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## Data Visualization as a Tool to Experience the Legacy of Dante's Divine Comedy and its Influence on the Cultural Heritage


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***DATA VISUALIZATION AS A TOOL TO EXPERIENCE THE  
LEGACY OF DANTE'S DIVINE COMEDY AND ITS  
INFLUENCE ON THE CULTURAL HERITAGE***

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*DivineComedy.digital* is a digital humanities project that celebrates the *Divine Comedy*'s influence on the world's cultural and artistic heritage, inspiring millions of people in Italy and worldwide. The project was conceived by Matteo Bonera, designed and developed by an eighteen-person team of The Visual Agency, an Italian-based studio specialized in information design. This article explores the collection methodology led by Anna Bardazzi and the design approach that led to the development of this tool.

*Introduction to the project*

*DivineComedy.digital* is a digital humanities project. The website (available at <https://divinecomedy.digital>) collects artworks depicting the narrative world of the *Divine Comedy*. It provides a holistic experience for the users: while listening to the audio of verses, a digital gallery explores the vast collection of artworks representing scenes from Dante Alighieri's poem. This heritage spans seven centuries of art history and represents a summa of the many interpretations artists and playwrights have given to the poem, which have contributed to defining this famous and mythical imaginary world. Through an interactive visualization that maps the complete structure of the Italian poet's masterpiece, the application enables a hypermedia exploration of the content of the *Divine Comedy* and its related imagery. Users can overview what is probably the most compelling vision of the medieval world and observe how the interpretations given by artists have changed over the centuries.

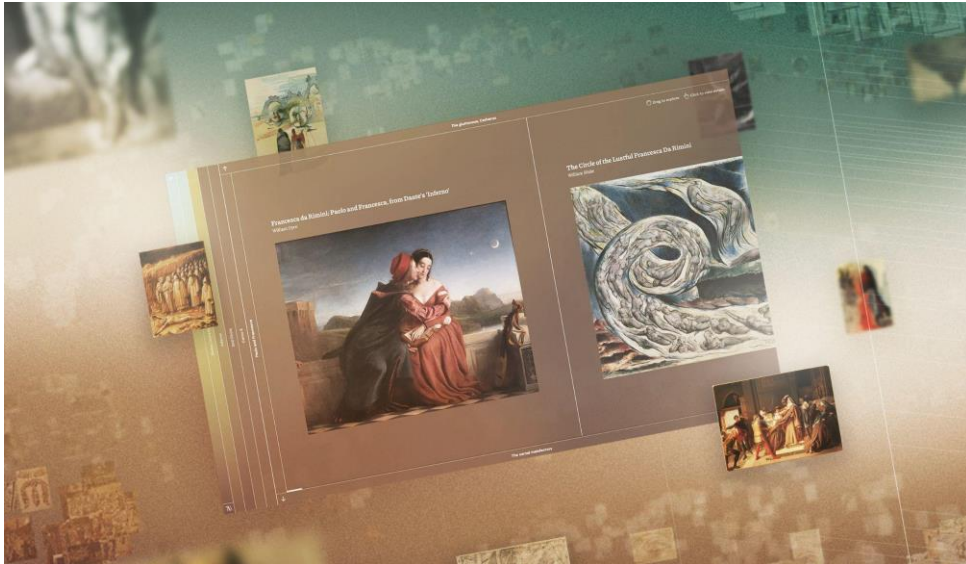


Fig. 1. The gallery of Paolo and Francesca's scene, one of the 413 galleries.

The project was released in June 2021, for the occasion of the 700<sup>th</sup> anniversary of Dante Alighieri's death, besides hundreds of commemorative events that took place in Italy throughout 2021.

*DivineComedy.digital* was developed as a self-initiated project by The Visual Agency — an Italian data visualization and information design company previously known for releasing the award-winning digital humanities project [Codex-atlanticus.it](https://codex-atlanticus.it), about Leonardo Da Vinci's *Codice Atlantico* — and sponsored by *Società Dante Alighieri* — a cultural institution that promotes Italian culture and language around the world.

