data from the 1567 register and in blue that from 1747.

That said, given the absence of a reference map and considering both the readability and the language of the text, which significantly limit the usability of the information it contains, the results of the test still prove to be useful. The geometry, although indicative, facilitates consultation of the document.

The most interesting aspect, considering the three-part set of documents available in Gandino, lies in the opportunities for comparison across different historical periods. Under particular conditions, such as the one described above, this makes it possible to develop reflections and further analyses related both to the political and economic dynamics of the time and to historical methods of measurement and cartographic representation.

4. Conclusions

The work presented in this paper proposes an interdisciplinary approach to the graphical translation of information contained in written archival documents through the use of AI, with the aim of supporting the valorisation of archival heritage.

The experience conducted on the specific case study, the 1747 “Calcato” of Gandino (with additional insights from the sixteenth-century version), first and foremost raised a number of directions for future work and further investigation. In particular, the central role of the prompt design and construction phase clearly emerged, an area that still offers considerable room for development, both in terms of tools and methodological approaches. Moving to aspects more directly related to the case study, a key issue concerns the management of shared boundary elements between areas, namely vertices and segments common to multiple polylines. Although the LLMs demonstrated a generally good ability to interpret the texts from this perspective, this remains a crucial point for the correct reconstruction of the territorial configuration of communal properties. Considering the data not only at the level of individual areas but in terms of the broader territory, it would also be highly valuable to further investigate the spatial placement of geometries. This is, of course, an extremely challenging issue, given the characteristics of the source text. However, the use of the toponyms contained therein could represent a promising key for experimentation in this direction, especially considering recent developments highlighted in the state-of-the-art analysis.

It should be noted that the nature and characteristics of the data contained in textual registers significantly influenced both the interpretation and the use of the results. The low precision of the reported measurements, particularly regarding the orientation of polyline vectors, did not allow for the development of fully rigorous computational and processing systems. As noted, the dataset exhibits a considerable degree of indeterminacy. The various visualizations obtained for the areas should therefore be understood as approximations of the actual geometries described by the properties in those centuries, representing one of the possible solutions to the underlying geometric problem. A series of field surveys is bringing to light the location of some of the “termini” that serve as vertices of the polylines. This activity is leading to their georeferencing, potentially establishing a connection between real-world elements and those represented in the map. This new dataset could significantly facilitate the AI-based recalculation of geometries, by providing additional information for the resolution of the geometric problem.

However, this should not be interpreted as a means of assigning metric accuracy to the graphical outputs, which cannot be used for strict quantitative analysis, but remain valuable for qualitative reasoning. However, the authors do not attribute lesser value to the experimentation or to the results obtained. On the contrary, the work proved to be effective: the proposed approach enabled a simpler and more immediate interpretation of the complex instructions contained in the chapters of the “Calcato”, thus positively addressing the initial research question. This is even more evident in the case of the 1567 document, which, due to its latin language and difficult readability, was particularly challenging to interpret and use.

More broadly, these findings highlight the importance of interdisciplinary approaches in fostering the use of archival documents and enhancing the value of the rich information they contain. The tests conducted show that even a streamlined and easily replicable approach based on LLMs can provide significant support in the fields of historical and territorial studies. Although still relatively underexplored, this research domain, and this combination (AI and historical textual documents), demonstrates considerable potential and offers wide scope for further development across a range of stimulating directions.

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