Discourse annotation guideline for low-resource languages

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Complete List of Authors:	Varga, Francielle; University of São Paulo, Institute of Mathematical and Computer Sciences; Federal University of Minas Gerais, Schmeisser-Nieto, Wolfgang ; Universitat de Barcelona Rabinovich, Zohar ; University of Southern California Pardo, Thiago; University of Sao Paulo Benevenuto, Fabrício ; Federal University of Minas Gerais
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ARTICLE

Discourse annotation guideline for low-resource languages

Francielle Vargas[1]*, Wolfgang Schmeisser-Nieto[4], Zohar Rabinovich[2], Thiago A. S. Pardo[1], and Fabrício Benevenuto[3]

[1]Institute of Mathematical and Computer Sciences, University of São Paulo, Brazil
[2]Viterbi School of Engineering, University of Southern California, United States
[3]Computer Science Department, Federal University of Minas Gerais, Brazil
[4]Department of Linguistics, University of Barcelona, Spain
*Corresponding author. E-mail: franciellealvargas@usp.br

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Abstract

Most existing discourse annotation guidelines have focused on the English language. As a result, there is a significant lack of research concerning computational discourse level-language understanding and generation for other languages. To fill this relevant gap, we introduce the first discourse annotation guideline using the Rhetorical Structure Theory (RST) for low-resource languages. Specifically, this guideline provides accurate examples of discourse coherence relations in three romance languages: Italian, Portuguese, and Spanish. We further discuss theoretical definitions of RST and compare different artificial intelligence discourse frameworks, hence offering a reliable and accessible survey to new researchers and annotators.

1. Introduction

The word "discourse" is derived from the Latin prefix dis- meaning "away" and the root word *currere* meaning "to run", and according to word etymology, the discourse describes thoughts in words, responsible for the interpretation of the communicative events in context (Nunan 1993). Discourse analysis comprises a dynamic notion that embraces various linguistic components of texts (morpho-lexical, syntactic, semantic, and pragmatic), as well as paralinguistic and extralinguistic components (punctuation, prosody, paragraphing, links to the contextual setting, short and long-term memory) (DuBois 2003). As claimed by Hovy (1993b), the content of a discourse derives from different sources, and a surface-level structure is required to comprise them all. The major sources for the content of discourse are the semantics of the message, the interpersonal Speech Acts, the "control" information included by the speaker to assist the hearer's understanding (namely information signaling theme, focus, and topic), and knowledge about stylistic preferably (Grosz 1987). Considering this scenario, the very assumption underlying the definition of discourse may be applied by different areas. Indeed, discourse analysis comprises concerns across humanities and social sciences (Fairclough 2003), besides computer science, more specifically the Artificial Intelligence (AI) dealing with its sub-area called Computational Linguistics (CL) (Braud et al. 2020 2021 2022; Strube et al. 2023; Rohde et al. 2018; Trnavac et al. 2016; Androutsopoulos et al. 2013; Jurafsky and Martin 2009; Hovy 1993a 1992; Fawcett and Davies 1992).

[1]**Warning**: This paper may contain examples of offensive stereotypes and fake news.
[2]**RST community and additional resources**: http://www.sfu.ca/rst/index.html

In AI literature dealing with computational linguistics, Jurafsky (2020) argues that language does not normally consist of isolated, unrelated sentences, but instead of collocated, structured, coherent groups of sentences, and a coherent structured group of sentences is named discourse. Moreover, Ramsay (2005) defines discourse in CL as an extended sequence of sentences produced by one or more people to convert or exchange information. According to Moore and Wiemer-Hastings (2003), the models of discourse structure and processing are crucial for constructing computational systems capable of interpreting and generating natural language. The authors also argue that discourse research in computational linguistics and artificial intelligence encompasses spoken and written discourse, monologues, dialogue (both spoken and keyboarded), and the context created by prior utterances affects the current one regardless of which participant uttered it. Lastly, research on discourse focuses on two fundamental questions within computational linguistics and artificial intelligence. First, what information is contained in extended sequences of utterances that go beyond the meaning of the individual utterances themselves? Second, how does the context in which an utterance is used affect the meaning of the individual utterances or parts of them? (Moore and Wiemer-Hastings 2003).

