

# From the Hellenic peristyle to the monastic cloister: an architectural legacy traced through ontology

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## Abstract

The history of architecture is shaped not only by stones and structures but also by ideas that evolve, adapt, and are transmitted through time. This article offers an evolutionary reading of medieval monastic architecture, arguing that the cloister—the central element of conventual life—derives directly, both in form and function, from the peristyle of the Hellenic stoa house. This hypothesis is supported by an ontological analysis based on a comparative study of two emblematic case studies: the eastern and western cloisters of the Benedictine Monastery of San Nicolò l’Arena in Catania, and the Peristyle House 1 of Monte Iato in western Sicily. In this context, computational ontologies are not merely a classificatory tool, but rather an investigative method capable of reconstructing conceptual relationships between architectural elements distant in time.

## Keywords

Ontology, Architectural Heritage, Hellenic Peristyle, Monastic Cloister, Cultural Heritage, Semantic Web, Knowledge Representation, Digital Humanities

## 1. Introduction and related work

Architectural design decisions are hard to define, as they rely on complex expertise and memory associations. Research shows that creativity in this process requires references that help architects develop and strengthen design solutions [1] [2] [3] [4]. During the design process, memories, as objects and as rules, are subject to modification, enrichment, recombination, transformation, usage through analogy or metaphor and personal memories [5] or to a reorganization of knowledge [6]. One of the most interesting objects of architectural knowledge is the architectural type: a recognized codified model to discipline some shapes and functions with objective rules [7]. The architectural type has been chosen in the first place to apply the ontological approach, due to its semantic density and richness [3]. In this context, computational ontologies are thought of not only as a classification system but as an investigative tool that allows us to reconstruct conceptual connections between architectural elements separated by time. The chosen approach for the construction of this semantic map is grounded on a cross-analysis of functional data, such as specific uses of courtyards and porticoes, material

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data, such as construction techniques and materials employed, and spatial data that characterize the architectural artifacts we analyzed.

The ontological approach enabled the identification not only of formal analogies, but also of deeper similarities, related to intended use and symbolic spatial functions. The research is supported by an extensive literature review, including foundational works such as *Tra lava e mare*, edited by Branciforti and La Rosa [8], *L'architettura greca in Occidente nel III secolo a.C.* curated by Calìo and Des Courtils [9], and specific studies on the restoration of the Monastery of San Nicolò l'Arena, particularly the contributions of De Carlo [10]. From these sources, a nuanced vision of monastic architecture emerges as an idealized model shaped by the spiritual needs of monks, yet rooted in more ancient spatial archetypes. The notion of type used in architecture reminds the categorial notions on which ontological analysis rests, that is, the rigid distinction of entities in homogeneous classes that fix some of their properties as primary or essential, discussed since Vitruvius [11]. Martì Arìs [7] claims that an architectural type is a statement that describes a logical scheme, a formal structure. To understand this view, we need to think of types as abstractions built not just from the analysis of their (real and/or possible) instances but from the complex system of relationships among the context of architectural activity, the design that it produces, and the building that it realizes [3].

In previous works [12] [13] [14] Benedictine monasteries showed themselves to be interesting fields of investigation prototype for surveys into architectural types because of their 'density' in semantic layers that traveled over centuries, locations and functions.

The following comparative analysis highlighted striking analogies between the Greek peristyle and the Benedictine cloister; we could claim a kind of typological continuity, nevertheless applied to a different function. Grandinetti [15] concentrates on architectural types in ancient Greece, showing how these types were structured over time in Greece, then entered Roman architecture, and became part of the structure of urban morphology in the later Empire and Medieval period. In his analysis, he focuses on temples, telesterion, bouleuterion, stoa and gymnasia. In this perspective the stoa, the open Hellenic portico, is the nucleus from which the Greek peristyle and then the Roman peristyle also descends, quadrupling and converting to public and domestic use. The medieval cloister is the last link in this chain and shares with its predecessors the aesthetics and versatility. The stoa can be thought of as a space that is simultaneously public/open (stoa), closed/public (gymnasium) and closed/private (peristyle), often still in the portion of the house considered "public". This oscillation between public and private has also been found in its descendants analyzed in this article.

