# Articulating Intra- and Intertextual Relationships in the Fragment Collection Working with the Digital Edition of Giacomo Leopardi's *Zibaldone*

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**Abstract** Leopardi's *Zibaldone* presents a compelling study of semantic relations between textual fragments because the author's interpretive annotations form complex intra- and intertextual networks that elude close reading. The *Digital Zibaldone* project has built the foundation of a semantic digital edition to reconstruct the discourse order of Leopardi's intellectual inquiries and his reception of fictional and scholarly works, while offering readers some tools for their analysis. Its larger research framework aims to create synergy between the hermeneutic project of the fragment genre and digital methods of knowledge representation.

**Keywords** Giacomo Leopardi. Zibaldone. Digital editions. Fragment genre. Semantic networks. Intratextuality. Intertextuality. Linked data. Humanities ontologies. Graphesis.

**Summary** 1 Introduction. – 2 The *Digital Zibaldone* Project: Editorial Models and Research Frameworks. – 2.1 Semantic Web Technologies in the Personal Research Archive. – 2.2 Activating the Relational Power of Ideas: Fragments and Thought-Images. – 3 Reconstructing the *Zibaldone*'s Intra- and Intertextual Networks. – 3.1 Developing the Foundation of a Semantic Digital Edition. – 3.2 Aligning the Semantic Layers of Intratextual References and Thematic Indexes. – 3.3 Disambiguating Bibliographic Sources with Authority Databases. – 4 Synthetic Frameworks for Exploring the Semantic Relationships of the Fragments. – 4.1 Navigation Settings and Paragraph Information Box. – 4.2 Thematic Index Aggregates and Related Headings. – 4.3 Network Graph Generation and Visualisation. – 5 Conclusion.

> La scienza della natura non è che scienza di
> rapporti. Tutti i progressi del nostro spirito
> consistono nello scoprire i rapporti. [...] è manifesto
> che colui che ignora una parte, o piuttosto
> una qualità una faccia della natura, legata con
> qualsivoglia cosa che possa formar soggetto di
> ragionamento, ignora un'infinità di rapporti.
> (Giacomo Leopardi, *Zibaldone*, 1836)[1]

> To great writers, finished works weigh lighter than
> those fragments on which they work throughout
> their lives.
> (Walter Benjamin, *One-Way Street*, "Standard
> Clock")

## 1 Introduction

Giacomo Leopardi's *Zibaldone* offers a compelling case study of semantic relations between textual fragments because its non-sequential discourse, explicitly interlinked textuality, and the number and complexity of its authorial intra- and intertextual references challenge the semantic organisation of the codex and the cognitive process of close reading. The text amounts to c. one million words of notes and reflections written in several languages on an encyclopaedic variety of topics and punctuated with quotes and bibliographic information, while the manuscript abounds in marginal and interlinear additions, underlining, and references connecting related fragments. Leopardi uses date divisions to mark a circumscribed reflection and adopts page and paragraph numbers to locate the targets of his references. He also indexed the fragments thematically at the paragraph level, using different heading categories that denote topic specificity. His indexing method follows a principle of "logica combinatoria" (Cacciapuoti 2001, 252) which ascribes each fragment to multiple headings and makes cross-references between headings. Given the magnitude of this reference system (the text has over 6,000 explicit and implicit internal references, and the two main indexes list over 10,000 paragraphs), the reader's task of following the intersections of these relationships becomes a logistical impasse, as experienced first-hand by the author who left many of his projects at the editorial stage of annotation.[2]

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[1]  All quotations from the *Zibaldone* are from its digital edition (Stoyanova, Johnston 2011-23) and its English translation (Leopardi 2013b). In subsequent quotations from the text the title is abbreviated to *Zib.* and the page numbers refer to those marked by Leopardi in the manuscript.

[2]  In letters to his editor Stella from September 13 and November 22, 1826, Leopardi describes the difficulty of harvesting his knowledge from his "immenso volume manoscritto, o scartafaccio" (immense manuscript volume or notebook; Author's transl.)

Leopardi's structured close analysis of his fragment collection can take advantage of the synergistic application of computational methods for knowledge representation in order to articulate the complex aggregate of semantic relations established one at a time from different phenomenological perspectives.[3] Engaging with the text in a digital research environment would bring definition to its networked discourses and make Leopardi's thought more accessible to scholars, students, and the general public. This methodological approach to the analysis of the text will allow readers to follow the development of arguments, as a concept accretes signifying value through its network of references in different thematic contexts; to gain insight into Leopardi's scholarly practices of taking notes, citing sources, making and qualifying connections in the process of interpretation; to explore the historical, linguistic, disciplinary, and cultural contexts of his thought through his intertexts. What is more, in addressing these challenges of semantic organisation through the research framework of the fragment genre in its contention with its codex medium, the *Digital Zibaldone* project proposes that the affordances of a digital workspace could significantly advance the critical, aesthetic, and performative engagement with the constellational hermeneutic methodology of this textual phenomenon.[4]

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as one of scale, order, and arrangement, which he was hoping to confront with his alphabetical index (Leopardi 2013a, 1334). Arguably (cf. Acanfora 1989, 89-90), in rendering explicit the intertwining of conceptual fields and the vast scope of the collection, the process of indexing discouraged the author from proceeding with his projects.

**3**   D'Intino describes the *Zibaldone*'s genre as a "kind of 'laboratory notebook'", in which "to the despair of readers and interpreters, Leopardi returns again and again to the same questions, looking at them from different, often divergent, angles" (Leopardi 2013b, 79).

**4**   The constellation metaphor is used by Benjamin and Adorno to describe the fragment's resistance to instrumental reductionism in the hermeneutic process: "by gathering concepts round the central one that is sought, they attempt to express what that concept aims at, not to circumscribe it to operative ends" (Adorno 2003, 165-6). Such constellations of ideas tend to "structure the philosophy of an author from the inside" (Desideri 2020, 12), and struggle to find narrative form.

## 2 The *Digital Zibaldone* Project: Editorial Models and Research Frameworks

### 2.1 Semantic Web Technologies in the Personal Research Archive

The digital remediation of the *Zibaldone* did not begin with the aim to produce a digital edition of the text but with an experiment to model Leopardi's notebook as a digital editing environment in response to its function as a personal knowledge base, and so, to support Leopardi's methods of analysis and interpretation – a model that can be extended to and is informed by other representatives of the literary-philosophical fragment genre. The TEI data model adopted at the project's onset has allowed us to articulate the stratified composition of the text, which is fundamental for representing the conceptual relationships between its semantic units; to link Leopardi's references with their targets within the text, as well as between the *Zibaldone* and its indexes, and to describe their typologies; to define named entities (persons, works, places) with references to authority databases; to describe manuscript layout features, some of which contain key indications for determining the degrees of relatedness between the fragments. These markup decisions have been dictated by the need to define the semantic networks of the collection and parameters for assigning attributes of relatedness to their edges. Our editorial objectives to reconstruct the intratextual network of thematic relationships, to identify Leopardi's sources through his bibliographic references, and to categorise the modalities in which he employs them, naturally align with the graph data model and the affordances of semantic web technologies to support the interpretative core of humanities research by

> discovering, articulating, and visualizing relationships that may otherwise be difficult to investigate. (Usiskin et al. 2019, 191)

Semantic ontologies, linked open data, and network graph visualisations can serve as informational, analytical, exploratory, and narrative tools for bringing Leopardi's fragments into epistemic structures of higher semantic orders – those implicit in the author's discrete records of semantic annotation, those that readers could generate in research queries, and those inferred by machines.

