

Describing Monastic Iconography Using Semantic Data: A Preliminary Investigation

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ABSTRACT (ENGLISH)

In recent years, significant developments have occurred in the Digital Humanities field in the analysis of artworks' iconography. Nevertheless, these studies often fall short of historians' specialised research, such as the studies about monastic iconography, which reconstructs the parallelism with hagiographies (i.e., texts describing the saints' lives), and their visual representation. Key moments in a saint's life described in hagiographies, namely hagiographic models, often reappear visually, indicating a complex reuse of models. Furthermore, saints' representations also show common visual patterns. A thorough description of the phenomena through semantic web tools would allow us to computationally trace the influences of visual and textual models in monastic culture. The current work examines how existing ontologies for art description, specifically ICON, can represent these aspects. Using St. Romuald's life as a case study, the findings show that while ICON covers many necessary features, additional extensions are needed to depict hagiographic models and the specific event typologies they illustrate. Future work will formalise these extensions and enrich them through literature that defines hagiographic models.

Keywords: Iconography; Hagiographic studies; Monastic culture; Semantic Web; Ontologies

ABSTRACT (ITALIANO)

Descrivere l'iconografia monastica attraverso dati semantici: un'indagine preliminare

Recenti sviluppi nel campo delle Digital Humanities riguardano l'analisi computazionale delle opere d'arte visiva e delle iconografie. Tuttavia, alcuni filoni specialistici della ricerca storico-artistica richiedono ulteriori approfondimenti. Tra questi, alcuni studi sull'iconografia di ambito monastico si concentrano sul collegamento tra testi agiografici (narrazioni sulla vita dei santi) e la loro rappresentazione visiva. In questo contesto, i momenti chiave della vita del santo descritti nei testi, noti come modelli agiografici, spesso ricompaiono visivamente, così che l'intricato riutilizzo di modelli presenti nella tradizione testuale agiografica di diversi santi si riflette nell'iconografia. Inoltre, ulteriori relazioni sono fornite dalla ricorrenza di prototipi visivi. Il presente lavoro esamina come le ontologie esistenti per la descrizione storico-artistica, in particolare ICON, possano rappresentare questi aspetti. Utilizzando la vita di San Romualdo come caso di studio, i risultati mostrano che, mentre ICON può descrivere la maggior parte delle caratteristiche del dominio, sono necessarie ulteriori estensioni per rappresentare i modelli agiografici e le specifiche tipologie di eventi che illustrano. Futuri sviluppi della presente indagine includeranno la formalizzazione di queste estensioni e l'arricchimento attraverso la letteratura che definisce i modelli agiografici.

Parole chiave: Iconografia; Studi agiografici; Monachesimo; Web semantico; Ontologie

1. INTRODUCTION¹

In recent years, significant developments have occurred in the Digital Humanities field concerning the computational analysis of artwork iconography, as shown by the long-standing relevance of controlled vocabularies and by the more recent advancements in ontologies, Knowledge graphs, databases, and studies in computer vision for iconography detection.

Nevertheless, these resources often struggle to meet the requirements of art historians' specialised research. Among them, the studies in monastic iconography hinder a complexity going beyond the identification of a depicted saint in a visual work (e.g., a bearded man with the pastoral staff, chalice, book, and crow shows St. Benedict). Latin Hagiographies, namely, the descriptions of saints' lives, have a complex textual tradition in which narrative models of monastic life, traceable back to the Eastern world, shaped not only the dictates of the various monastic orders but also the visual depiction of the saints (Delcorno, 1991). Formally expressing such aspects in a semantic model would advance art-historical research by recognising mutual influences between common events characterising the saints' *vitae* and the variants in their visual representation.

¹ The authors contributed to the paper as it follows. Francesco is responsible for Sections 2 and 5.1. Sofia Baroncini is responsible for Sections 1, 3 and 7. Both authors are responsible for Sections 4, 5.2, and 6.

