

# ODI and BACODI: a study on *Destini incrociati* by Italo Calvino with Semantic Web Technologies

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## ABSTRACT

On the centenary of Italo Calvino's birth, this research aims to investigate the “macchina narrativa combinatoria” [1] using Semantic Web technologies to formalise and analyse textual and iconographical aspects that concern narrative and compositional structures, plot concepts and character roles in the collection *Il castello dei destini incrociati* by Italo Calvino. In particular, ODI Ontology (Ontologia dei *Destini incrociati* di Italo Calvino) and its corresponding Knowledge Base (BACODI, Base di Conoscenza dell'Ontologia dei *Destini incrociati* di Italo Calvino), represent and describe the publication of the edition, the description of the cards - both as parts of the deck and as narrative instances in Calvino's text - and, finally, the semantic links and narrative relations between cards in each story, considering their coexistence in a single environment. Data has been analysed under three main aspects: the semantics conveyed by the tarot cards, the text structure and the relations between cards.

## KEYWORDS

Semantic Web, Italo Calvino, Narratology, Knowledge Graph, Digital Humanities

## 1. INTRODUCTION

*Il castello dei destini incrociati*, the first collection of the homonymous work published by Einaudi in 1973, is one of Calvino's most rigorous works of combinatorial literature. In particular, the author chooses a specific tarot deck, the *Pierpont-Morgan Bergamo* [2], as a system of signs and a real language [3]: the twelve stories of the collection arise, in fact, from the combination of several cards that, placed in a row - in vertical or horizontal order -, create a series of narrative sequences. The main characteristic of the travellers of *Il castello* is that they have lost their speech, but they are nevertheless eager to tell their own stories. It is this urge to communicate that leads them to use the tarot deck as a means of storytelling. The result is a *quadrato magico* [1] in which each narrative sequence is crossed with another, as are the destinies of the twelve travellers of the castle. Each sequence can be read in any direction (e.g. from top to bottom or from left to right and vice versa) so that the meaning of each narrative story is given by the way each card is combined with the other cards of the deck.

Although Digital Humanities research extensively covers knowledge representation of cultural heritage, there is a lack of formal representations for hermeneutic analysis of texts that consider formal expressions and narrative connections.

*Il castello dei destini incrociati*, because of its mechanical, geometric and combinatorial nature, lends itself to experience a formal ontology for a computational study both critical and narratological of the text. Specifically, ODI aims to represent the edition of the work, the description of the cards - both as artefacts and narrative instances - and the semantic links and narrative relations between the different cards in each story, considering their coexistence in a single environment. In summary, this research aims at superseding the canonical representation of textual entities (i.e., tagging places, agents and events of a text) modelling the texture of the work in all its narrative and compositional elements considering their textual and iconographical dimensions.

## 2. STATE OF THE ART

The field of digital scientific editions (DSE) has seen important developments, in the context of the semantic web, that have led to a new reflection on the concept of “digital edition” that goes beyond the reductive dichotomy based on medium (print-digital). Despite the widespread production of DSE as testified by [4, 5], to the best of our knowledge Calvino's production has received little attention in the field of Digital Humanities. *Atlante Calvino* [6]: *letteratura e visualizzazione* is a virtual environment that explores Calvino's corpus through a combination of literature and visual design but does not delve into its textual aspects. However, through an analysis of the textual elements, it could be feasible to decipher certain

portions of the texts that are still safeguarded by copyright, despite the inability to provide unrestricted access to them in their entirety.

Trying to build an ontology on *Il castello* by Italo Calvino means thinking, first, about its peculiar narrative and compositional structure.

Even though there are theoretical studies on *Il castello dei destini incrociati* (including both collections), there is an absence of analyses for a closer understanding of the combinatorial and narrative relations between cards in the text. In other words, many scholars pause over the multipurpose and symbolic nature of tarot cards for the generative process of the stories and their interweaving [15], but how the mechanism of the “macchina narrativa combinatoria” [1] works is overlooked. A computational study may facilitate in this regard a new attention to the combinatorial functioning of the work, through a study focused on the textures of the text and their characteristics.

Over time, various attempts have been made to identify a universal theoretical model of narrative structures, with increasing attention paid to the modalities and techniques of narration: the study and analysis of the character, starting with Propp's [7] famous scheme on character functions; reflections on the 'narrative voice' and the 'point of view' [8]; furthermore, the categories of space and time analysed by both [9] and [10].