Ramsay (2005) claims that discourse-aware models must be built incrementally. For example, a wide range of discourse sentences accomplishes reference to concepts of the world, which were already known to the reader in the discourse. The incremental function of natural language to knowledge construction provides benefits to referring expressions for following tasks. This tasks are issues into computational linguistics related to discourse-level phenomena, such as **anaphora**, which even though there is notoriously difficult to find a definition, according to Castagnola (2002), consists of a reference to entities mentioned previously in the discourse; **pronouns**, which are used to refer to items that have been mentioned very recently and also it may be recognized based on very simple characteristic properties; **coreference** (also called co-reference), defined by Jurafsky and Martin (2009) as two noun phrases that refer to the same entity, and coreference resolution, therefore, is the task of identifying the sets of noun phrases that refer to the same entity; **theme**, according to Halliday (1995), consists of a sentence as its first phrase, being the rheme the remainder; **rheme**, consists of an element responsible for providing the cohesion of a sentence as a communicative whole Bussmann (1998); **topic** and **focus**, such as claimed by Ramsay (2005) are different devices than theme and rheme, although they achieve similar effects, mainly if we consider intonation (or its typographical equivalents); **presupposition** and **entailment** are types of inference, presupposition, differently entailment present a wide range of computational and linguistic proprieties not exhibited by the general class of inferences Mukherjee and Joshi (2013); **implicature** (also called conversational implicature), is a pragmatic concept introduced by British philosopher (Grice 1975), which showed how meaning expressed by the speaker (speaker meaning) in conversation, not directly encoded in the words, maybe inferred (recognized) by the hearer; **discourse coherence**, as defined by Jurafsky (2020), consists of a coherent structured group of sentences, in which the word "coherence" is used to refer to the relationship between sentences that makes real discourses different than just random assemblages of sentences. Besides that, according to Mann et al. (1992), theories of discourse coherence, which were broadly defined as "the sense of overall unity of a text", are often used as descriptive tools in the analysis of coherence.

Discourse and Pragmatic literature have been providing a set of frameworks in natural language processing, such as **Discourse Representation Structure (DRS)**, which consists of a set of discourse referents - corresponding to the set of individuals mentioned in the sentence being interpreted - and a set of conditions which are propositions involving those referents; The **Penn Discourse TreeBank (PDTB)** (Prasad et al. 2008), which was proposed on the simple idea that discourse relations are grounded in an identifiable set of explicit words or phrases (discourse connectives) or simply in sentence adjacency, it has been taken up and used by many researchers in the NLP community and more recently, by researchers in psycholinguistics as well. As claimed

by Jurafsky (2020), PDTB consists of labeling corpus lexical-aware grounded composed of annotation of discourse coherence between text spans, they were given a list of discourse connectives, words that signal discourse relations, such as *like because*; discourse connectives such as *although, when, since, or as a result, among other*. Moreover, the most common discourse organization framework used in CL (Jurafsky 2020), the **Rhetorical Structure Theory (RST**) (Mann and Thompson 1987), is defined as "a theory to help us understand texts as instruments of communication". Therefore, the RST provides a framework for investigating relational propositions, which are unstated but inferred propositions that arise from the text structure in the process of interpreting texts (Mann and Thompson 1987). Even though there is a lack of available comprehensive RST literature reviews, most recently, Hou et al. (2020)provide a Rhetorical structure theory comprehensive review, in which theory, parsing methods, and applications are well-discussed and presented.

As claimed by Passonneau and Litman (1997), natural language systems rarely exploit discourse structure and linguistic and cultural devices due to scarce consideration in the development of data resources and methods concerning other languages. This predominance results in a lack of research and advances for low-resource languages. Hence, we introduce the first discourse annotation guideline using the Rhetorical Structure Theory framework for low-resource languages. We further present a summarized survey related to the main definitions concerning discourse in AI dealing with CL. We also discuss theoretical aspects that encompass the RST framework. Specifically, **our guideline describes 24 (twenty-four) discourse coherence relations in three romance languages: Italian, Portuguese, and Spanish**. We hope to contribute to the advancement of research and NLP systems development focused on discourse-level-language understating and generation for low-resource languages.