To the best of the authors' knowledge, no studies related to the hagiographic domain explore it through the lens of the semantic web. The current study aims to address the formalization of the hagiographic domain to support a structured methodological approach. In this paper, we examine whether existing ontologies allow the representation of the field's core questions to identify the existing gaps and propose a first modelling attempt. Therefore, the research questions we address are: 1) Can semantic web technologies aid art historians in detecting and examining the parallels existing between a saint's iconography and the narrative *topoi* present in hagiographical sources? 2) Do existing tools allow us to represent the core characteristics of hagiographical research? 3) How can we integrate current ontologies to better cover domain characteristics?

The study focuses on the case study of the depiction of St. Romuald, the founder of the Camaldolese order, and his relations with Pier Damiani's *Vita Beati Romualdi* (1042), a saint's hagiographical source presenting some narrative *topoi* (from *Vitae Patrum* literature). This focus was chosen because the life of Saint Romuald, a work of significant literary importance, exemplifies the role of hagiography in shaping monastic ideals based on earlier (eastern) models. After an examination of the literature, we selected for the description of the case study the ICON ontology (Sartini et al., 2023), as it offers the highest level of detail and is domain-specific.

2. RELATED WORKS

2.1. Digital humanities and iconography

The growing interest in saints' iconography has led to projects focused on creating machine-readable data for analyzing it through various approaches² (Impett, 2020; Milani & Fraternali, 2021).

The digital edition of the "Index Lexicon der Christlichen Ikonographie" (LCI)³ focus on Christian iconography, especially on saints. The Iconclass classification system⁴ standardizes and describes (western) visual content through hierarchical notation. Similarly, Getty's Iconography Authority⁵ enhances classification by defining relationships between iconographic narratives, allowing users to specify sources and facilitating accurate analysis.

While these tools help scholars describe artwork content, they fall short in addressing more complex relationships between parts of the iconography and reference sources. These tasks can be better described through ontologies. The VIR ontology (Carboni & de Luca, 2019) extends the CIDOC-CRM (CIDOC Conceptual Reference Model) (Bekiari et al., 2021) to support the recording of relationships and structural units in visual representations. It effectively describes connections between iconographical objects, their attributes, and prototypical objects in a visual source. The ICON ontology (Sartini et al., 2023), developed from Panofsky's theoretical framework, enables a semantic detailed description of artworks subjects and meanings, along with information about (textual) sources and the provenance of the interpretation. Among knowledge graphs, IICONGRAPH (Sartini, 2024) describes through ICON art-related statements re-engineered from ArCo (Veninata, 2020) and Wikidata (Vrandečić & Krötzsch, 2014). However, the limited amount of information it includes concerning the lives of saints restricts its effectiveness for research about saints' iconography. The Iconology Dataset (Baroncini, 2024), which describes through ICON a selection of interpretations by Erwin Panofsky, contains some granular descriptions of visual representations of Saint's iconography. Relevant is also HyperReal (Sartini et al., 2021), a knowledge graph describing symbols and symbolic meanings that includes descriptions of symbols of the Western Christian tradition.

The models and vocabularies discussed are valuable resources for classifying and describing the iconographic content of artworks related to saints. However, the role of texts and narrative models in the interpretation process (e.g., hagiographic text needed for understanding iconographic variants) is not addressed in detail.

2.2. Monastic Hagiography and Iconography

Research on monastic sanctity holds a significant place within the field of hagiographical studies (defined here as writings about saints and their cults; Chiapparini & Rochini, 2022; Leonardi, 2011; Rigo et al., 2018). In translating, adapting, and reinterpreting texts from Late Antiquity to the Middle Ages, various

² The various approaches involved include, but are not limited to: deep learning, network analysis, automatic recognition. https://datavirgo.huma-num.fr/a_propos.html (last consulted: 19/01/2025).