Both the peristyle and the cloister are structured around a central courtyard, surrounded by a colonnaded portico, and connected to functionally distributed spaces arranged with symmetry and order. While the peristyle was an integral part of the private house—intended for family life, meetings, and leisure—the cloister served a spiritual purpose, dedicated to meditation and prayer, as well as a physical connection. Nonetheless, both express the notion of a protected, inward-facing space of introspection. Particularly noteworthy is the two-storey configuration and the relationship between the covered galleries and adjacent living quarters, which reinforces the hypothesis of formal and functional continuity.

From a constructional perspective as well, a surprising degree of coherence is observed. The persistent use of columns, architraves, and porticoes to delineate and qualify spaces, reflects a transmission of technical knowledge as well as stylistic paradigms. The techniques used to

construct colonnaded spaces, together with the modular organization of spatial units, constitute a unifying thread across centuries of architectural practice—adapted over time to meet the values and needs of different societies, after the Romans’ advances in technology during the later centuries of the Roman Empire and the Middle Ages, the peristylum’s lines were realized with arches and vaults without losing their shapes or functions, but increasing their density and layering meanings and possible readings about them.

This shows that types are attraction points of structural regulations and formal milestones with a large number of varieties in their instantiations. They identify the parts that, according to their level of shape similarity, characterize the architectural typology and the urban morphology: something that connects the ancient Greek gym type to the monastery we know today. Monasteries that, in turn, later may have become schools, hospital, and so on [15] [3]. The cloister and peristyle house type is widespread and generalizable, precisely because of its spatial and functional characteristics that transcend the Sicilian context, in fact it finds confirmation in various contexts throughout the Mediterranean. This architectural type is found in many cultures and traditions. In Byzantine architecture, for example, we can recognize it in the cloister of Monreale in Sicily. In the Islamic context of the city of Yezd, the capital of Iran, traditional houses before the advent of modernism, featured porticoes as essential parts of the front courtyard. Porticoes, as a system of active sociocultural elements connected to form and space, are an integral part of the entire urban layout of the cities of Bologna in Italy and Burges in Belgium. [16]

These similarities make the Mediterranean not only an area of origin, but the center of a profound and transversal architectural narrative, spanning different eras and places, confirming the pervasive and symbolic power of this architectural type in the history of housing. Outside of this geographical context, Chinese architecture also adopts a similar layout in the siheyuan, the traditional Beijing home, composed of buildings arranged around a rectangular courtyard that serves as the hub of family life. Given this pervasiveness, we decided not to describe in our ontology exclusively cloisters and peristyles belonging to specific buildings, but to create classes to describe the cloister and peristyle as generic and abstract architectural types, with characteristics deriving from the analysis of architectural types in their specific variants.

During the development of this project, we took into account some cultural heritage ontologies, among them CulTO (Cultural Tools Ontology) [17], a semantic environment based on OWL, designed for architectural elements, decorations, documents, and images associated with sacred buildings, integrating them into an H-BIM model. We also considered the CARE Ontology [18], a CIDOC-CRM-based ontology in OWL, dedicated to historical Christian buildings, which—thanks to its level of granularity—enables the representation of structural details of medieval churches and monasteries, and the CRMba extension (CIDOC-CRM Built Archaeology) [19], an OWL/RDF ontology that encodes metadata for archaeological buildings, describing stratigraphic units and construction phases of ancient artifacts.

Unlike the ontologies mentioned above, BCloister serves as an interpretative and comparative tool, rather than solely a classificatory or descriptive/documentary model. We developed an ontology that helps us to delineate a genuine architectural genealogy, in which the medieval cloister no longer appears as an autonomous invention, but rather as an erudite and spiritual reinterpretation of the Greek domestic model. From this perspective, the peristyle is not only a structural precursor but also a conceptual reference that inspired and shaped the design of

monastic spaces.

## 2. BCloister ontology Description

Our ontology consists of 226 classes, 55 object properties, about 1.701 axioms (1166 of which are logical axioms), more of 67 data properties and about 150 individuals.