2. Low-Resource Languages

According to Khan et al. (2023), natural languages may be classified into two main categories: **low-resource Languages (LRLs)** and **high-resource languages (HRLs)**. More broadly, HRLs consist of languages with a wide range of available data resources that enable machines to learn and understand natural languages. For instance, English is a well-resourced language as compared to other spoken languages (Khan et al. 2023). On the other hand, LRLs consist of languages with scarce or no resources available, which is defined by Cieri et al. (2016) as less studied, resource-scarce, less computerized, less privileged, less commonly taught, or low-density languages. Taking into account this scenario, as claimed by Khan et al. (2023), most of the European languages are severely under-resourced, and propose that a coordinated, large-scale effort has to be made in Europe to create the missing technologies and transfer these technologies to the languages faced with digital extinction. Furthermore, Latin American Languages including indigenous languages are also considered under-resourced languages (e.g. Brazilian Portuguese, Latin American Spanish, etc.)

Recent studies on low-resource languages have been providing data language resources for languages that lack them we have seen terms such as *low density*, *less commonly taught*, *underresourced*, *less resourced* and *low resource* (Cieri et al. 2016). Low density here consists of languages with few online or computational data resources exist (Megerdoomian and Parvaz 2008). On the other hand, less commonly taught are world languages that are underrepresented in the education system[1]. The terms under-resourced, less-resourced, or low-resource seem to have similar means by literature. Furthermore, Wiemerslage et al. (2022) argue that low-resource language is defined via the metric of Gross Language Product (GLP). It is the product of the number of native speakers of the language in any country and the country's per capita Gross National

[1]National Council of Less Commonly Taught Languages (NCOLCTL).

Product. Note that this definition suffers influence from the social-political and economic context of language once that "low" definition is liked relatively to some expectation based on the "importance" of the language (Megerdoomian and Parvaz 2008). Low-resource languages are neglected by NLP literature. As a result, most discourse-aware data resources are produced in English. To fill this relevant gap, wee introduce the first discourse guideline using RST for low-resource languages. Specifically, this guideline provides examples of RST coherence relations in three different romance languages: **Italian**, **Portuguese**, and **Spanish**.

3. RST Annotation Guideline

We introduce the first discourse annotation guideline using Rhetorical Structure Theory (RST) focused on low-resource languages. The RST was originally proposed for computer-based authoring and natural language generation, however, this powerful framework has been used ever since in a wide variety of NLP tasks. According to Mann and Thompson (1987), RST consists of a theory to help us understand texts as instruments of communication. Hence, it provides a framework for investigating relational propositions, which are unstated but inferred propositions that arise from the text structure in the process of interpreting texts.Mabona et al. (2019) claim that the RST is a model that represents a document as a tree of discourse units recursively built by connecting smaller units through rhetorical relations.

This guideline focuses on low-resource languages, mainly Italian, Portuguese, and Spanish. e used three different datasets: DETESTS[2] composed of comments in Spanish from news articles segmented into 5,629 sentences containing hate speech against immigrants; Deceiver[3] composed of 600 news articles and fake news in Portuguese and English; and Italian-RST-News[4] extracted from a relevant media outlets in Italy, as well as the Wikipedia.it. In this discourse annotation guideline, we extracted examples from these datasets in different languages and domains (e.g. news articles, fake news, and hate speech comments containing stereotypes). Observe that, even though RST has been originally applied to news articles, we aim to show the feasibility of the RST framework to be applied in different domains and discourse structures. Nevertheless, each domain presents its challenges, mainly the domain of web comments due to different noise and grammar inadequacies. Therefore, we are proposing well-presented discourse coherence relations proprieties and accurate RST guidelines to support researchers and annotators to annotate discourse structure using RST in different domains.

According to Mann and Thompson (1987), the fundamental mechanisms to annotate text and generate RST trees are: **segmentation**, **nuclearity**, **schemas**, and **structures (coherence relations)**, described as follows.

3.1 Segmentation

Text segmentation is a fundamental task in natural language processing. In RST, there are two main definitions for text segmentation: **text spans** and **elementary discourse unit**. A text span is an uninterrupted linear interval of text. An elementary discourse unit (EDU) consists of an elementary discourse unit. Finally, the task of discourse segmentation consists of segmenting an uninterrupted linear interval of text into a sequence of elementary discourse units (EDUs)(Li et al. 2018). Each utterance of an EDU contributes to the communicative relevance of the preceding utterances or constitutes the onset of a new unit of meaning or event that subsequent utterances

[2] https://github.com/alarca94/detests

[3] https://github.com/franciellevargas/Deceiver

[4] https://github.com/franciellevargas/Italian-RST-News

may add to (Passonneau and Litman 1997). In the same settings, discourse models as multiutterance EDUs and structural relations among them, yield a discourse tree structure (Grosz and Sidner 1986).