The critical and practical efforts to bring about a paradigm shift in the modelling of digital scholarly editions by broadening the philological focus on the "text-as-document" towards modelling the "text-as-work" (Robinson 2013, 110) in order to "express and support the properties [...] that construct its meaning" (van Zundert 2016, 104),

and towards the "text-as-network" (Witt 2018, 221) to reflect the dominant activities of textual editors as "identifying and describing relationships between identifiable text parts" (223), broadly support our editorial model of Leopardi's notebook as a digital workspace for text analysis and interpretation based on formalising the relationships between the various parts of the text. The digital assertive edition proposed by Vogeler to "use the information conveyed in the text as structured data" (2019, 318) further describes our focus on the thematic contents of the text and on representing its named entities as linked open data. In the objective to reconstruct the intertextuality of the *Zibaldone*, the project takes advantage of the semantic scholarly edition model advanced by Tomasi, and especially as employed in Bufalini's *Notebook* (Daquino et al. 2020) which maps the semantic relationships between the authors and works discussed by Bufalini onto the notebook's fragmented textuality and links them to the web of data. Semantic ontologies for intertextual relationships can formalise Leopardi's critical engagement with other texts,[5] and the publication as linked open data of the several thousand quotes and bibliographic references to works and their authors, editors, translators, and publishers, allows to build a comprehensive tableau of his sources by enhancing them with information from authority databases.

A congenial editorial model, in particular for representing the conceptual networks of Leopardi's intratextual references and thematic indexes, is offered by Wittgenstein's *Nachlass* which similarly records the author's editorial annotations for structuring his collection of remarks by means of indexing systems indicating his "*action intentions*" (Pichler 2021, 197; italics in the original).[6] The *Zibaldone* shares with the *Nachlass* its "'crisscross' knowledge" (Pichler et al. 2021, 60) characterised by "concept dynamics, vagueness, multiperspectivism, [...] competing and contentious knowledge claims" (59). The Wittgenstein ontology maps the conceptual organisation of the fragments through philosophical subjects with subclasses, modelling different types of arguments and "chaining [them] into greater debates" (66). The "simple index structure, proven in the Gutenberg era" (Pichler, Zöllner-Weber 2013, 703), is employed as a main element of the Wittgenstein ontology to denote philosophical topics or "'issues'" (704), and in our case would correspond to Leopardi's in-

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[5]  Besides the methodology of the Bufalini edition, the INTRO ontology (https://github.com/BOberreither/INTRO) for intertextual relationships in literary studies can be adopted for our purposes.

[6]  Wittgenstein marked his notes with different symbols, numbers, and letters for the reordering of the collection – a task demanding a digital editing environment with tools for filtering the fragments semantically, which the interface of the Wittgenstein Archive at the University of Bergen (WAB) affords through interactive dynamic presentation and semantic faceted search and browsing.

dexes for the *Zibaldone* and their expansion by editors of print editions and by the project *Lessico Leopardiano*.[7] The scope of an ontology for representing the conceptual structure of the author's own records of text analysis could be extended through collaborative expert participation to include different modalities of argument. Their clustering into convergent and divergent "perspectives" – to borrow another term from the Wittgenstein ontology (Pichler et al. 2021, 69), would allow to represent, for example, the dialectical development of key binary notions in Leopardi's thought. Besides the classification of thematic categories and arguments, the definition of typologies for the references and index headings, which our project infers from the author's formal patterns of composition, would allow us to establish parameters for evaluating the degree of relatedness inherent in the intratextual relationships of the collection. This data of rich authorial analysis of semantic relatedness between text fragments then could be formalised for purposes of natural language processing.[8]

Semantic web technologies thus can assist scholars to analyse the relational structure of complex datasets which lack a formal discourse organisation but – as is the case of the fragment genre – present with copious indications for their conceptual modelling. Conversely, the research queries that necessitate their computational formalisation in the first place could inform the design of ontologies and of digital workspaces to lend definition to the process of interpretation itself. As Pichler et al. (2021) suggest, in order to advance the integration of semantic ontologies with the discourse of the humanities, ontology development needs to account for "non-shared conceptualization and contradiction between viewpoints," to "reason over multiperspectivism, contentiousness, conceptual vagueness," to "computationally map the dynamism of human knowledge" (71). Bradley and Pasin (2017) have proposed that integrating ontologies with a tool for supporting scholarly interpretation, such as *Pliny*,[9] could help scholars bring emerging ideas from the note-taking and annotation stages towards clarity and formality, while acknowledging the limitations of existing graph-based data models for the "in-

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[7]   The project for a Lexicon of Leopardi's concepts initiated by Bellucci and D'Intino at Sapienza University is a continuing collaboration of the community of Leopardi scholars.

[8]   Although the application of NLP methods is beyond the editors' scope and expertise, such an approach could complement Leopardi's close analysis by comparing the virtual hyperlinks between fragments and their thematic tagging with the co-occurrences of key terms. Conversely, his analytical annotations could be formalised as an algorithm for computing semantic relatedness between text fragments, as in Yazdani, Popescu-Belis (2013, 178) who evaluate the "real-world knowledge" of hyperlinks in Wikipedia articles in relation to their lexical similarity.

[9]   The project has been retired but can be consulted at https://www.kcl.ac.uk/research/pliny-project.

completeness and ambiguity" (2017, § 88) inherent in the process of interpretation. In its function as a personal knowledge base, the unbound codex of the *Zibaldone* accommodates the capture and storage of observations, while Leopardi's analysis through referencing and indexing corresponds to the intermediate stage defined in *Pliny* as organising the notes "into a collection of interrelated concepts, categories, or topics" (§ 27) – a process which requires a technology to support the dynamic sorting, retrieving, aggregating, and re-arranging of research material on the scale of thousands interconnected fragments. While *Pliny* is a promising theoretical model of bringing ontologies to bear on the process of constructing interpretation, the design of such a workspace would benefit from case studies of intellectual notebooks which dwell at the project stage and employ organisational expedients to simulate the dimensions of a digital editing environment. The digital remediation of the notebook genre furthermore necessitates "synthetic frameworks" (Drucker 2013, § 38) in order to convey "fragmented and correlated points of view that resist self-evident reification" (§ 39). Drucker's proposal to develop the design of interpretative humanities interfaces to

> create environments that are constellationary, so that diagrammatic relations can be used to re-order familiar conventions through acts of generative, performative engagement (§ 39)

resonates with the exigency of the fragment collection for a workspace to support its hermeneutic practices. The creation of a computational model of the semantic organisation of the *Zibaldone* thus also entails the design of a research platform to configure its multiperspectival discourse, and therefore can take advantage of and offer explorative ground for modelling authoring environments to support modular, fluid, networked, multimodal scholarship. Whereas "literal translations of a book into a non-book-oriented medium" (van Zundert 2016, 104) abound among digital scholarly editions, and "digital simulation of print monographs" (Spence 2018, 471) among emerging digitally-mediated long-form scholarly publications, some fragment collections emphatically fail to become books in an endeavour to convey the constellational order of their phenomenological discourse.