### 2.1. Classes

The two cloisters and the peristyle were modeled within the same OWL 2 ontology <sup>1</sup> in order to define specific object properties and semantic relationships that could highlight their analogies. We used the CIDOC standard for some classes to make our ontology easily interoperable and reusable. To this end, representative categories were established as general hierarchical classes, abstracting the essential aspects of both architectural configurations. The class CIDOC-CRM E18 Physical thing has subclass E24 Physical human made thing, from where depends our subclass Building, includes two subclasses: Monastery, which refers to a generic monastic complex, and Peristyle\_House, referring to a generic peristyle-type house. At a deeper level of granularity, the individuals SanNicoloMonastery and House1\_Mount\_lato refer to the specific examples analyzed in the case study. The class Space falls within the same classes and contains the architectural areas of a Benedictine monastery and of a peristyle-type house suitable to establish analogies and similarities among the architectural types of cloister and peristyle, and their surrounding functional spaces.

A first analogy between a cloister and a peristyle, is that they are bordered by similar types of spatial units: The refectory adjacent to the cloister is functionally analogous to the triclinium in the peristyle complex; The library corresponds functionally to the tablinum; The dormitory aligns with the cubicula.

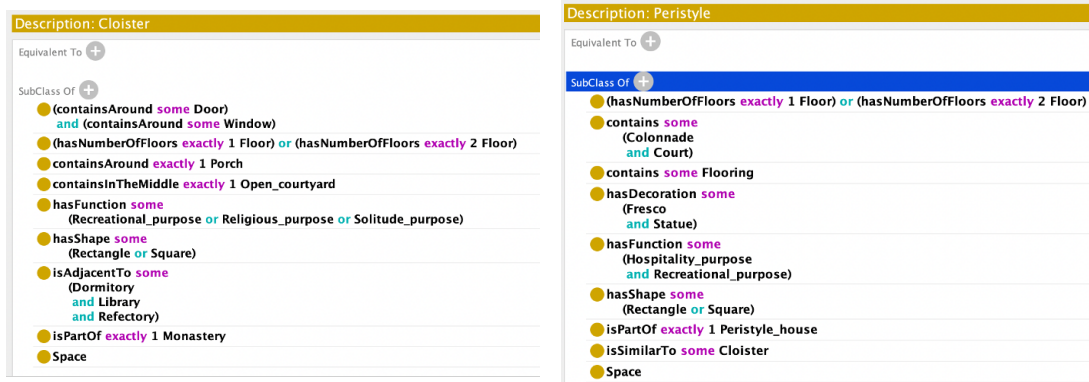
By "similar spaces", we refer to areas that share equivalent usage patterns, support comparable functional activities, and engage in analogous spatial relationships with either the cloister or the peristyle. These spatial relationships were modeled using the object property *IsAdjacentTo*, a subclass of CIDOC-CRM P122 borders with, which semantically encodes spatial adjacency between architectural units.

Continuity in religious usage is documented through the presence of votive statues or *lararia* in Roman peristyles, which inherited the structural and stylistic forms of the Greek stoa, thereby contributing to the transmission of the colonnaded courtyard typology into the modern age (see bibliography: Muratori [20], Caniggia [21], Martí Arís [7], Grandinetti [15]).

Recreational and meditative uses are also found to coexist within both architectural forms, intrinsically tied to the nature of the portico as an enclosed open space within a private building. Such spaces could, when necessary, be opened to visitors and employed for representational purposes, while still providing secluded access to a fully private garden for the inhabitants. Actually, this architectural type is also suitable for commercial uses; just think that the external part of the Greek stoa was used as a place of trade while the internal part was used as a warehouse.

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<sup>1</sup><https://github.com/IDiMauro19/BCloister>



**Figure 1:** Comparative analysis framework taken from our ontology BCloister

Further analogies between the open courtyard of the cloister and the Hellenic hortus are observable in the presence of fountains, small temples, and paved surfaces. These semantic similarities have been captured using the custom object property `IsSimilarTo`, subclass of CIDOC-CRM P130 shows features of, specifically created to trace overlapping features in the ontological descriptions of architectural types.

Within the Space class, a specific subclass named Cloister has been defined to describe the architectural typology of the generic cloister (as shown in Figure 1). This is understood as an abstract model encompassing all architectural elements that are commonly found in Benedictine cloisters. The cloister is subdivided into two clearly identifiable sections: a Porch (portico) and an Open\_Courtyard, both described through dedicated subclasses. For this purpose, two custom object properties were created: `containsAround`, which links the cloister to its surrounding portico, and `containsInTheMiddle`, which links it to the central courtyard.