Recently, attention has turned toward the use of ontological technologies for the representation of narrative structures for both literary and narratological research purposes. Some projects have attempted to integrate Semantic Web technologies and narratological studies as SEBNET [11], a system able to analyse and generate fairy tales; SEB [12,13], a semantic network application to analyse relations between characters in more complex narratives; Labyrinth [14], a system able to make users explore a digital archive following the narrative relations between the works of art contained in it.

### 3. METHODOLOGY

The source edition, particularly, the first six chapters of the first collection of Italo Calvino's *Il castello*, has been analysed according to the methodology proposed by [16]. This qualitative approach focuses on the text content and thematic analysis and consists of three main phases: *skimming* (which includes a preliminary, superficial analysis of the text), *reading* (thorough and precise analysis of the same), and *interpretation* (related to the moment of hermeneutic study of the work). The analysis produced 19 requirements (competency questions) grouped into 8 categories (e.g. “What are the meanings associated with cards that have suit Wands?” which concerns the category of the semiotics of suits in numeral cards, cf. section 5 (*Results*, a-h)).

Additionally, the analysis of source materials produced a series of conceptual maps representing the domain. Maps have been then refactored and translated into an OWL ontology, called ODI. Data have been gathered from the text and saved in a set of tables, which have been then converted into the Knowledge Base, called BACODI, modelled on the ontology. As a first testing activity, ODI has been applied to the second section of Calvino's work, *Tutte le altre storie* (seventh chapter, containing six stories) and the model validity was confirmed. Subsequently, even the second section of the work was added to the Knowledge Base. The representativeness of the ontology and the correctness of the data in BACODI have been tested through the 19 competency questions previously defined via SPARQL queries.

Finally, BACODI data have been studied to investigate the 8 main categories mainly concerning the work's semantics, the text structure and links and relations between cards. Each analysis is referred to a specific category and has been carried out using a selection of competency questions run in SPARQL against BACODI. In section 5 (*Results*) we summarise our findings, and we provide two example analyses (The semiotics of suits in numeral cards and iconographic dimensions of cards). The work is provided with technical documentation<sup>1</sup>, particularly, in *Query Paths* section all analyses are presented in detail.

### 4. MODEL

ODI models the requirements mentioned in section 1 (*Introduction*) formalising the edition of the work, the description of the cards - both as artefacts and narrative instances - and the semantic links and narrative relations between the different cards in each story. This section presents the model along with a case study, the representation of *The Cavaliere di Coppe* and its relation with another card (*La Temperanza*) in the first story.

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<sup>1</sup> <https://odi-documentation.github.io/materials/>