## 2.2 Activating the Relational Power of Ideas: Fragments and Thought-Images

Leopardi's *Zibaldone*, Wittgenstein's *Nachlass*, Coleridge's *Notebooks*, Valéry's *Cahiers*, Benjamin's *Passagenwerk*, Joubert's *Carnets*, Novalis' *Brouillon*, among others, are kindred texts that capture the "infinitely resonant interconnectedness or relationality" (Gifford 1998, 303). The hermeneutic methodology of fragment writers magnifies the networked structure of meaning by repeatedly returning to phenomena from a multiplicity of contexts in an extended temporal and textual space:[10]

> The same problems, regularly resurgent, are forever reformulated and reviewed, giving wider associations, sharper definitions, renewed perspectives and contexts of significance. (Gifford 1998, 46)

Their expansive perspective, which the Jena Romantics describe as "potentiation",[11] raises the signifying power of ideas and renders increasingly scrupulous its articulation – the arranging of words in a sentence and the circumscribing of concepts in a discourse framework. The *Zibaldone* fragments contend with the challenge of semantic organisation already at the level of syntax which is laden with relative clauses, lists of synonyms and qualifiers, as reflected in the manuscript's interlinear and marginal additions[12] – some integrated with pointers into a sentence while others positioned in parallel, before Leopardi confronts their relationality at the paragraph level with his combinatory methods of cross-referencing and thematic indexing. As the open space of the notebook expands in volume, contexts, and scale of observation, the correlations between fragments become convoluted, though they can gain form and clarity in a mental image described by Leopardi as

> colpo d'occhio che scuopre in un tratto le cose contenute in un vasto campo, e i loro scambievoli rapporti.[13]

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10   The *Zibaldone* has 4,526 manuscript pages written over the span of fifteen years, and with intense continuity during five. Valéry, who perhaps exemplifies the most unremitting practice of the fragment, wrote c. 28,000 pages of notes over the course of more than fifty years.

11   In his theory and practices of the fragment, "F. Schlegel frequently uses the verb 'to potentiate' (*potenzieren*) to describe the process of recontextualization that continually raises an artwork's semantic potentiality to a higher power" (Hall 2009, 426). The notion is likewise common in the writings of Novalis.

12   As D'Intino explains, Leopardi's tendency "to stretch his discourse – at times almost to the breaking point" is motivated by an ambition "to seize an idea, a concept, a proposition" (Leopardi 2013b, 102).

13   'The ability to take things in at a glance that discovers the things contained in a vast field, and their reciprocal relationships' (*Zib.* 1854).

The simultaneous comprehension of the interrelations between many concepts which had been observed one at a time, fosters their qualitative re-evaluation and enhances the observer's cognitive capacity:

> Quindi è che scoprendo in un sol tratto molte più cose ch'egli non è usato di scorgere a un tempo, e d'un sol colpo d'occhio discernendo e mirando una moltitudine di oggetti, ben da lui veduti più volte ciascuno, ma non mai tutti insieme (se non in altre simili congiunture), egli è in grado di scorger con essi i loro rapporti scambievoli, e per la novità di quella moltitudine di oggetti tutti insieme rappresentantisegli, egli è attirato e a considerare, benché rapidamente, i detti oggetti meglio che per l'innanzi non avea fatto, e ch'egli non suole; e a voler guardare e notare i detti rapporti. [14]

This superior cognitive experience prompts the thinker to want to look at the new relationships and to take note of them, so that the mental image can translate into interpretative discourse –

> purch'ei sia capace di ben esprimere i propri concetti, ed abbia bene e chiaramente e distintamente presenti le cose allora concepite e sentite.[15]

Although it is conditioned by the application of close attention, such augmented perception cannot be purposefully attained; it is fleeting and its recollection is unreliable:

> E forse esso stesso dopo quel punto, non crede più alle verità che allora avea concepite e trovate, cioè o non si ricorda, o non vede più con egual chiarezza, i rapporti, le proposizioni, i sillogismi, e le loro concatenazioni che l'avevano portato a quelle conseguenze.[16]

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**14**  'Hence, in discovering all at once many more things than he would ordinarily be accustomed to notice at one time, and in discerning and seeing at a single glance a multitude of objects, each of which he has seen individually on many occasions but never all together (apart from in similar circumstances), along with them he is able to see all their reciprocal relations, and as a result of the novelty of this multitude of objects that presents itself to him all together, he is led to consider these objects, albeit fleetingly, better than he has done before this time, and better than he is used to doing, and to want to look at and note these relationships' (*Zib.* 3269-70).

**15**  'Provided he has the things conceived and felt in that moment clearly and distinctly present before him' (*Zib.* 3271).

**16**  'And perhaps he himself after that point no longer believes in the truths that he has then grasped and discovered, that is, either does not remember or he no longer sees with the same clarity the relationships, the propositions, the syllogisms, and their concatenations that had brought him to those conclusions' (*Zib.* 1976).

As the thinker endeavours to translate the conceptual order of relations into narrative, the synoptic image of the mind is simulated by visual metaphors and graphic configurations. Thus, for example, Walter Benjamin's "flashlike image" is a "mode of cognition" (Weigel 2015, 347) very similar to Leopardi's synoptic flash-like glance:

> It stands for a way of knowing that in an instant can illuminate an entire situation. [...] a faculty in which an 'enhanced presence of mind' (*gesteigerte Geistesgegenwart*)[17] is coupled with an involuntary mode of seeing. The flashlike cognition is something that befalls the person unintentionally. (Weigel 2015, 348)

Moreover, for Benjamin,

> the tension of his writing becomes pictorially evident, almost to the extent of drawing itself, of composing itself in an image: in the figure-of-thought. (Desideri 2020, 14)

Indeed, the discursive methods that fragment collections employ to convey a conceptual image as "interrelatedness that is not stated but rather shown" (Brand 2004, 41) often rely on the spatial and visual semiotics of cross-references, index cards and indexes, folders, classificatory tables, catalogues, outlines, diagrams, page layout, underlining, geometrical figures, colours, connecting lines, shading, cutting and sticking pieces of paper, montage.[18]

The research framework of the *Digital Zibaldone* project explores how the phenomenological method of the fragment collection, of relating disparate ideas as they arise in an "intention-less" state of "immersion" (Benjamin 1998, 36) and their gathering into semantic constellations that resist an instrumental order of discourse, could be conveyed through the computational aggregation of the fragments' metadata and their visualisation as semantic networks, thus replicating the inferences drawn by the flash-like image to support the interpretative process it engenders. By rendering the fragments readily accessible for recall and re-arrangement, their configurations could be examined anew with greater clarity and discernment. Beyond analysis, the visual hermeneutics of graphesis has potential to further mediate the interpretative process into discourse and create rhetorical forms that embody, rather than describe, the connecting

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[17]  Weigel cites from Benjamin's *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit*.