The cloister may exhibit either a rectangular or square layout and can fulfill one or more of the following purposes: `Recreational_purpose`, `Religious_purpose`, or `Solitude_purpose`. Both the Open\_Courtyard and the Porch were further described through dedicated subclasses.

Specifically, the subclass Porch, models a generic portico composed of four covered corridors, arches, columns, and vaulted ceilings. It closely resembles the Colonnade element found in the stoa-type house. Two individuals (instances) were also created: `L_Porch` and `P_Porch`, which refer respectively to the eastern and western porticoes.

The semantic declaration of similarity between the cloister and the peristyle is based on the structural and functional parallelism identified between their constituent elements: namely, Colonnade and Court for the peristyle, and Porch and Open\_Courtyard for the cloister.

Both structures exhibit a large open central courtyard and are enclosed by a covered two-storey colonnade. The property `hasPart` was introduced to semantically link these two fundamental architectural components common to both the cloister and the peristyle.

Each of the four sides of the Porch contains doors and windows that lead to adjacent functional spaces, mirroring the configuration found in the stoa and peristyle.

From this point onward, the ontology proceeds with increasingly fine-grained modeling: any Architectural\_feature that exhibits aesthetic or functional characteristics analogous to its counterpart will be semantically linked through the object property `isSimilarTo`.

The Porch consists of four instances of *Covered\_Corridor*, a subclass of *Corridor*, included within the *Architectural\_feature* class. It also contains a set of arches, columns, and vaulted ceilings. The Porch is defined as a part of the Cloister. The object property *ConsistOf* was used to formally express the essential constituent components of an architectural space.

The *Open\_Courtyard* includes features such as rainwater collection cisterns, paved surfaces, fountains, and small temples, that reflect its religious function. It may also incorporate garden elements used for decorative purposes, such as flowers, hedges, and trees. The similarity of individual architectural components belonging either to the peristyle or to the cloister implies a broader structural similarity, thereby establishing a strong correlation between the cloister and the stoa-type house.

The *Architectural\_feature* class contains architectural elements organized into generic hierarchical subclasses, with more specific typologies corresponding to the various spatial entities described. The prefix *gf* is used to designate features located on the ground floor, whereas *f1* refers to those on the first floor. The acronyms *L*, *P*, and *MIP* are used to indicate the eastern (Levante), western (Ponente), and Monte Iato house instances, respectively, accompanied by numeric suffixes to differentiate among multiple instances of the same element type.

Within the *Column\_order* class, subclasses have been defined to specify the architectural orders of the various colonnades: Doric, Ionic, and Tuscan.

The *Decorative\_element* class, a subclass of CIDOC-CRM E18 Physical Thing, includes naturalistic garden compositions, statues, and wall decorations. The *Shape* class comprises the morphological forms of various architectural elements, and a consistent method has been applied in the definition of its subclasses.

The *Direction*, subclass of CIDOC-CRM E53 Place and Size, subclass of E54 Dimension, classes contain subclasses describing, respectively, the four cardinal points—used for spatial orientation of elements—and the size attributes (*Big*, *Small*) employed to achieve a more accurate and functional spatial description.

The *Use* class, subclass of E17 Type Assignment, defines the various purposes that justify the existence of specific elements within the cloister and the peristyle. Based on the presence of particular architectural features that condition their function, an additional correlation between the two spaces has emerged, traced through the property *hasFunction*, subproperty of the CIDOC-CRM P19 was intended use of. In cloisters that include small temples and statues—similarly to the peristyle—the associated purposes are religious and contemplative (*Religious\_purpose*, *Solitude\_purpose*). In the peristyle, the presence of a fountain was common and served primarily for refreshment. This architectural element was inherited by the cloisters, where it assumed a deeper symbolic meaning: water, originally a means of physical refreshment, became a representation of spiritual life, in accordance with Christian principles in which it symbolizes purification and rebirth.

Some areas of the cloister were used by monks for reading and study, often equipped with lecterns, in a way that is analogous to the portion of the Court adjacent to the Tablinum in the peristyle, which was employed for work-related activities. *Recreational\_purpose* and *Hospitality\_purpose* are associated with those areas of both the cloister and the peristyle that are located near the entrance, typically furnished with spaces for refreshment or for hosting guests and offering beverages or food.