³ <https://brill.com/display/db/lcio> (last consulted: 19/01/2025).

⁴ <https://iconclass.org/> (last consulted: 19/01/2025).

⁵ <https://www.getty.edu/research/tools/vocabularies/index.html> (last consulted: 19/01/2025).

topoi related to monastic asceticism, which originated in Egypt and Syria before entering the medieval Latin world, were used by Latin authors to define new models of monasticism (Constantinou & Høgel, 2020; Wiśniewski, 2020).

Writers shaped these themes to meet their time's narrative, doctrinal, social, and devotional needs. This is especially evident in hermit holiness, which experienced a revival in the West within the 11th and 13th centuries (Wiśniewski, 2020), well exemplified by the figure and hagiography of Saint Romuald (Bannister, 2011). The concept of hagiographic *topoi* is the central theme of Thomas Pratsch's extensive study (Pratsch, 2012). This work aims to provide resources for identifying historical information in Byzantine hagiography and serves as a reference for recognizing these *topoi*, providing a systematic framework useful for classifying and interpreting Byzantine subjects in visual representations.

The collective work "Agiographie und Kunst" (Kerscher, 1993) highlights the importance of narrative and conceptual frameworks derived from hagiography and formalised in *topoi*, which serve as "interpretative models" (Kerscher, 1993) that can be also used as a lens for analysing visual representations.

The current research focuses on the sole visual representation of *hagiographic models* in saint's iconography, intending to understand how the textual tradition affects the visual arts. Although scholars use various terms to describe the *topoi* that characterise much of the hagiographic narrative (Pratsch, 2012; Kerscher, 1993), we adopt the term "hagiographic model" based on its prevalent usage in the literature (Del Corno, 1988; Degl'Innocenti, 1984; Leonardi, 1991; Petrus Damiani, 1957).

3. THE ICON ONTOLOGY

The ICON ontology describes interpretations of artwork content and meaning on three levels of understanding, from a more superficial one, in which simple objects, actions, and emotions can be recognized, to a deeper one, in which deep concepts and meanings are identified (e.g., the message of "wedding wish" that the artwork is supposed to give). Each subject is recognized through an icon:Recognition, and the overall interpretation is given by a collection of Recognitions (icon:InterpretationDescription). A key aspect of the ontology is that each recognition identifies the specific subject as manifested in the artwork (e.g., Venus with floating hair as it appears in Botticelli's painting *The birth of Venus*), identified by the class icon:VisualSubject and its subclasses at each level (icon:ArtisticMotif, icon:Image, icon:IntrinsicMeaning), which is then related to generic subjects, as they can be described by vocabularies (e.g., the ICONCLASS code for Venus), identified at each level by further subclasses (*Action*, *NaturalElement*, *ExpressionalMeaning* for level 1; *Character*, *Event*, *NamedObject*, *Personification*, *Symbol*, *Story*, *Allegory* at level 2; *CulturalPhenomenon* and *SocialObject* at level 3). Relations among the Visual Subjects allow us to describe their appearance and meaning as they occur in the artwork analysed. For example, a Composition collecting the Artistic Motifs associated with the concepts *woman*, *fluttering hair*, *shell*, and *standing* (lev. 1), can be related to an Image (Venus as it appears in the painting), related to the icon:Character "Venus" (iconclass:92C4) and to the icon:Story "birth of Venus" (iconclass:92C411). In this way, it is possible to retrieve the specific appearance of the subject in the painting, knowing the pose, qualities, and, if present, further meanings of Venus, and, at the same time, retrieve all the artworks presenting the general subjects (e.g., the Character *Venus*, the Action *standing*, etc.). Furthermore, the reuse of relations from the CiTO ontology (Shotton, 2010) allows expressing the (textual) source used by the interpreter for making the recognition⁶.