[18]  For a discussion on some of the organisational expedients of different fragment collections see Marx et al. 2015; Gifford 1998; Kinloch 1996.

threads of interpretation.[19] In a basic sense, the research framework for the *Digital Zibaldone* recalls Engelbart's vision for augmenting human intellect with a computer system that would make explicit the "types of network relationships among concepts" (Engelbart, English 1968, 398; quoted in Barnet 2013, 1325), which are embedded in language, and so would facilitate the human ability to

> externalize [our] thoughts in the concept structures that are meaningful outside; moving around flexibly, manipulating them and viewing them. (Engelbart 1998, quoted in Barnet 2013, 1461-2)

## 3 Reconstructing the *Zibaldone*'s Intra- and Intertextual Networks

### 3.1 Developing the Foundation of a Semantic Digital Edition

The *Digital Zibaldone* builds on a rich editorial history of scholarly print editions and some digital remediations of the text.[20] While editorial priority has been to reconstruct the author's conceptual organisation of the fragment collection and facilitate its further analysis, rather than to produce a diplomatic edition which had been accomplished by the CD-ROM edition (Ballerini, Ceragioli 2009), at this mature phase of development the divergencies from a fully diplomatic edition are few.[21] The transcription of the *Zibaldone* with its authorial thematic indexes and the encoding of their structural elements in XML according to the TEI *P5 Guidelines* are based on the CD-ROM edition, the facsimile edition (Peruzzi 1989-94), and on partial examination of the manuscript at the archives of the Biblioteca Nazionale di Napoli. The *Roma* tool of the TEI consortium was used to create a custom schema for the project, and was gradually modified with the addition of new elements. Based originally on the TEI Lite customisation, a custom schema was produced and exported as an ODD customisation and as a RELAX NG schema used to validate

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**19**   Drucker's scholarship on visual epistemology and hermeneutic visualisation in the humanities offers a critical framework for remediating the visual metaphors of cognition employed by Leopardi and other practitioners of the fragment genre.

**20**   The editorial methodology, bibliography of sources, a list of errata corrected in referenced editions, a user's guide, and related publications are made available on the project's website. As the interface undergoes continued development, tutorials will be created to illustrate the affordances of the research platform.

**21**   The transcription does not include deleted text, markers for the distribution of the lines on a page and for the breaking of words over two lines, and a few common abbreviations have been normalised silently to facilitate string search and corpus analysis.

the project's TEI files. The markup distinguishes significant layout features of the manuscript and charts the stratified and interlinked composition of the text with date divisions, marginalia, inline and interlinear additions, the targets of intra- and intertextual references, distinctions between heading categories of the indexes, some of the ink variations, several types of underlining. The edition also identifies quotes and their language, titles of works, miscellaneous bibliographic information, persons, and places, and provides editorial notes for corrections, normalisations, and additions, such as target specifications for Leopardi's verbal references, with the number of encoded items being on the scale of 100,000. Besides the four authorial indexes, the dataset includes three editorial ones for persons, works, and places, with corresponding Wikidata and VIAF identifiers, biographical and bibliographic data, links to online encyclopaedia information and to the text of the works (of the edition cited by Leopardi, if available) on Google Books, the Internet Archive, Wikisource, and other open access digital resources.

For reasons of editorial expediency and limitations of resources for project development, the dataset has been hosted as a MySQL database with the provision to transfer it to a graph database once the TEI markup is completed, which was accomplished in the Spring of 2023. The database is used to store a search index and records of entries contained within the document with associated dates; it also contains tables storing representations of elements and element relationships in the form of nodes and edges, allowing for the generation of graphs and other metadata. The graph database transition will allow users to harvest the data more quickly and explore the networks between encoded entities dynamically in the context of the entire graph. The next phase of development will translate into RDF triples those entities encoded in the TEI that are relevant for defining the relationships between the textual segments, namely all of Leopardi's targets of references (notes written in the margin and inline, paragraphs, paragraph sequences, and index headings), his date divisions, his mentions of works, persons, and places. Existing ontologies would allow to adequately describe the intertextual relationships based on the bibliographic references,[22] but the main challenge in defining further the intratextual relationships is the need to lend semantic value to the edges in order to reconstruct the thematic networks of the fragments according to a hierarchy of relatedness. The properties of these relationships can be inferred from the layout of the text and Leopardi's methods of composition, and have been described in the TEI.

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**22**  Besides the *Wittgenstein Ontology*, *Paolo Bufalini's Notebook* and the *Dante Hypermedia Network* are excellent models in Italian Studies; the *Intertextual Relationship Ontology* (INTRO) for literary studies will also be explored.

The excerpt below **[fig. 1]** of encoding a *Zibaldone* date division consisting of a single paragraph (p. 1155,3) gives an example of some of the distinctive features of the text which constitute semantic entities. As can be seen in the facsimile, Leopardi uses date markers in parentheses at the end of a paragraph to mark his occasions of composition and to denote a circumscribed reflection as the main building block of the text. In this example, the date marker of the previous paragraph (visible on the first line of the facsimile excerpt) has the same date of June 11, 1821 but each of these is a separate date division. This function of the date division to mark a semantic unit is reinforced by the cases of thematic discontinuity between passages separated by identical date markers.[23] In the TEI, the date label replicates Leopardi's date marker and has a range to reflect Leopardi's use of compound dates (for example, "14.-15. Luglio. 1823") or of multiple date markers written in the body of the same paragraph adding layers to the same reflection,[24] as well as of the time period of composition of the undated fragments (mostly in the first 100 pp.). These correlations between theme, paragraph, and chronology allow to compute thematic continuities and discontinuities across the collection.

Although Leopardi does not mark the paragraphs, they are clearly indented and he counts them in directing his intratextual references, as with one of the references here to the first paragraph on p. 1212 ("V. p. 1212. capoverso 1"). Each paragraph has been assigned an xml:id which serves as the target of most intratextual and index references. In identifying the targets, close reading was employed to ensure coherence with Leopardi's count or when he does not specify a paragraph, as in the first reference on p. 1155,3 to p. 1117 ("Alla p. 1117") which is part of the first paragraph beginning on p. 1116. This process is sometimes facilitated by reciprocal references, especially when there are multiple references in the same paragraph added in the margin or inline.

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[23]   One example are the four different date divisions on July 4, 1822 which altogether consist of five paragraphs indexed under twelve unique themes from the 1827 index, giving a glimpse of the diverse subjects occupying the thinker that day.

[24]   Among the most anomalous in this respect is the short paragraph 2664,3 which has seven date markers written over three days.