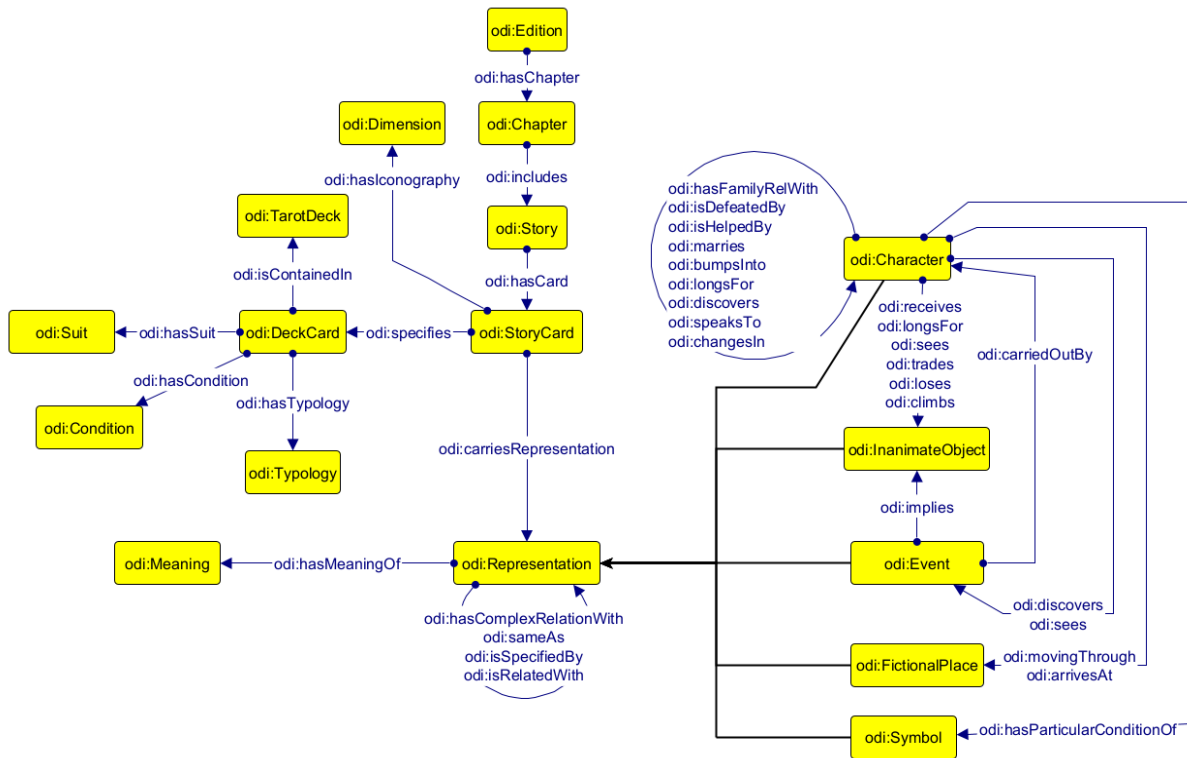


Figure 1. Main classes and object properties in ODI.

*The edition.* It represents the literary edition (`odi:Edition`), including title, author, publication date, publisher, place of publication and chapters. Although not directly addressed by the project’s representational requirements, ODI includes the description of the edition for both providing contextual information about the work and for further alignment with other ontologies.

*Tarot cards as artefacts and narrative instances.* It represents tarot cards (`odi:TarotCard`) as iconographical artworks belonging to the tarot deck *Pierpont-Morgan Bergamo* (`odi:TarotDeck`) and as occurrences in the stories (`odi:Story`). Each card is represented by its name, presence or not of the variant name in the collection, suit, typology, number, current location, condition, iconography and author. The connection between the card as a physical object (`odi:DeckCard`) and its narrative dimension (`odi:StoryCard`) is represented through the property `odi:specifies`. As specifications in the stories (`odi:StoryCard`), cards are, then, represented as narrative instances (`odi:Representation` and its subclasses, `odi:Meaning`) and with additional information such as the dimension of the iconography in the page, the position in the text and the presence or not of the variant name in the text.

*Semantics links and narrative relations between the cards in the stories.* It represents semantic links between two cards in the same story and the network of narrative relations between each protagonist and the cards in each story. As far as narrative relations are concerned, the model formalises simple relations (e.g. `odi:bumpsInto`, `odi:speaksTo`) and complex relations (`odi:hasComplexRelationWith`), which means direct or indirect relations. In particular, cards that have a direct relation with the protagonist can either be specified (`odi:isSpecifiedBy`) or have a general relation (`odi:isRelatedWith`) with the card that has got an indirect relation. In the Knowledge Base, complex relations are characterised by two triples, while simple relations by one. Two cards can, also, have a semantic link to express an identity (`odi:sameAs`) or an evolution (`odi:changesIn`) of the same representation in the same story.