4. APPROACH

To the aim of verifying whether the available vocabularies and ontologies can be reused to describe the characteristics of hagiographical studies, we first define the requirements of the intended domain. Secondly, we verify whether the ICON ontology can fulfill such requirements through the aid of the description of the representative case study of St. Romuald. Finally, we provide some suggestions for possible extensions.

From examining the characteristics of the hagiographic models identified in the literature, and with the aid of the chosen case study, an (ontological) model for the study of iconography through the lenses of hagiography should be able to represent: 1) the hagiographic model (e.g., "Conversion") visually rendered in a work of art, 2) the relation with the source, 3) visual variants of the same model in different saints' *vitae*, 4) details of the scene that are meaningful for the narration (e.g., the presence of "Sign of

⁶ Further details about the ontology are provided at: <https://w3id.org/icon/docs/>

sanctity"). We evaluate the coverage of these aspects by the ICON ontology, chosen as it offers the highest level of detail and is domain-specific.

As mentioned in section 2.2, reinterpreting the Lives of the first monk saints of Late Antiquity, particularly in (hermitic) sanctity narratives in the Latin West, involves reusing and adapting narrative modules. This is especially evident in hermit asceticism, which experienced a revival in the West during the 11th and 12th centuries (Dijk & Dijkstra, 2006). As the life of St. Romuald exemplifies such characteristics, it is chosen as a case study in this contribution. Therefore, we select one representative iconography depicting a meaningful moment of St. Romuald's *vitae* as a test case.

5. CASE STUDY

5.1 Description

The chosen case study is a print depicting St. Romuald's conversion. It illustrates the second chapter of Pier Damiani's *Vita Beati Romualdi* (Petrus Damiani, 1957), written in 1043, and is part of the printed series "Vita et Acta:SS:mi Patris et Patriarcha Romvaldi (...)" published in Vienna in 1726⁷. This case study represents the hagiographic model of conversion, a common theme in saints' lives (see the *Vitae Patrum* and the *Historia Monachorum*; Del Corno, 1991; Rufinus & Schulz-Flügel, 1990). The scene is set in the monastery of Sant'Apollinare in Classe, where Romualdo decides to become a monk after witnessing an apparition of the martyr saint. The print shows Romuald and another monk kneeling before Saint Apollinaris, who emerges from under the altar dedicated to the Virgin Mary and incenses the church with a thurible.

An exemplary parallel of the same hagiographic model is the conversion of St. Anthony. The iconography depicted in a 1372 fresco by the Florentine artist Niccolò di Tommaso and others, located in Pistoia at Museo Marino Marini (Fig. 2), illustrates the episode in which the saint experiences his conversion while listening to the sacred scriptures in a small church (Athanasius Alexandrinus, 1974). Above the altar, a triptych featuring the Virgin Mary in the central compartment.

The two art pieces depicting the conversions of St. Romuald and St. Anthony share common visual elements, specifically the setting and the representation of the Virgin Mary as both a statue and a painting. These different portrayals highlight our approach's potential in addressing research questions regarding typological patterns related to the connection between hagiography and iconography.



Figure 1. St.Apollinaris appears to St.Romuald (detail)⁸ Figure 2. St. Anthony Listen to the Gospel passage⁹

5.2 Formal representation

In this paper, we provide a formal representation of the St. Romuald case study, focusing on the description of the main entity within the iconographic subjects with the ICON ontology (see Section 3). For the sake of brevity, we listed the items that could be described in the case study in Table 1.

⁷ Vita et Acta:SS:mi Patris et Patriarcha Romvaldi (...), Vienna, 1726, Biblioteca Classense, 40.5.N.

⁸ Courtesy of the Biblioteca Classense.