According to Hobbs (1979) segmental structure is an artifact of coherence relations among utterances, such as elaboration, evaluation, cause, and so on. Elementary discourse unit (EDU) in RST is an atomic semantic unit, similar to a clause in a sentence, and may also be considered clause-like units that serve as building blocks for discourse parsing (Li et al. 2018). Although the types of discourse units being coded and the relations among them vary (Passonneau and Litman 1997), to identify EDUs is necessary to classify the prominent and complementary text spans into a sentence or document according to the writer's intention. For instance, we first should identify the most prominent and important text segment in the sentence, then, the most complementary text segment. As a result, he most prominent text segment é classified as the nucleus, and the complementary text segment is classified as the satellite.

3.2 Nuclearity

Nuclearity in RST consists of the identification of prominent and complementary EDUs classified in **nucleus** and **satellite**. Furthermore, the type of nuclearity is divided into **mononuclear** and **multinuclear**, as shown in Figure 1. Observe that the nucleus consists of EDUs that are more central and relevant in the relation. Differently, the supporting EDUs are named satellites.

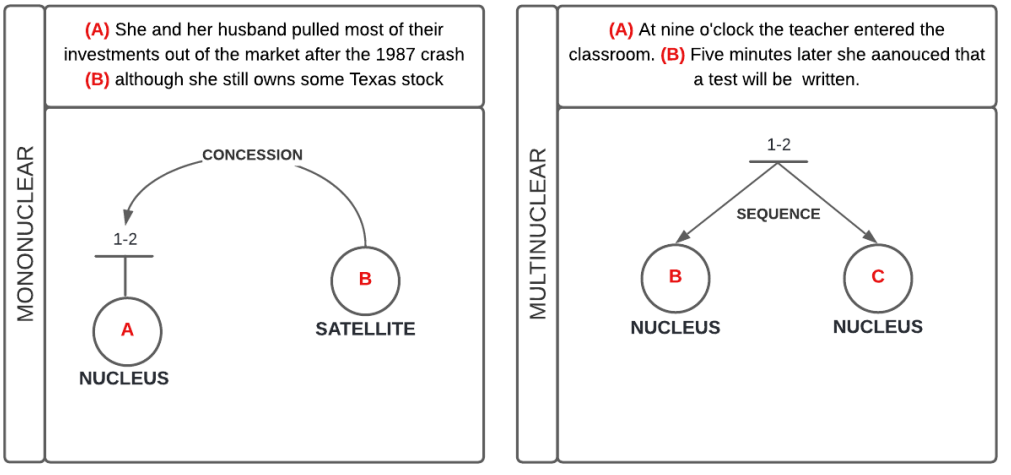

Figure 1. Nuclearity structure in mononuclear and multinuclear discourse coherence relations.

3.3 Schema

According to Mann and Thompson (1987), a schema may be defined as **predefined patterns specifying how regions of text combine to form larger regions, up to whole texts**. In Figure 2, we show five different types of schemas originally proposed by RST's authors. Observe that a schema based on the RST framework is characterized by a vertical line pointing to one of the text spans that the schema covers called the nucleus. The other spans are linked to the nucleus by relations, represented by labeled curved lines, and these spans are called satellites.

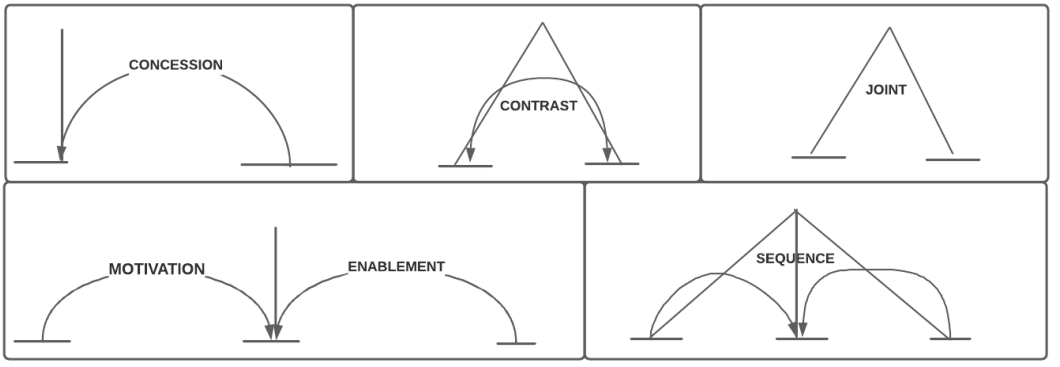

Figure 2. Types of schemes.