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<div>
    <dateline>
        <date rend="11. Giugno 1821." from="1821-06-11" to="1821-06-11"/>
    </dateline>
    <p xml:id="p1155_3" n="1155,3">
        <ref type="paragraph" target="p1116_1" subtype="subordinate">Alla p. 1117</ref>.
        Nostri soli continuativi sono i verbi <hi rend="underline">venire</hi> e
        <hi rend="underline">andare</hi> uniti a' gerundi de' verbi denotanti l'azione
        che vogliamo significare, come <hi rend="underline">venir</hi>
        <hi rend="underline">facendo</hi>, <hi rend="underline">andar</hi>
        <hi rend="underline">dicendo</hi>. I quali modi però hanno meno forza,
        e meno significazione della continuità, che non ne hanno propriamente
        i continuativi latini. E dimostrano una languida continuazione della cosa,
        <note place="inline">un'azione più languida, e meno continua, ed anche interrotta;
            e di più un'azione meno perfetta.
        <ref type="paragraph" target="p1212_1">V. p. 1212. capoverso 1</ref></note>.
        <note place="inline"><handShift new="H1"/>e
            <ref type="paragraph" target="p2328_1">p. 2328.</ref></note>
        <handShift ana="main"/><date>(11. Giugno 1821.)</date>.</p>
</div>
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**Figure 1** *Zibaldone*, p. 1155, paragraph 3. Manuscript facsimile (Ballerini, Ceragioli 2009) and *Digital Zibaldone* dataset, TEI markup

Some intratextual references are given a subtype describing the kind of relatedness they establish. In this example, the first reference is described as "subordinate," which is inferred from Leopardi's formulaic statement in the beginning of c. 14% of all paragraphs to indicate the continuation of a previous fragment. Thus, p. 1155,3 could potentially function as a footnote to p. 1117 (p. 1116,1) written a week and 38 pages later, however it splits the linear chain of reference into a network with references to two other locations in the manuscript – p. 1212,1 and p. 2318 (both subordinated to p. 1155,3), which in turn link to their own "subordinate" paragraphs **[fig. 2]**. These two references appear as additions at the end of the fragment and are nested in two separate inline notes **[fig. 1]**.
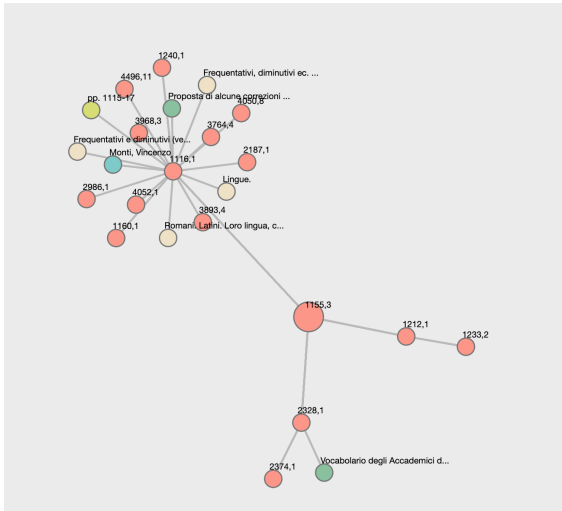
Since the various kinds of additions often contain cross-references, as in this example, and those in the margin are sometimes reference targets (with an xml:id), they are encoded as notes with a location (interlinear, inline, margin, foot), which allows to represent statistically and explore Leopardi's method of text analysis and semantic annotation in terms of chronology and perspective – whether there are correlations between establishing connections during the composition of the text (for example, when references are written in the middle of a sentence), as continuation of previous fragments, during re-reading, during the indexing stage, between fragments with reciprocal references and those that are only outgoing or incoming. For the purpose of generating such statistical data, the manuscript was consulted to record ink variations for notes containing paragraph references which are not always evident in the black and white images of the facsimile editions. The inline notes are typically written after or near the date marker, but sometimes there are multiple consecutive inline and marginal notes and their chronological layering can only be determined by the differences in pen and ink. Thus, the last reference in this example (to p. 2328) is in a separate inline note and marked with a different handwriting style from the rest of the text, but previous editions either do not make a distinction or represent both consecutive references (p. 1212 and p. 2328) as written in the same inline addition. This information can also be inferred from the fact that both fragments are "subordinate" to p. 1155,3 and the outgoing references on p. 1155,3 were likely written at the time of their composition.

## 3.2 Aligning the Semantic Layers of Intratextual References and Thematic Indexes

The document analysis and TEI markup have benefited from Leopardi's rigorous attention to form in composing and editing the text. He adopts two main layers of annotation for navigating the fragments according to their semantic order: the map of intratextual references which are employed to indicate their generative relationship, to record associations during composition as ideas are elaborated further, and to establish them in retrospect; and the indexes which add thematic metadata to the associations and thereby exponentially increase the density of the network. For instance, p. 1329,3 has no direct intratextual references, but it is listed under several headings from the 1827 Index which thus relate it to 69 paragraphs in an extended thematic network on the subjects of grace, naturalness, affectation, etc. **[fig. 3]**. In the network visualisation clearly emerge those paragraphs between the several clusters which have most themes in common with the central node. The significance of the number of paragraphs listed under each index heading for determining the hierarchy of thematic foci of a fragment is evident in this paragraph which has no less than six different headings[25] but "Sgraziataggine" (Gracelessness) would be most applicable because it has no other references. By overlaying the reference network within the text with that of the index headings, we can compute the extent to which direct references overlap with those in an index theme, so as to better define their weight in the network. Within these two authorial methods of text analysis, the structural organisation of the collection suggests additional parameters for determining a hierarchy of semantic relatedness which will serve the modelling of the *Zibaldone* ontology.[26]

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**25**   The index headings "Pudore. Verecondia" and "Verecondia. Pudore" are redundant, as they list the same two paragraphs.

**26**   The first categorisation of these relationships was presented at the *Open Annotation Collaboration Workshop Phase II* (Chicago, March 2011) and has been developed in greater detail than can be discussed here.

## 15. Luglio 1821.

ⓘ

←Affettazione.  ←Grazia.  ←Natura e Fortuna; provvidenza ed arte.

←Naturalezza.  ←Pudore. Verecondia.  ←Sgraziataggine.

←Verecondia. Pudore.

**[1329,3]** Non è mai sgraziato un fanciullino che si vergogna, e parlando arrossisce, e non sa stare nè operare nè discorrere in presenza altrui. Bensì un giovane poco pratico del buon tratto, e desideroso di esserlo, o di comparirlo. Non è mai sgraziata una pastorella che non sa levar gli occhi, trovandosi fra persone nuove, nè ha la maniera di contenersi, **1330** di portarsi ec. Bensì una donna, egualmente o anche meno timida, e più istruita, ma che volendo figurare, o essere come le altre in una conversazione, non sappia esserlo o non abbia ancora imparato. Così lo sgraziato non deriva mai dalla natura (anzi le dette qualità naturali, sono graziose sempre ec. ec.), ma bensì frequentemente dall'arte, e questa non è mai fonte di grazia nè di convenienza, se non quando ha ricondotto l'uomo alla natura, o all'imitazione di essa, cio è alla disinvoltura, all'inaffettato, alla naturalezza ec. E l'andamento necessario dell'arte, è quasi sempre questo. Farci disimparare quello che già sapevamo senza fatica, e toglierci quelle qualità che possedevamo naturalmente. Poi con grande stento, esercizio, tempo, tornarci a insegnare le stesse cose, e restituirci le stesse qualità, o poco differenti. Giacchè quella modestia, quella timidezza, quella vergogna naturale ec. si trova bene spesso in molti, non più naturale, chè l'hanno perduta, ma artificiale, chè mediante l'arte appoco appoco e stentatamente l'hanno ricuperata. (15. Luglio 1821.).