In designing the presented ontology, a modeling strategy based on the predominant use of

individuals rather than an extensive class hierarchy was adopted. This decision was motivated by considerations of efficiency, model lightness, and domain-specific application needs—particularly within the context of architectural and art-historical documentation.

The ontology was conceived primarily as a descriptive and annotative tool, rather than as a model aimed at intensive logical reasoning. In this framework, individuals serve as unique instances of real or documented elements, making them particularly suitable for representing specific places, historical figures, or concrete architectural details.

These semantic relations allow for the virtual or conceptual reconstruction of complex architectural environments, starting from discrete, singular instances. The adopted approach aligns with a bottom-up logic, wherein conceptual structures emerge from the observation and description of tangible, documented elements. Nonetheless, this systematic and granular strategy also allows for the integration of specific individuals into broader generic classes. Within this context, object properties play a critical role, as they define semantic relationships between complex objects, thereby enabling inference and targeted querying.

## **2.2. Categorization of Object Properties by Functional Domain**

### **Structural and Compositional Relationships**

- **hasPart, isPartOf:** model mereological (part-whole) relationships.
- **hasDecoration, hasAccess, hasFunction, hasDimension, hasNumberOfFloors, hasShape:** complex attributive relationships linking an entity to its functional or structural components.
- **contains, isContainedIn, hosts:** express physical or functional containment between spaces or architectural elements.
- **builtBy, isMadeWith, isSustainedBy:** describe relationships between architectural objects and their agents or materials.

### **Spatial Relationships**

- **isAbove, isUnder, isInFrontOf, isAdjacentTo, isContiguousTo, isSeparatedBy, onEastOf, onWestOf, onNorthOf, onSouthOf:** describe relative spatial positions among architectural or spatial elements.
- **connects, looksUp, projected, projectedBy:** express topological, visual, or design-based relationships.

### **Conceptual or Semantic Relationships**

- **decorates, represents, isSimilarTo, separates, isDelimitedBy:** define symbolic, functional, or visual associations.

## **3. The Eastern and Western Cloisters**

Following an initial general study aimed at identifying and describing the core architectural elements of the "typical" cloister, our work progressively focused on an in-depth analysis of

the Eastern and Western cloisters of the Benedictine Monastery. Each cloister was mapped in detail, with the objective of systematically documenting their structural, functional, and material specificities.

A unique feature of the Benedictine complex is the coexistence of two cloisters, constructed in different periods and intended for distinct uses. This temporal and functional differentiation allowed us to explore the concept of typological continuity at the highest level of detail. Architectural elements, paving materials, decorative components, and the functional distribution of spaces were analyzed.

A central aspect of our investigation was the recognition of the diachronic and stratified nature of the entire Benedictine complex. The monastery underwent numerous construction phases and transformations, caused by both catastrophic events (e.g., earthquakes and lava flows) and evolving cultural or functional requirements. This diachronic approach was integrated into our ontological model, particularly through the association with the class *Person*, which includes agents—architects, monks, patrons—who played a documented role in the construction or renovation of the cloisters. These associations were formalized using the object properties *builtBy* and *projectedBy*.

We introduced the properties *containsOnNorth*, *containsOnSouth*, *containsOnWest*, and *containsOnEast* to locate each element within the built environment, according to cardinal orientation. These properties enabled us to semantically anchor each component—such as windows, doors, columns, or pavements—to its physical position, thus supporting a structurally coherent reading of the space.

From an ontological standpoint, these object properties were defined as transitive and inverse. Specific attributes (e.g., *north\_window\_number*) were thus introduced, allowing us not only to precisely count the elements present on each side, but also to describe any distinctive characteristics. In several cases, windows and access doors exhibited unique features linked to their position—such as variations in decoration, size, or function—necessitating explicit semantic differentiation.