### *Not another text-based tool*

The birth of the project stems from the idea of having a tool that could ease the general public to explore the content of the *Commedia*. Due to the poem's rigid and numerical structure, the text's study is frequently based on the one-to-thirty-three/thirty-four subdivision of the Canticas. The connection between the cardinal number of Canto and its events, encounters, and dialogues is purely mnemonic, and, because of the high number of them (more than four hundred), it is a barrier too hard to overcome for a straightforward approach to the poem.

A benchmark analysis demonstrated that almost all of the fifty existing websites about the *Divine Comedy* follow this previously mentioned cardinal numbers approach. Some exceptions based on other parameters (e.g., contemporary citings:

<https://research.bowdoin.edu/dante-today>, places: <https://www.mappingdante.com/>, or characters ) exist, but not as a primary way of approaching the *Commedia*, sometimes limited to the *Inferno* (e.g., <https://www.alpacaprojects.com/>) or not connected to the poem at all (e.g., <http://floatingmedia.com/dante/>). The complexity intertwined with the poem highlighted the need to shape a digital humanities tool that helped the general public access and explore such an articulated content based on something they can get. Dante's journey in the pop culture is widely known for the poet's encounters and his dialogues: events that define the plot of the *Divine Comedy* (e.g., the general public certainly knows about Paolo and Francesca and probably knows about their love affair but can't answer if asked to speak about *Inferno*, Canto V).

*DivineComedy.digital* facilitates the exploration of the content thanks to its unique way of accessing the poem's structure: based on scenes rather than cardinal numbers. Different artists' interpretations represent each scene; this provides a visual basis for teachers who need to explain the content and scholars who need to study it.

The experience and interface design considered the users and how and where they interact with it in different contexts and devices. Therefore the versioning of the application is developed seamlessly for desktop computers, tablets and smartphones.

While this tool is mainly designed for the general public, domain experts, especially dantists and researchers in the history of the art field, could find this collection beneficial to their studies, finding connections inside the application (hypermedia navigation of the tool based on related artworks from the same author) and external links to galleries, museums and archives who own the rights of the hosted images.

### *How the tool works*

The website opens by showing the project purpose, followed by the onboarding page, divided into five steps:

1. Dante's legacy
2. Artworks, authors, and metadata
3. A digital humanities tool

4. An ever-growing heritage
5. The *Divine Comedy*'s structure

Each step provides information about Dante, the artwork collection, and the *Divine Comedy*. While users are experiencing the introduction, the background color shades from a light blue (chosen for its symbolical connection with *Paradise*) to brick red (chosen for *Inferno*). The pictures follow the onboarding experience providing a panoramic overview of the collection along with an explanatory text. An artificial intelligence algorithm<sup>1</sup> is used to arrange images in clusters based on their visual similarity.

1. 'Dante's Legacy': artworks are arranged accordingly to their visual similarity: the more the pictures are close to each other, the more they are visually similar;
2. 'Artworks, authors and metadata': the map zoom-in to the cluster of Salvador Dalí's artworks that the AI determined are similar;
3. 'A digital humanities tool': the panoramic overview of all the artworks collection arranged as a grid;
4. 'An ever-growing heritage': the panoramic overview of all the artworks collection arranged by the century of creation. This last view shows the rejection of medieval values typical of the seventeenth and eighteenth centuries.

This data usage for the readers' onboarding represents a perfect match between technology and storytelling. The last step of the onboarding page lets users become familiar with the *Divine Comedy*-specific terms: *Canticas*, *Settings*, and *Cantos*.

Then users are invited to interact with the data-driven menu that depicts *Divine Comedy*'s structure and the plot divided into scenes. Visitors can choose to size the visualization according to the number of verses or the number of artworks. Sizing the menu by verses provides a panoramic overview of the *Commedia*'s structure and the length of each part, while choosing to do it by artworks provides an overview of the iconographic research. It is interesting to notice that sizing the structure by artworks provides an indirect insight into the popularity of each scene. (e.g., the most represented one is Paolo and Francesca's with its 51 artworks. Overall, *Inferno* is the most depicted *Cantica* with its more than 600 hundred

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<sup>1</sup> Pixplot is a t-distributed stochastic neighbor embedding (t-SNE) algorithm developed by Yale Digital Humanities Lab Team.

artworks). Each column of the interactive menu (Canticas, Settings, Cantos, and Scenes) can be normalized to further analysis.