«15 Luglio 1821.                                                    16. Luglio 1821.»
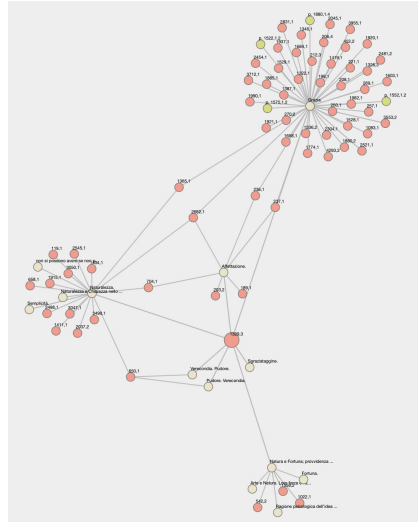
**Figure 3**  *Digital Zibaldone*, p. 1329,3 with information box showing the index themes under which it is listed and a network graph of its index headings along with their paragraph references. https://digitalzibaldone.net/?go=1329%2C3

### 3.2.1     Target Directedness and Chronology

There is a significant number of paragraphs that could be described as strictly (no other references) or partially subordinate to their targeted fragment. This typology of explicit directedness would have the highest weight in a network, and, as discussed in the previous section, can be inferred from the location of the references. When the data of the intratextual network is compared with that of the thematic indexes, these relationships can be evaluated further, such as whether the subordinate paragraph shares index themes with the parent, in order to examine how Leopardi constructs his arguments and potentially identify unique combinations of thematic perspectives. The greater part of numeric references establishes non-hierarchical relationships of two typologies: those written in the middle of a sentence or paragraph and those written at the end or as inline or marginal notes. These could be evaluated statistically and through close reading to explore whether references written in the middle of a paragraph refer to fragments of relative spatial and chronological proximity and whether their mode of analogy differs in its logic from that of references written in the margins. While some subordinate references are reciprocal, many fragments have only outgoing or incoming references. Although authorial intentionality may not play a role in lending value to reciprocity, the directedness of the edges is

a main category that could be evaluated in terms of semantic relatedness. Incoming references are surely easy to miss in reading the text sequentially since they may be written much later, therefore on the website they appear in the paragraph information window which aggregates first-generation references.

### 3.2.2 Target Specificity

Besides referencing numbered locations and on occasion (102 refs.) the titles of index headings (i.e., "see my theory on pleasure"), Leopardi directs his references with verbal indications to the following or preceding paragraphs or with variations of the phrase "as I have said elsewhere". These indefinite targets are assigned numbered paragraphs with editorial responsibility,[27] but while those in the immediate vicinity can be treated at the same semantic level as defined targets, the editorial additions identifying possible targets would have weaker value. The impact of distinguishing between explicit and implicit authorial references is evident in the large number of editorial targets which more than doubles the specified targets in the *Zibaldone*. Leopardi's vagueness and the fact that these references often repeat or come as a sequence of consecutive and non-consecutive targets, also suggest that they are directed at a more general level of discourse and address a topic more comprehensively, comparable to the lists of paragraphs under the index headings. The alignment of intratextual references and indexes allows to generate statistics on the frequencies of thematic subjects pertaining to the editorial references and to the paragraph sequences respectively, and so to further define their relevance in the network.

### 3.2.3 Target Granularity

While the dominant level of target segmentation both in the main text and in the indexes is the paragraph, some references point to smaller units, namely additions in the margins which contain either a reciprocal reference or the relevant text, and in a few cases the lines on a page, suggesting strong relevance. Conversely, some references address paragraph or page sequences (i.e. "p. 2171,1-p. 2177,1"), and the indexes also reference clusters of non-consecutive paragraphs on a page (i.e. "p. 4101,1.2.5.7.8"). A more general relationship combin-

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**27**   The Pacella edition (Leopardi 1991) and the English translation (Leopardi 2013b) have been consulted for suggestions on many of the verbal references and included with a responsibility tag referring to the respective edition.

ing granularity and specificity is found in the authorial and editorial sequences with open-ended targets (a page number and the following). These aggregates are encoded as sequences and listed as individual paragraphs.

### 3.2.4    Parallel Targets

The relatedness among successively written references to non-consecutive fragments ("See p. 2826 and the following thought, and p. 3037") is evident in a reading context,[28] however it could be lost in the computational processing if they are simply three edges among many of the node that lists them, and specifying their degree of semantic relatedness is especially useful for long paragraphs with numerous targets, as in this example of p. 2928,2 which has 19 authorial outgoing references.

A similar principle of relatedness is employed by the lists of references in the index headings which are thus related by virtue of their thematic metadata. As discussed above, these relationships are generally weaker than those established by the direct intratextual references, and to some extent they would overlap. We can qualify them further based on the layout of the headings. The main alphabetical index of 1827 demarcates three types of semantic relationships which tend to correspond to their number of paragraphs: headings, subheadings, and references to headings written on index cards (abbreviated in the scholarly literature as PR) which Leopardi did not copy because of their excessive length. Another level of semantic relatedness is established by Leopardi's references between index headings in 20% of those in the 1827 index. These can be categorised further according to the typology of relation they indicate, among which that of synonymy, antonymy, hypernymy, or between persons. The most general categories are offered by the headings of the so-called PNR index which distribute 2,533 targets over eight topics suggesting books titles, such as a treatise on human passions and qualities, a theory of the arts and letters, a handbook of practical philosophy, linguistic scholarship. The two short partial indexes, in which Leopardi experiments with indexing methods, can sometimes be redundant but also add extensive thematic descriptions of the fragments.

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28   In this example the consecutive references are also explicitly cross-referenced with each other, but this is not always the case.

### 3.3 Disambiguating Bibliographic Sources with Authority Databases

The complexity of thematic relations in the *Zibaldone* acquires another dimension through the several thousand references to texts and authors with which Leopardi engages and which are often at the centre of his inquiry. The TEI encoding identifies bibliographic references, titles, persons, quotes, and places as elements relevant to the bibliographic networks, and integrates Wikidata and/or VIAF identifiers for persons, works, and places [fig. 4].[29] This information is aggregated in editorial indexes which include links to the record in the authority files; an online encyclopaedia record; references to their paragraph and index locations; dates of birth and death for the persons; authors and editors for the works. Each title record also links to open access resources on the web that have the full text of the work, in order to create a virtual library for consulting these and, when possible, Leopardi's own editions. Additional bibliographic information included in Leopardi's reference, such as volumes, subtitles, page numbers, date and place of publication, and publisher, will eventually be integrated from the spreadsheet used for preparing the data.

```
<person xml:id="Q3541151" role="author" sex="0" sortKey="Manfredi">
 <persName>Manfredi, Eustachio</persName>
 <persName xml:lang="it">Eustachio Manfredi</persName>
 <persName xml:lang="en">Eustachio Manfredi</persName>
 <link type="wikidata" target="https://www.wikidata.org/wiki/Q3541151"/>
 <link type="biography" target="https://it.wikipedia.org/wiki/Eustachio_Manfredi"/>
 <link type="1827index" target="ind436" rend="Manfredi. Sua Lirica."/>
 <link type="VariaIndex" target="var45" rend="Giudizio sopra la lirica del Manfredi."/>
 <link type="ref" target="p28_2" rend="Manfredi"/>
 <link type="ref" target="p28_2" rend="Manfredi"/>
 <link type="ref" target="p28_3" rend="Manfredi"/>
 <link type="ref" target="p4264_1" rend="Manfredi"/>
 <birth when="1674" when-custom="+1674-09-20T00:00:00Z"/>
 <death when="1739" when-custom="+1739-02-15T00:00:00Z"/>
</person>
```