3.4 RST coherence relations

The RST predicts a tree of coherence relations (also known as rhetorical or discourse relations), mainly based on the premise that the content of text units may be hierarchically organized. Accordingly, it predicts that some units are more central (salient) to the text than others, as well as that the other units support the text message.

In this RST annotation guideline for low-resource languages, **we describe in detail 24 (twenty-four) coherence relations proposed originally by RST manuscript** (Thompson and Mann 1988). We highlight each of them in Sections 3.4.1 to 3.4.24.

3.4.1 ANTITHESIS

According to linguistics studies, antithesis is defined as a figure of speech characterized by the simultaneous use of terms, words, or sentences that are opposed to the meaning. For example, in "truth and lies are part of everyday life", the terms *truth* and *lies* form an **antithesis construction** due to opposition of meaning between the terms used to create an effect on the reader. In general, most figures of speech are used to create particular potential effects on the reader. Stede et al. (2017) define the ANTITHESIS discourse coherence relation as a relationship in which the writer regards the content of the nucleus as more important. Besides that, this relation is rarely signaled by connectives. In the same settings, corroborating the RST framework, when we encounter the ANTITHESIS discourse coherence relation, the situation presented in the nucleus is found in contrast with the situation presented in the satellite. The contrast may happen in only one or a wide range of respects. Additionally, it is always mononuclear – it is a counteractive relation that distinguishes clearly between the nuclearity of its arguments (Carlson and Marcu 2001). Table 1 describes the definitions in terms of constraints on the nucleus, satellite, and the combination of both for the ANTITHESIS discourse coherence relation. Notice this relation presents information intentionally informed and it is always mononuclear. In addition, there is one constraint on the nucleus, but there are no constraints on the satellite. In the nucleus, the writer judges the nucleus as valid. Lastly, the effect on the reader consists of the reader accepting the nucleus better than the satellite. Figures 3, 4 and 5 show examples of the ANTITHESIS relation.

Observe that the nucleus presents information of which the author is more favorable than information presented in satellite. In addition, the nucleus and satellite are both in contrast, and the reader accepts the nucleus better than the satellite. Finally, a final statement is not less important than previous statements.

Table 1. Antithesis relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	The writer judge N valid
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	N and S are in contrast
Effect on the reader	The reader's ability to comprehend N is increased.

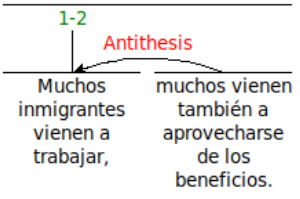

Figure 3. Antithesis Relation in Spanish.

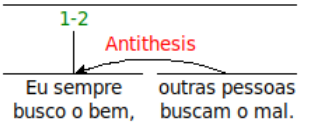

Figure 4. Antithesis Relation in Portuguese.

Figure 5. Antithesis Relation in Italian.

3.4.2 BACKGROUND

Stede et al. (2017) define the BACKGROUND relation as a type of coherence relation that settles a relationship between nucleus-satellite, in which the understanding of the satellite makes it easier for the reader to understand the content of the nucleus. Therefore, it would be difficult to comprehend the nucleus without the "background" information provided by the satellite. Furthermore, the satellite, mostly but not always, precedes the nucleus, and the satellite at the beginning of the text often serves to introduce the topic of the text. Carlson and Marcu (2001) claim that the satellite is responsible for providing the context of use or the grounds concerning which the nucleus is to be understood. In this case, understanding the satellite helps the reader understand the nucleus. Also, the satellite is not the cause/reason/motivation of the situation presented in the nucleus, and the reader/writer's intentions are irrelevant in determining whether such a relation holds. Finally, BACKGROUND is rarely signaled by connectives (Stede et al. 2017). In Table 2, we describe the definitions for BACKGROUND relation. Notice it is a mononuclear relation and presents intentional information. The nucleus presents information that must be understood from the information described in the satellite. There are no constraints on the satellite. Therefore, the satellite improves the reader's ability to understand the nucleus. On the effects on the reader, the reader understands better the nucleus from the reading of satellites. Figures 6, 7 and 8 show examples of BACKGROUND discourse coherence relation. Observe that the nucleus presents the information more prominent. Nevertheless, the information presented in satellites is relevant to understanding the nucleus. In other words, without the information presented in the satellite, the reader would not understand properly the information presented in the nucleus.