Fig.2. The interactive menu visualization of *Divine Comedy's* structure and plot.

Clicking on a scene makes it possible to enter the relative gallery. Users can drag or scroll through the artworks while listening to the related audio verses. Users can browse the detail page for each artwork to analyze its metadata and external links or cross-browse the website by choosing artworks from the same author.

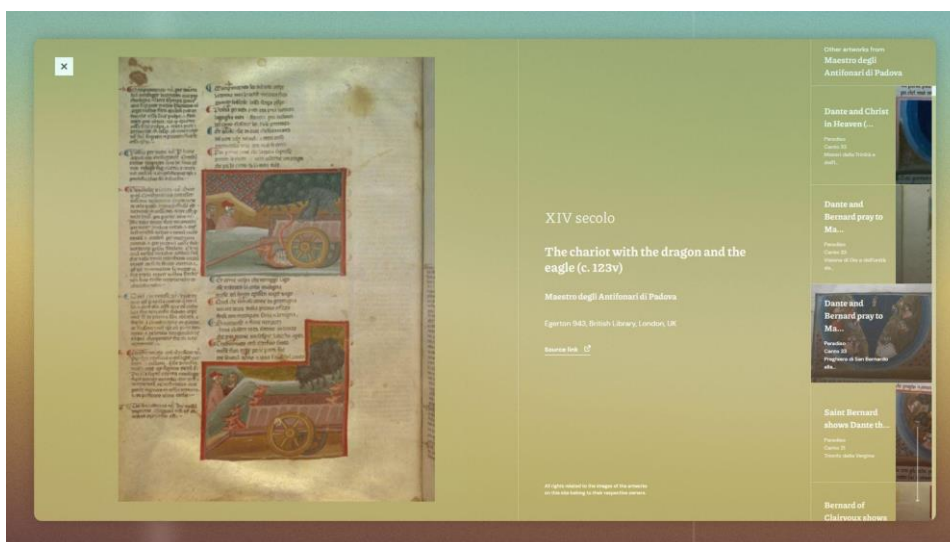


Fig. 3. Artwork page with metadata and related artworks.

*The artwork collection linked to the 'Commedia'*

The project's backbone relies on two databases: the artwork collection and the *Comedy's* structure and plot.

The artworks collection database counts over one thousand pieces depicting a *Divine Comedy* scene. Anna Bardazzi conducted the research. She produced a final result of 1,194 artworks cataloged with care and diligence, including illuminated manuscripts, engravings, canvases, frescoes, and drawings. Each artwork has been cataloged according to the following parameters: author, title, year, the gallery or library or archive, or museum that preserves the artwork and its city and country. Other important information has been cataloged for the picture and its copyright. This digital collection counts artworks from over 70 museums and over 90 artists. (see picture 2).