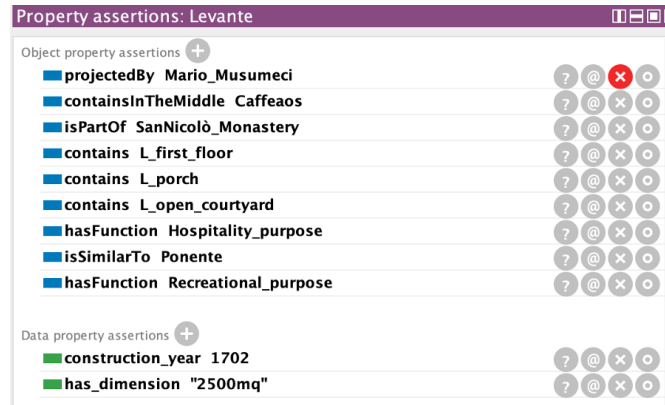
### 3.1. Western Cloister

We chose to model the Western cloister in its original configuration, prior to both the 1669 lava flow and the 1693 earthquake.

The Western cloister, also referred to as the *Cloister of the Marbles* or *Cloister of the Oranges*, is the older of the two and was built on the ruins of a preexisting structure. Traces of the 16th-century foundations are still visible in the basement areas. Unlike the other cloister, it originally did not host a garden but featured a monumental pavement of cobblestones and lava stone, remnants of which are still visible beneath the current surface. At the center remains the large 17th-century marble fountain.

The porticoes on the sides are supported by white marble columns, also from the 17th century, and part of the original construction, though reassembled in the 18th century. The ground floor includes the following spaces:

- The Porch, adjacent to the Dormitory—composed of several monks' cells and the abbot's room—as well as the Library (where lecterns were likely placed for study) and the Refectory,



**Figure 2:** Eastern cloister ontological model taken from our ontology BCloister

- An Open\_Courtyard .

The second level of the Western Cloister was built (1612–1638) with hexagonal terracotta paving by Domenico Lusitano. After the 1669 Etna eruption and the 1693 earthquake, reconstruction added a marble fountain and colonnade, the only surviving elements of the original cloister.

In 1669, following the eruption of Mount Etna, the resulting lava flow reached the Monastery, surrounding and destroying several of its structures. At this point, the Benedictine community initiated an extensive reconstruction and completion project. The quadrilobed marble fountain and the colonnade are the only architectural elements that survived from the cloister destroyed in the 1693 earthquake.

### 3.2. Eastern Cloister

In 1702, the construction contract for the eastern wing of the monastery was awarded. The cloister is occupied by a dense garden, entirely surrounded by arcaded porticoes supported by pillars and full-centre arches, surmounted by a continuous terrace.

In the 19th century, the engineer Mario Musumeci was entrusted with the completion works of the cloister. He constructed new porticoes on the remaining three sides, replicating the design of the original structure, redesigned the gardens, and added a central neo-Gothic *Caffeaos*, decorated with multicolored majolica tiles. This evocative site presents itself as a true garden, enriched by a variety of plant species. The construction of the building dates back to 1842.

Figure 2 shows how the Eastern Cloister ontological model is described in the ontology BCloister. The Eastern Cloister was mapped through its constituent parts – L\_first\_floor, L\_porch, and L\_open\_courtyard – using the contains object property.

### 3.3. Reasoning Rules

To enhance the system’s capability to retrieve and semantically classify complex architectural information, we deemed it useful to define a set of declarative rules. These SWRL rules serve to

automate the categorization of architectural elements based on their structural components, thereby overcoming the expressiveness limitations of OWL alone. This hybrid modeling strategy enables richer knowledge representation within the architectural domain, supporting logic-based inference and advanced querying capabilities.

**Rule 1:**  $\text{hasPart}(?x, ?a) \wedge \text{Arch}(?a) \wedge \text{hasPart}(?x, ?c) \wedge \text{Column}(?c) \wedge \text{hasPart}(?x, ?v) \wedge \text{Vault}(?v) \rightarrow \text{Porch}(?x)$

This rule enables automated identification of porches as complex architectural entities composed of arches, columns, and vaults—useful for inferring typological patterns.

**Rule 2:**  $\text{hasPart}(?x, ?a) \wedge \text{Arch}(?a) \wedge \text{hasPart}(?x, ?c) \wedge \text{Column}(?c) \wedge \text{hasPart}(?x, ?v) \wedge \text{Vault}(?v) \rightarrow \text{Colonnade}(?x)$

This rule enables automated identification of colonnades as complex architectural entities composed of arches, columns, and vaults—useful for inferring typological patterns.