⁹ Image 2 published under a, CC BY 3.0 license (author:Sailko), available at: https://commons.wikimedia.org/wiki/File:Niccol%C3%B2_di_tommaso_e_antonio_vite,_affreschi_dell%27oratorio_del_tau,_post_1372,_storie_di_s._antonio_01.jpg#metadata

	Class/relation		Instances
	Specific subject	General subject	
Lev 1	Artistic Motif or Composition	Natural Element	(1) kneeling man with joined hands; (2) church; (3) statue; (4) bearded man; (5) thurible; (6) kneeling monk with joined hands
		Action	(7) incensing the church; (8) pray while kneeling
		Quality	(1) youthful age
Lev 2	Image	Character	St. Romuald (1), Iconclass:11H(ROMUALD), St.Apollinaris (4)
		Event	St. Apollinaris appears to St.Romuald
		Place	St.Apollinaris Church (2)
		Named Object	Virgin altarpiece (3)
		Story	Story of St.Apollinaris who appears to St.Romuald
		cites for information	Vita Beati Romualdi, ch. 2

Table 1. Main entities relevant in the description of St.Apollinaris appears to St.Romuald

As we see in Table 1 and Figure 1, the majority of the identified traits of St. Romuald's depiction can be described with ICON ontology. Among the various significant iconographic entities, the class icon:Place allows the description of the location where the event occurs, and the class icon:NamedObject describes the presence of the simulacrum of the Virgin as a meaningful detail of the narrative. Furthermore, the property cito:citesForInformation enables the linkage of the depicted scene to its textual source of reference. At the first level, the class icon:Action provides for the description of the actions of specific characters as a visual counterpart to the iconographic representation of St. Anthony. The numbers associated with the instances indicate the relationships among the specific subjects (i.e., Images, Artistic Motifs, Compositions) recognized at the levels of the description. The artwork depicting St. Anthony can be described in a similar way,¹⁰ highlighting the presence of the setting (a church) and Mary's altarpiece, features that are in common with the previous artwork.

Nevertheless, the ICON ontology presents some limits when representing core features of hagiography. Whereas the class icon:Event allows the description of every event, therefore including moments of the saint's life, a hagiographical analysis would require that such events are recognised as the hagiographical model shaped in the textual sources. To this end, the ICON ontology may be extended to represent such specific events depicting the saint's life, introducing the class *Hagiographic Event* as a subclass of icon:Event. This class would represent the iconographical rendering of the narrative *topoi* described in texts, allowing the identification of the influence of literary structures in the visual sources. Then, the class can be further specified with the definition of shared, recurrent moments in the saint's *vitae* (e.g., conversion, temptation). In the provided example, the *Hagiographic Event* enables us to associate this *topos* with certain common iconographic attributes and arrangements of the depicted scenes by relating the recognition of the Image (*ART1-IMG6*) to the ArtisticMotifs or Compositions representing the other subjects (e.g., a kneeling man) through the relation *icon:refersToArtisticMotif*, or other subjects grouped in the same Story (e.g., the Place *St. Apollinaris Church*). Specifically, the comparison pertaining to the conversion encompasses the saint's youthful age, the setting of a church, and the presence of the Virgin Mary (in both statue and painting) as one of the means of conversion. The separation between the generic and the artwork's specific subject provided by the ICON ontology allows a thorough description of the subjects depicted and their relations in a specific artwork (e.g., the kneeling man with joined hands is recognised at level 2 as the Character St. Romuald) and, at the same time, the retrieval of all the artworks presenting the subject (e.g., a query retrieving all the artworks in which the *Hagiographic Event* "Conversion of St. Romuald" can retrieve all the artworks, for which then more specific details about the Conversion are provided). Furthermore, the extension of the *Hagiographic Event* class with further specialised moments (e.g., Conversion, see Fig. 3) would allow an even broader retrieval of all the saints depicted in the conversion moment, allowing for a detailed comparison.

¹⁰ We don't provide here a full description of this artwork for the sake of brevity.