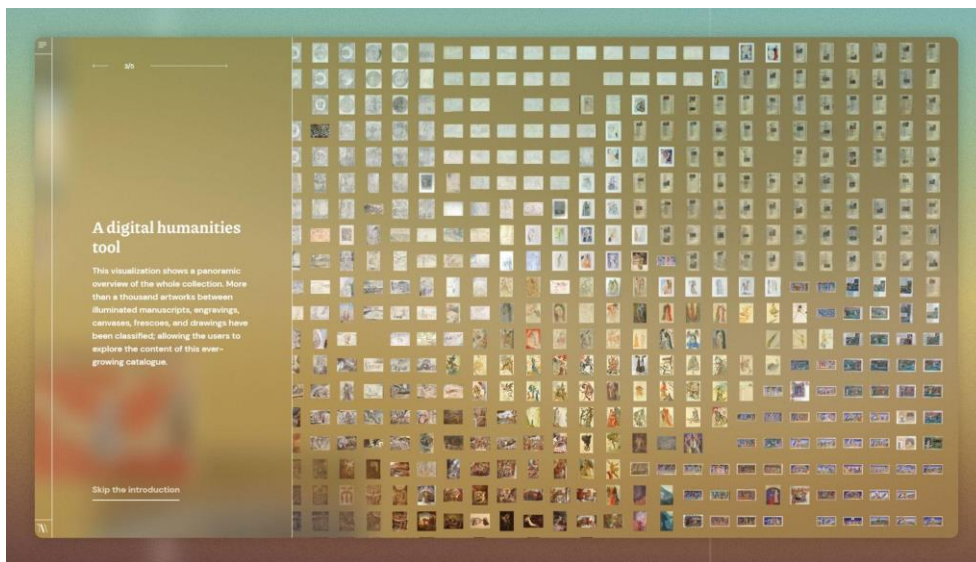


Fig. 4. This visualization shows a panoramic view of the whole collection: more than a thousand artworks have been classified and mapped to the poem's structure, allowing users to explore the content of this ever-growing catalog easily.

The research was carried out starting from a collection of data taken from texts or essays already known to scholars of Dante iconography (studies of Lucia Battaglia Ricci, Chiara Ponchia, and others)<sup>2</sup> and then moved on to a broader and more varied online research

<sup>2</sup> Lucia Battaglia Ricci, *Dante per immagini. Dalle miniature trecentesche ai giorni nostri* (Turin: Einaudi, 2018).

Chiara Ponchia, *Frammenti dell'Aldilà. Miniature trecentesche della Divina Commedia* (Padua: Il Poligrafo, 2015).

of the most critical iconographic sources on the *Divine Comedy*. Methodologically speaking, the first artworks that were categorized were those attributed to well-known artists with their share in the representation of Dante's *opera omnia*: William Blake, Sandro Botticelli, Dante Gabriel Rossetti, Gustave Doré, Salvador Dalì. Once their works were collected, the attention shifted to those cited by the sources that did not have the same united pattern in depicting the poem that the artists mentioned above had but mainly presented sporadic artworks on some scene or character of the *Divine Comedy*.

This collection took everything that was documentable into account in the most objective way and gave the liberty to integrate with those artworks that the research could not detect. Users can suggest any work by filling out a form on the *Suggest artwork* page. The idea of allowing this collection to grow fits the philosophy of the digital humanities, where users become contributors and vice versa, and it contributes to the spirit of democratization of cultural and artistic heritage.

The second database retraces the *Divine Comedy's* structure and its plot. Verses are attributed to the typical Canticas, Cantos, and the thirty 'settings' (circles for *Inferno*, terraces for *Purgatory*, and spheres for *Paradise*) and subsequently attributed to 413 scenes<sup>3</sup>. As mentioned before, treating *Commedia* as a movie screenplay enables users to orient themselves and their navigation through the content.

Once the two databases have been compiled, all the artworks have been reconducted to one of the 413 scenes. These two connected databases provide the basis for new ways to explore the content of this digital collection.

### *Conclusions*

As most critical studies demonstrate, the collection of images on the *Divine Comedy* has, for the most part, always been a chronological subdivision. From these studies, it is possible to note an evident prevalence of depictions in centuries like the fourteenth and the fifteenth, with their wide range of miniatures on noteworthy manuscripts that report the text of the poem, such as ms. Egerton

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<sup>3</sup> Each Canto counts from three to six scenes, for a total of 413 scenes overall.



943, ms. Yates Thompson 36, and so on; the sixteenth century also proved to be an era full of representations mainly depicted on the innovative printed editions that became the primary trend of that time, like the famous woodcuts of Alessandro Vellutello on Cristoforo Landino's comment of the *Commedia* from 1544. The nineteenth and twentieth centuries also produced various illustrations that modernized the poem's sceneries and characters to give voice to the cultural climate of the period that still relied on the words and images of the medieval poet. On the contrary, centuries like the seventeenth and the eighteenth show a decisive minority imagery-wise. This fact has been confirmed with the more global research conducted online on the *Divine Comedy's* representation. A variety of less known images and artists have been cataloged for the database, and even though they are not works known by many, they can still be placed in those centuries that abound with artists' creativity on Dante's work. In summary, the research has proven that the imagery of the *Divine Comedy* has predominantly conquered those centuries that already themselves enjoyed artistic creativity: the Middle Ages, the Renaissance, Romanticism, and the twentieth century with its diversification of the artistic movements throughout the years (Futurism, Surrealism, abstract expressionism, and so on).