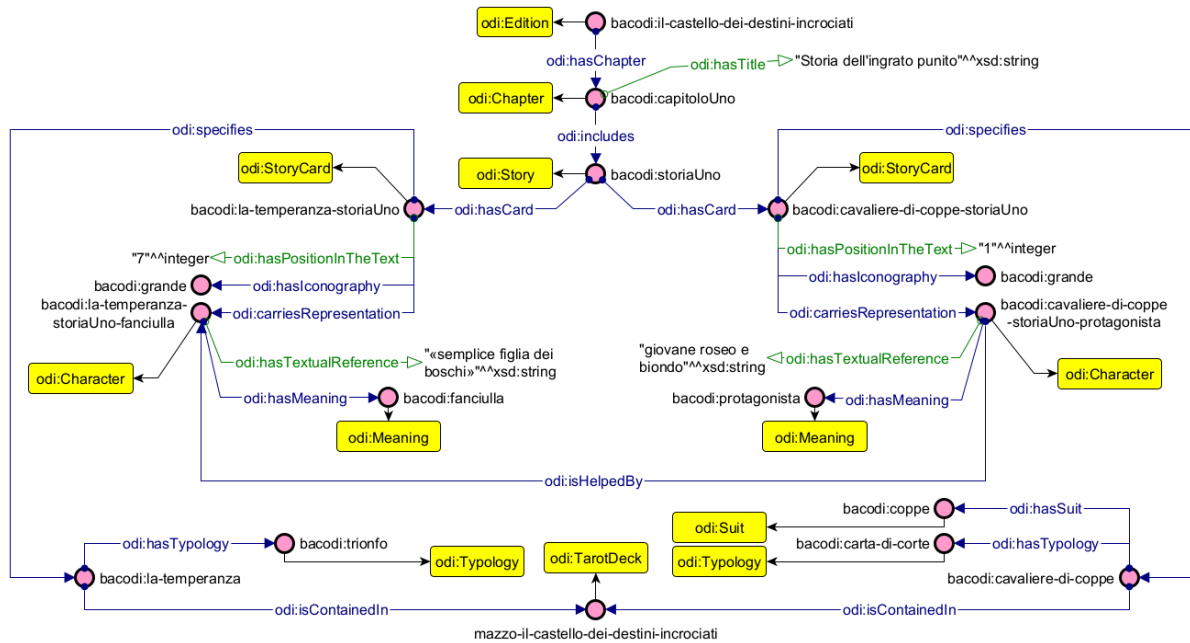


Figure 2. Representation in BACODI of the interaction (odi:isHelpedBy) between the cards Cavaliere di Coppe and La Temperanza in the first story.

Therefore, we present an example (figure 2), showing the formal representation of the *Cavaliere di Coppe* and its relation with another card (*La Temperanza*) in the first story. *Cavaliere di Coppe* (odi:StoryCard) is the protagonist of *Storia dell'ingrato punito* (odi:Story). After introducing himself, the protagonist arranges 17 tarot cards gradually. In summary, the narrative depicts a knight who is robbed and hanged from a tree branch by a brigand but subsequently rescued by a maiden. The said maiden, in turn, resolves to avenge the knight when he forsakes her to wed a woman of greater affluence. In the denouement of the story, the knight meets his demise at the hands of Cybele and her adherents. In particular, the maiden who initially helps the knight is represented by the triumph *La Temperanza* and in BACODI the property which describes this interaction is odi:isHelpedBy. As shown in figure 2, both cards are represented in relation to the tarot deck (odi:TarotDeck) and the story (odi:Story). In the first case, they are represented as artefacts belonging to the tarot deck (odi:TarotCard) with their main characteristics (e.g. the *Cavaliere di Coppe* is “cour card” (odi:Typology) and its suit is “cups” (odi:Suit)). In the second case, they are represented as narrative instances (odi:StoryCard) describing the interaction of the two characters in the story (odi:Character) with a specific meaning (respectively the protagonist and the woman, odi:Meaning).

## 5. RESULTS

The network of narrative occurrences preserved in BACODI and modelled using ODI, suggests the need for a more comprehensive analysis of the *Il Castello* considering the use of tarot cards as a privileged means of communication and, in particular, of narration. The analysis was on the whole carried out on three main aspects, recalling the categories of requirements (cf. section 1, *Introduction*): the **tarot cards semantics**, investigated through (a) the semiotics of suits in numeral cards, (b) the narrative function of court cards and triumphs [15], (c) the usage of the same cards with the same meaning in different stories, and (d) the use of two different cards for the same representation in the same story (semantic links, cf. section 4, *Model*); the **text structure**, investigated through (e) the position of the cards in each story, (f) recurring patterns of cards through the stories, and (g) the iconographic dimension of the cards running along the margins of the edition; finally, **relations between cards** have been analysed under the light of (h) simple relations (direct relations between each protagonist and the cards in the stories) and complex relations (indirect relations between each protagonist and the cards in the stories). For the sake of the example, here we report an analysis of the tarot cards' semantics (e.g., the semiotics of suits in numeral cards) and one of the text structure (the iconographic dimensions of the cards).

Each suit in *Il castello* has its own fictional iconography referring to a specific semantic field<sup>2</sup>, which differs from the traditional cartomantic bibliography [17]. The occurrences of tarot cards featuring the suit of Wands predominantly depict

<sup>2</sup> For the complete overview of this analysis please refer to the *Query Paths* page at <https://odi-documentation.github.io/materials/>. In particular, this study is documented in *The semantics > The semiotics of suits in numeral cards*.

the wooden environment of *Il Castello* (e.g., log, wood). However, in rare cases it is the card number that defines its meaning: for example, *Due di Bastoni* can be used to express duality or a choice between two situations (in *Storia della sposa dannata* and in the fourth story of *Tutte le altre storie*) regardless of the suit. In contrast, tarot cards featuring the suit of Coins refer to two distinctly contrasting semantic domains: first, earthly power, wealth and materiality (e.g., richness, inheritance, money); secondly, heaven, the divine and the immaterial (e.g., light, moon, state of beatitude). Between the two semantic fields, however, the former stands out over the latter. Most of the findings regarding the symbolism of numerals in the suit of Swords refer to themes of warfare (e.g., war, duel, dispute); sometimes, it specifically refers to defence (e.g., barrier, guards). Finally, the semantic meaning associated with the suit of Cups is less clearly defined than the three aforementioned suits. From the results, it is possible to note a large percentage that refers to banqueting and refreshment (e.g., banquet, wedding banquet, tavern); there are, however, other references such as those related to wealth (e.g., the source of life, world peace) or to love (e.g., love encounter). In most cases, the meanings of tarot cards are determined by their respective suits, with the type of suit significantly impacting the meaning of numbered cards (unlike triumphs and court cards, analysed in their narrative function (b)). Additionally, not all four suits refer to a single and defined semantic field: the suit of Wands recalls, in fact, a narrow semantic field, whereas the suit of Cups indicates broader semantics.