**Figure 4**  *Digital Zibaldone* dataset. TEI encoding of a person record

Whereas Leopardi's bibliographic references often contain very specific information about the editions he is using, many quotes are not explicitly marked and there are numerous cases of intertextual derivation (quotes within quotes, references within references) which can be difficult to define because he frequently employs secondary literature and reference materials: anthologies, lexicons, articles in

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**29**  More than a hundred persons and works are not present in either database, and Wikidata ids will be created for them. The editorial process was based on reconciliation of the data in OpenRefine and entailed manual verification of all records and identification for many that were not suggested by the software.

journals translated from other journals, critical editions of classical authors by multiple editors, book reviews. Disambiguating the relationships of citation through an ontology in order to articulate and visually represent their extended chains of derivation becomes indispensable, especially for references to the works of ancient authors which have been transmitted through encyclopaedias, biographers, and editors.

The difference in the presentation of intratextual relationships between the narrative style of a print edition's apparatus embedded in the sequential reading of the text and the modular presentation of the digital environment which disambiguates and abstracts each record from its narrative stream in order to chart its relationships across the collection, can be of significant impact to the reader of a fragmented text which lends itself to numerous entry points and selective reading. Even at the basic hypertext interface, the identification of a work from Leopardi's abbreviations and incomplete bibliographic references and the immediate access to its text already present in a synthetic form a lot of implicit and distributed information. The complete reconstruction of Leopardi's network of intertextual references through linked data and semantic ontologies would create an augmented reading experience, in which their relations can be queried at various levels of granularity according to multiple parameters across and beyond the dataset. Wikidata, for example, allows to extract properties for persons and works, which can be harvested to create comprehensive charts with the genre of the work, its language and date of inception, and for persons their occupation, dates of birth and death, language, gender, country of origin, field of work, etc., and thereby guide various research questions.

## 4 Synthetic Frameworks for Exploring the Semantic Relationships of the Fragments

The *Digital Zibaldone* website interface offers navigation and re-search menus which allow access to the relational organisation of the fragments through several synthetic frameworks, without requir-ing data processing competencies.

### 4.1 Navigation Settings and Paragraph Information Box

The research platform presents the text by date divisions with a cal-endar menu, and employs Navigation Settings allowing a modular se-lection of manuscript markers and editorial additions to suit differ-ent reader purposes – quotes, for example, are italicised and can be easily distinguished in reading the text; the additions are integrated according their indicated position in line of text but their markers can be shown or hidden; rhetorical underlining can be shown only, etc. One of these options is an information box linked to each para-graph displaying its first-generation references with incoming and outgoing paragraphs, index themes, persons and works mentioned, to show at a glance the topics of that fragment, and to direct the read-er to its most relevant paragraphs, to Leopardi's thematic indexes, and to the persons and works indexes **[fig. 5]**.



**Figure 5** *Digital Zibaldone*, p. 362,1. Navigation Settings and Information Box. `https://digitalzibaldone.net/?go=362%2C1`

## 4.2 Thematic Index Aggregates and Related Headings

Each index heading page **[fig. 6]** aggregates a list with hyperlinks to its paragraph references and to any sub-themes and referenced themes; the text of all referenced paragraphs (not displayed entirely); a statistical chart of the frequencies of the other index headings that also list these paragraph nodes; and a first-generation network graph (not displayed). The limitations of the MySQL database are most evident in this interface which slows down the dynamic harvesting of the data; alternatively, for the longer lists, such as PR and PNR, the statistical data is displayed as pre-generated images. A future addition to the related themes frequency statistics will be a list with links to the paragraphs that each of these headings have in common.



Figure 6    *Digital Zibaldone*, Index of 1827, "Affettazione. Affection".
https://digitalzibaldone.net/theme/ind3

## 4.3 Network Graph Generation and Visualisation

At a more comprehensive level of aggregation the web platform allows to generate the network graph of first and second-generation relations of any intratextual references (paragraph, note, sequence), index themes, persons, and works, or a combination thereof, through a Node ID query by using their xml:id. While the interface for this query is under development at the time of writing, it is accessible at `https://digitalzibaldone.net/?a=graph` and was used to automatically generate the graphs in figures 2, 3, 7, and 8. The data can also be exported for custom manipulation in GEXF, GraphML, CSV, and JSON formats. A future functionality of this interface is a custom selection of types of nodes, which will allow users to pre-define the extent of the network according to their research criteria. The computational and diagrammatic challenge is to filter and arrange the interrelations according to a hierarchy of relevance in order to be able to follow intersecting paths through the extent of the network that is meaningful. For instance, including all the references from the more general PNR and PR index headings or some reference works, such as Forcellini's *Lexicon* (the title with highest frequency), may be unfeasible to represent coherently and irrelevant at the level of paragraph nodes.[30]

Figure 7 shows a second-generation network of a single paragraph, 2619,2 (large red node in the centre), which includes paragraphs, paragraph ranges, index themes, persons and works mentioned **[fig. 7]**. The graph allows to quickly identify points of connection among the thematic clusters for further exploration: 1570,1 (to the left of the main node) is not directly related to the main node (in fact, it lacks direct paragraph references altogether, as can be seen from its info box), but it is the connecting point between two of the main node's index themes. Similar is the case of 3661,1 (to the right of the main node) which shares a direct incoming reference and an index theme with the main node, while checking its info box or extending the network to another generation shows that its immediate links are limited to these two, thus reinforcing its potential relevance to the main node.