Another important aspect obtained from this study is the selectivity of certain artists in representing the most famous scenes to the disadvantage of lesser-known characters and settings. The famous scene of Paolo and Francesca conversing with Dante (Canto V of the *Infèrno*) was represented in 51 artworks. In contrast, the less-known scene of Canto 27, the conversation with Guido da Montefeltro, counts only seven artworks. It is important to note that artists have always preferred those scenes that immediately struck Dante's audience since the first appearances of the work.

It is to be noted that the *Cantica* on which there have been more representations is the *Infèrno*, while the one on which fewer images were produced is the *Paradise*. Nonetheless, a significant amount of data has been found for each *Cantica*. As mentioned above, the paintings and illustrations that have been gathered demonstrate a clear preference for those scenes that are more widespread in the collective imagination; scenes like the already cited Paolo and Francesca (*Inf.* 5), the dark wood and the encounter with

Virgil (*Inf.* 1), the Acheron river and the ferryman Charon (*Inf.* 3) count more than twenty artworks as so do scenes like the depiction of Lucifer (*Inf.* 34) or the encounter with the devils (*Inf.* 21, and 22). However, it is interesting that other visual scenes that could have been portrayed have not been considered as much as those mentioned above. Mythological creatures such as the Furies (*Inf.* 9), the Centaurs (*Inf.* 12), and the Giants (*Inf.* 31), but even the heavenly creatures like the angels or the Eagle (*Par.* 28) have not been as lucky.

In terms of user experience, the aim of *DivineComedy.digital* is to break people's habits and take their time to enjoy, what we call, a *slow surfing experience*. To do so, the website relies on a couple of design solutions: horizontal scrolling and the bottom-to-top structure of the main visualization.

The horizontal scrolling is deliberately designed to be counterintuitive for people used to scrolling downwards on websites and social media. This choice aims to break users' habits to let them discover how to interact with the website and take the proper time to listen to the *Divine Comedy's* audio verses.

The other choice is to design the *Divine Comedy* structure from bottom to top. The Inferno is archetypally thought to develop downward, but if we consider Dante's path to redemption as a whole, it grows upwardly, from the Earth to Paradise. Therefore, the main visualization representing the *Divine Comedy* structure and its plot shows the Inferno in the bottom part (colored in brick red) and the Paradise in the upper part (colored in cloudy blue).

Using data to size the *Divine Comedy's* structure brought some interesting speculation not strictly related to the design or development phases but rather to the subject matter. Thanks to the main visualization, it is possible to measure that, contrary to what is commonly held, the three Canticas are not perfectly symmetrical in mathematical terms. They have the same structure, but some slight differences don't allow them to overlap perfectly. Regarding the number of verses, it is visually apparent how the 8<sup>th</sup> circle weights on the overall structure like none of the other settings.

Other insights could be found in how cantos insist on the settings: not every part of them belongs to a specific setting without discontinuity. For instance: *Inf.* 7 mainly insists on the 4<sup>th</sup> Circle, but its last 31 verses (The Styx and the Wrathful) belong to the

Fifth Circle. Other asymmetries could be found in *Inf.* 31. While its beginning scene (The Giants) belongs to the Eighth Circle, the other three scenes (Nimrod, Ephialtes, and Antaeus) don't belong to it nor the Ninth Circle. Other similar examples could be easily visualized along *Purgatory* and *Paradise* by analyzing the structure.

Lastly, the filters of the interactive menu enable users to further analyses. Normalizing the structure in each setting makes it visually clear how the density of cantos changes along with different settings, providing unpredicted information on the structure overall.

The now existing connection between artworks and the *Divine Comedy's* structure and plot, eased by the design of the interface driven by metadata, enables domain experts to further analyses that hopefully provide the basis for unexplored analysis of the *Commedia*.