The existence of different iconographic dimensions in the text [1] has raised the prospect of investigating BACODI in order to comprehend the underlying motives for a decision that appears deliberate<sup>3</sup>. Overall, there are a total of 118 iconographic depictions running along the edition's margins, comprising 61 large and 57 small images.

The three queries made for the iconographic dimension of the cards show that, as far as numerals and triumphs are concerned, the discrepancy between the number of big dimensions and small dimensions is little.

Differently, the iconographic dimension of the court cards, and, particularly, those representing the protagonist, is almost always big except for three occurrences in the seventh chapter, *Tutte le altre storie*, in which it is drawn on the page with a small dimension (*Il Bagatto* in the fifth story; *La Temperanza* and *La Giustizia* in the last story). In all three occurrences, however, the three cards express something else than the presentation at the beginning of the story. In other words, the big dimension serves, at the beginning of the story, to the reader to identify the protagonist's card; the other times the protagonist appears with a different card, it can be either big or small. For instance, in the fifth story, the protagonist is, initially, represented with the *Fante di Coppe* and it has got a big dimension. After, the protagonist is represented with *Il Bagatto* to express the protagonist's desire to become emperor, and it has got a small dimension. The author's artistic choice to give importance to the dimension of each card in the text is thus proven. In the case of the protagonist card, the big dimension indicates the importance of the protagonist as the main motor of the narrative.

## 6. CONCLUSION AND FUTURE WORKS

This study explores how to exploit Semantic Web technologies to represent aspects of interpretative analysis in the humanities on literary texts. Specifically, this research aims to provide a formal representation of the narrative use of tarot cards and their relations in the stories *Il castello dei destini incrociati* by Italo Calvino through semantic web technologies. ODI and BACODI represent the textual and iconographical elements on which narratives are built (description of the cards - both in relation to the deck and to the stories in the collection) and their relations (the semantic links and narrative relations present in each story between the different cards) considering their coexistence in a single environment (the edition of the work).

The project supersedes the canonical representation of textual entities (i.e., tagging places, agents and events of a text) establishing a network of narrative relations and semantic links which allow to learn more about the construction of the combinatorial machine set up by the author. Thanks to the formalisation of data, it is possible to understand: the preference for some cards rather than others to express certain entities; how the cards are repeated and combined; what is the main structure of the various narrative sequences and how the literary tradition fits inside. Particularly, BACODI provides an example (cf. section 5, *Results*) of how modelling textual narrative structures as well as textual-iconographic relations can open further investigations on the "macchina narrativa combinatoria" [1] of *Il Castello*.

Results could encourage studies of other works of Calvino's combinatorial narrative period (1967-1980), adapting some ODI parts to the specificities of the texts. For instance, the unit including semantic links and narrative relations between cards in each story could be replicated to create a semantic network of all the characters appearing in the different readings of *Se una notte d'inverno un viaggiatore* (1979). This kind of attention could point out the role of the various characters in relation to the protagonist, the Reader, and to his plural reading path.

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<sup>3</sup> For the complete overview of this analysis please refer to the Query Paths page at <https://odi-documentation.github.io/materials/>. In particular, this study is documented in *The text structure > The iconographic dimension*.

Moreover, this project represents the need to go beyond the canonical digital scholarly editions, even those based on semantic Web technologies to demonstrate how to use the semantics as a way for creating new interpretational paths, to explore the content of literary works and to expand, with new methodologies, the users' knowledge on our textual tradition. In the future, we aim to go beyond the approach that sees each protagonist as a privileged point of observation to formalise a more complex network of relations between all the cards in the deck. Additionally, we plan to align ODI with existing ontologies to ensure interoperability with other models (e.g., FRBRoo). We, also, aim to expand our work to the second collection of the work, *La taverna dei destini incrociati*. Finally, a future goal is to be able to create digital visualisations to explore the work through specific pathways between cards that can bridge the copyright issue. Particularly, for each card, a legend could be provided for the description and physical appearance of the card, with a related picture of the miniature; furthermore, different reading directions would accompany the reader within a plural path, according to the different narrative sequences in which each card may manifest itself.

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