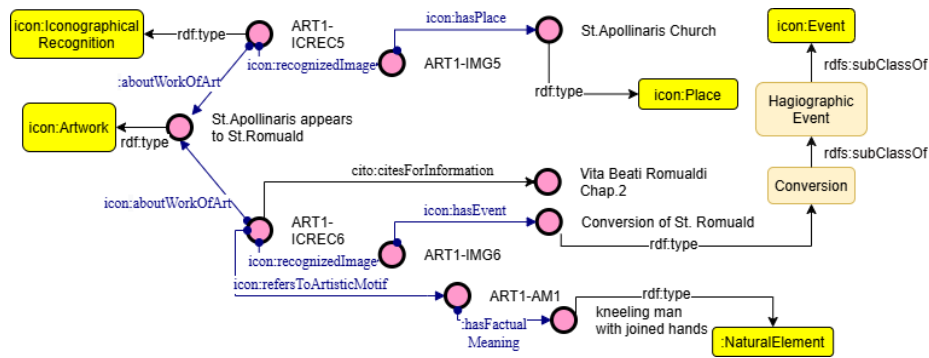


Figure 3. Section of the graphical representation of St. Apollinaris appears to St. Romuald (proposed classes in orange)

6. RESULTS

Although ICON can describe the key features of iconographic representations related to monastic themes found in hagiographic sources, it lacks means of descriptions for the hagiographic narrative models. These can serve as interpretative structures used to analyse visual representations. The process involves introducing a class, namely the *Hagiographic Event*, that corresponds to key terms (e.g., "conversion") into the artwork's description while implementing iconographic subject recognition.¹¹ These categories stem from common moments in saints' lives based on hagiographic narratives. The introduction of the *Icon:HagiographicEvent* class has enabled connections between meaningful elements and iconographic features related to the conversion of St. Romuald and the hagiographic *topos* (conversion), paralleling the representation of this event in a scene from the life of St. Anthony Abbot. This parallelism was selected due to the strong connections between the hagiographies of the two saints (Bannister, 2011).

7. CONCLUSIONS AND FUTURE WORKS

Narrowly interwoven with the textual tradition of hagiographies, namely, texts describing the saints' *vitae*, the iconography of (monastic) saints often depicts key moments of their life, known as *hagiographic models* (e.g., the moment of the conversion). Iconographies depicting them show not only the sharing of models, but also visual arrangements shared by art pieces depicting different saints. A detailed description of the phenomena through semantic web tools would allow us to computationally trace such influences. To this end, the current work examined the extent to which the currently available ontologies can represent the key aspects of the domain. While the ICON ontology addresses the most needed features, additional updates are required. We therefore suggested the extension of the ontology to include a class, named *HagiographicEvent*, intended to represent the hagiographic models as rendered in visual materials, namely, as events part of a saint's life. This class, further specialised in subclasses, representing the specific moments of a saint's biography, would allow the comparison of iconographic sources. Future works include the formalisation and evaluation of the proposed extension, and its enrichment with further subclasses through the examination of literature that provides typological definitions of hagiographic models. Specifically, Pratsch's work systematically catalogues hagiographic models (*topoi*), which may be examined to extend the ontology or create a controlled vocabulary. Moreover, we consider to validate our model with empirical tests involving other hagiographic *topoi* and saints (e.g., the Hagiographic Event "Call to Withdrawal" linked to pictorial cycles related to anchorites stories). The extension would allow cross-referencing among a selection of representations of saint monks by computationally identifying and analysing structured data on the iconographic occurrences of specific modules.

Ultimately, this will deepen our understanding of monastic visual culture in relation to hagiographic narratives while also advancing digital art history and semantic web technologies within the field of iconography.

¹¹ Claims that are made by an agent (a person or a computer) about an artwork to recognize a single subject are individuals of the class Recognition. The subclasses of Recognition express each recognition conducted at a certain level of interpretation, namely Pre-Iconographical Recognition (level 1), Iconographical Recognition (level 2), and Iconological Recognition (level 3). See: <https://w3id.org/icon/docs/>

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