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**30**   This is evident in many examples on linguistics: 2688,1 has a single outgoing reference, two authorial and four editorial incoming ones, but is inscribed in one very general PNR theme, one large PR and one 1827 index sub-theme, which altogether produce 1375 nodes and 1730 edges. In this case focusing on the sub-heading and the references from the text would produce more meaningful results.
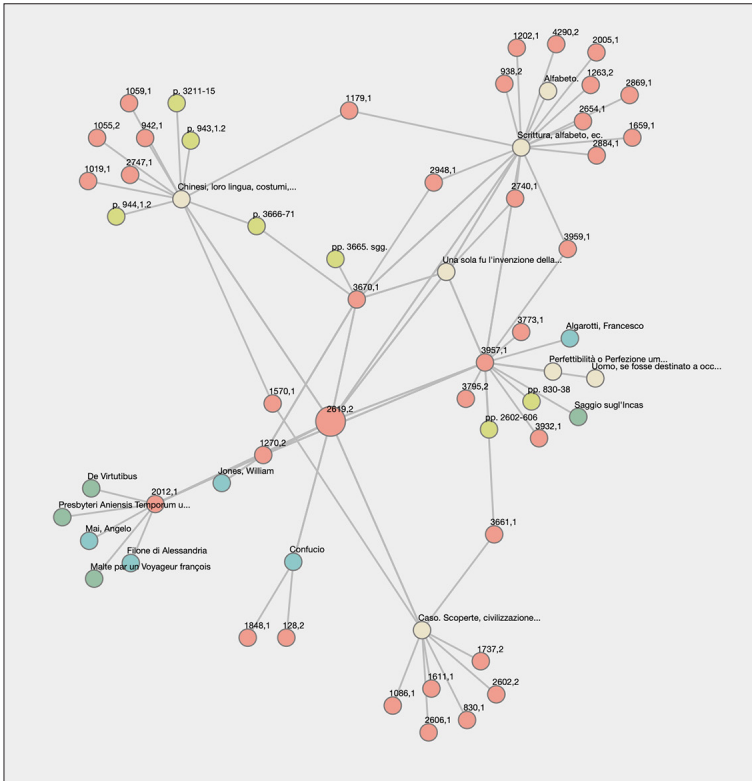
While all of the bibliographic data is not yet fully integrated in a user-friendly interface, statistical frequencies show, unsurprisingly, that after the reference volumes of Forcellini, Du Cange and Accademia della Crusca, the most frequent presence is that of Cicero and Virgil, followed by Lucian, Plato, and Homer. However, it is only when we connect the authors to their works, to the contexts offered by the indexes, as well as to the chronology of the text, that we can begin to evaluate to what extent and how a particular work or author influences Leopardi's thought. The network graph **[fig. 8]** of Homer's *Iliad* shows several layers of interrelatedness: the paragraphs in which the poem is mentioned, the paragraphs to which they are directly referenced, persons, other works mentioned in these paragraphs, and the index themes of the paragraph nodes. The graph should be browsed dynamically to zoom in on different areas which can serve as entry points into the text for researching the thematic contexts in which the work is mentioned and how it is related to other works in Leop-

ardi's thought. We can easily identify those paragraphs in the immediate proximity which have none or few other themes and therefore likely address the main node most specifically – basic information which, however, cannot be gathered in the discursive space of the text. One of the closest paragraphs links to Cicero's *De Divinatione*, in which Leopardi explores the intertextual relationship of translation. Expected correlations at a glance are the very close relation of the *Iliad* to the *Odyssey* and to scholarship on Homer, but how it is connected in the same paragraph (4406,2) to a volume on Finland and its inhabitants raises curiosity. In this case we cannot see an overview of that paragraph's index themes because the last 231 pages are not indexed by Leopardi – and that is where user annotation would begin. On the other hand, outlier themes, such as "Sacerdozio presso gli antichi" (Priesthood among the ancients) on the far right of the graph, can suggest an isolated thematic focus which in this example Leopardi explores in the context of several other works. Statistical charts and networks graphs, thus, can lend concreteness and dimensionality to relationships that may be lost in the narrative form of the bibliographic reference and certainly are very difficult to discover in the fragmented space of the text.
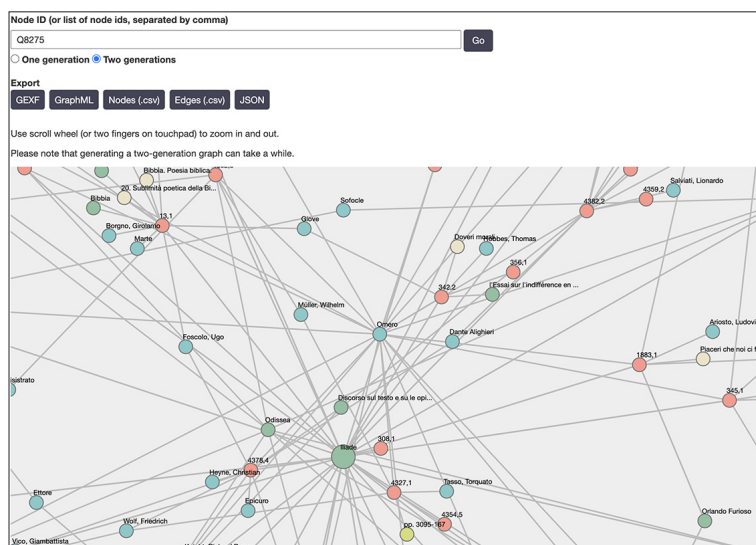


**Figure 8**   Network graph of Homer's *Iliad* mentioned in the paragraphs of the *Zibaldone* in relation to their index themes and other works (see https://digitalzibaldone.net/?a=graph)

# 5    Conclusion

The design of the interface and the refinement of the dataset cannot be completely developed without feedback from user experience with extensive scholarly research on the text. Conversely, in reconstructing the semantic relationships in the *Zibaldone* and determining the parameters of a research query, a researcher should be able to generate exploratory statistical information about the features of the dataset, or conduct text analysis with digital methods independent of the authorial interpretation, such as topic modelling or sentiment analysis. The next phase of the project will develop towards building the semantic edition and facilitating the mediation between development and user community. The completed dataset will be made available in a public repository; the editor will publish onsite tutorials and research studies illustrating the usability of the research platform; the website will integrate a user annotation environment to allow for dynamic engagement with the text which extends the author's semantic annotations. The platform thus aims to become a collaborative workspace for sharing the results of research queries and expanding the critical apparatus of the edition, for example with secondary bibliography on the text linked to the referenced fragments. The objective to afford collective annotation that can target the collection at various levels of semantic granularity and to create a platform for scholarly communication is motivated by the processual and open-ended nature of Leopardi's discourse, and has been informed in particular by the notions of "knowledge site" (Shillingsburg 2006), "fluid, co-operative and distributed editions" Robinson 2004), "dynamic contextualization" (D'Iorio 2016), "reusable third-party annotations" (Koolen, Boot 2020), among other scholarly contributions to the design of a "social edition" (Siemens et al. 2012; Price 2016).

   Many levels of discursive mediation are needed for the methods of close and distant reading to productively inform one another, but the fragmented discourse of the *Zibaldone* lends itself precisely to a performative reading that requires both: in the process of configuring its constellations of insights – perhaps arrested by a *colpo d'occhio* – we also cultivate the phenomenological attention that drives its hermeneutic project. And as we endeavour to render our datasets machine-readable and interoperable, the design of inclusive interfaces to augment our scholarly and readerly primitives demands equal attention. This vision for the *Digital Zibaldone* can only heed Leopardi's own aspiration for mediating his encyclopaedic personal knowledge base to the general public:

Ora son dietro ad ordinare i materiali della Enciclopedia. Spero che sarà un'Opera che si farà leggere per forza ad ogni sorta di persone. (Leopardi 2013a, 1345)[31]

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31 "Now I am after putting in order the materials for the Encyclopaedia. I hope that it will become a Work that naturally will be read by all kinds of people" (Author's transl.). Leopardi shared this objective in a letter to his editor Stella on July 13, 1827, two days after starting the indexing of the *Zibaldone*.

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