**Rule 3:**  $\text{hasPart}(?x, ?c) \wedge \text{Court}(?c) \wedge \text{hasPart}(?x, ?col) \wedge \text{Colonnade}(?col) \rightarrow \text{Peristyle}(?x)$

This rule allows the system to identify Peristyles as a distinct subclass of courtyard—those enclosed by a colonnade—typical of classical architecture.

**Rule 4:**  $\text{hasPart}(?x, ?c) \wedge \text{Open\_courtyard}(?c) \wedge \text{hasPart}(?x, ?col) \wedge \text{Porch}(?col) \rightarrow \text{Cloister}(?x)$

Analogously to Rule 3, this axiom infers that an entity is a Cloister if its components are an open courtyard and a porch.

## 4. The Peristyle House of Monte Iato

The aristocratic residence, dated to ca. 300 BCE, consisted of two floors. The peristyle was located immediately after the entrance hall and included a secondary access point. It was also spatially connected to several rooms that opened directly onto it.

Archaeological excavations of the peristyle courtyard revealed several standing column shafts. Many of the architectural elements were carved from local limestone, executed with meticulous detail, and displayed both Doric and Ionic orders.

The peristyle colonnade extended over two floors, with four columns per side on both the ground and upper levels. On the south and west sides of the upper floor, actual columns were absent; instead, their presence was simulated through stucco decorations.

The upper-level portico was paved with *cocciopesto* (a waterproof opus signinum flooring) and bounded by balustrades, while the courtyard area was equipped with stone paving.

The reception rooms of the house were located on the north side of the peristyle, while the lateral rooms served as banquet halls and bedrooms—functionally analogous to those in the monastic complex. The western wing included the *bath area* and its adjacent service spaces. The floor plan of the upper level mirrored that of the ground floor, allowing for structural and spatial correspondence across levels, as shown in Figure 3.

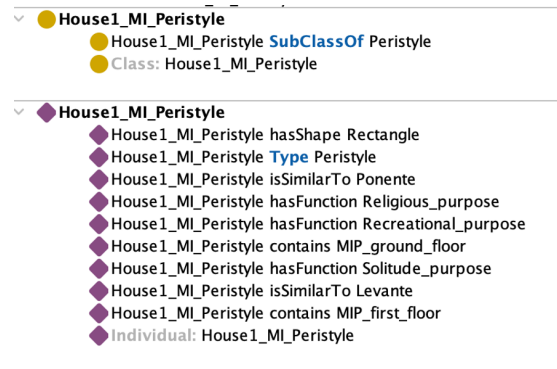


Figure 3: Monte Iato ontological model taken from our ontology BCloister

## 5. Conclusions

The work carried out demonstrates that the language of architecture is never static, but inherently dynamic: a code that traverses epochs, cultures, and functions—capable of both preserving and renewing itself. The identification of recurring patterns in Benedictine monasteries, rooted in the Rule of Saint Benedict, confirms the tendency toward the formalization of an "ideal space" for communal and contemplative life.

The cloister—beating heart of the monastery—thus emerges as both the spiritual and material heir of the Hellenic peristyle: an architectural bridge connecting the ethics of the Greek house with the mysticism of Christian silence. Through ontological analysis, we have demonstrated that architectural typologies are not isolated phenomena but rather part of a continuous cultural transmission that adapts ancient spatial concepts to new spiritual and functional requirements.

This research contributes to the broader understanding of how digital humanities tools, particularly ontologies, can reveal hidden connections in architectural heritage, providing new perspectives on the evolution of built environments across different civilizations and epochs. The methodological approach presented here demonstrates the potential of ontological modeling as a tool for comparative architectural analysis. By creating formal semantic relationships between architectural elements, we have shown how digital tools can support and enhance traditional art historical methodologies. The ontology serves not only as a database, but as an interpretative framework that allows researchers to discover previously unrecognized patterns and connections across different historical periods and geographical contexts. The detailed modeling of the Benedictine cloisters and the Hellenic peristyle house creates a reusable knowledge base that can be extended to include other architectural typologies and historical periods. The use of reasoning rules within the ontological framework has proven particularly valuable for automating the identification of architectural patterns and relationships. The ability to automatically infer relationships based on structural components provides a powerful tool for large-scale comparative studies of architectural heritage.

## Declaration on Generative AI

The authors declare that no generative Artificial Intelligence tools were used in the writing, editing, or translation of this paper.

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