Table 2. Background relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	The reader would not understand sufficiently N before to read S
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	S increases the reader's ability to understand any aspect of N
Effect on the reader	The readers' ability to understand N is increased.

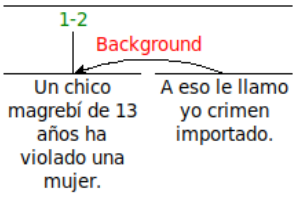

Figure 6. Background Relation in Spanish.

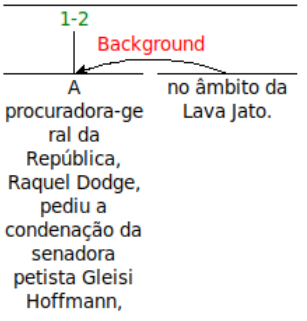

Figure 7. Background Relation in Portuguese.

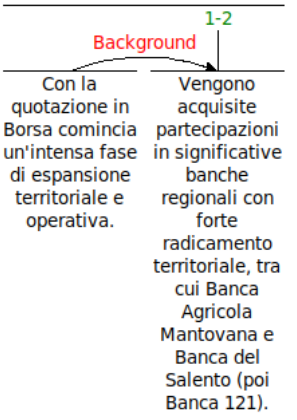

Figure 8. Background Relation in Italian.

3.4.3 CIRCUMSTANCE

According to linguistic studies, the circumstantial meanings would be analyzed from different perspectives. In Martin (1992), the authors studied the circumstantial meanings from a discourse-semantic perspective that would be related to the proposed term "setting", which refers to mainly locational circumstantial meanings. Nevertheless, as claimed by Dreyfus and Bennett (2017), the circumstantial meaning is separated from the type of circumstantial meaning from the type of lexico-grammatical structure that realizes that meaning. For instance, the sentence "I went to the union that hot Friday". In this sentence, it is possible to note a type of circumstantial meaning related to locational circumstantial meanings. On the other hand, the sentence "Lunchtimes on Friday are always busy in this cafe", provides a type of lexico-grammatical structure related to qualifier circumstantial meanings. More broadly, the circumstantial meaning is a region of ideational meaning that is instantiated across a range of lexico-grammatical structures: from the rank of the clausal constituent of circumstance in both directions: up to clause rank and down to below or within constituent rank (e.g. as qualifier) (Dreyfus and Bennett 2017). Shortly, this last one proposes the circumstantial meaning) within the discourse semantic system of ideational (Martin 1992).

According to RST, only carries a prototypical definition of "circumstance" and proposes a CIRCUMSTANCE discourse coherence relation, which as claimed by Mann and Thompson (1987), holds between two parts of a text if one of the parts establishes a circumstance or situation, and the other part is interpreted within or relative to a framework (e.g., a temporal or spatial framework). Stede et al. (2017) define it as a type of relationship between nucleus-satellites, in which the satellite supplies necessarily an event or state that occurs or has occurred, therefore it is not a hypothetical one. Carlson and Marcu (2001) argue that the presented situation in the satellite provides the context in which the presented situation in the nucleus should be interpreted. In addition, it is always mononuclear, and selecting the CIRCUMSTANCE relation over the BACKGROUND relation when the events are described in the nucleus and satellite is somewhat co-temporal. Considering a comparative analysis between the CIRCUMSTANCE and BACKGROUND, the information or the context of the BACKGROUND is not always specified clearly or delimited sharply. In addition, the events represented in the nucleus and the satellite occur at distinctly different times. The events in a CIRCUMSTANCE relation are somewhat co-temporal (Carlson and Marcu 2001). Also, the typical connectives found in CIRCUMSTANCE relations are *as, when, while* (Stede et al. 2017). Table 3 describes the definitions for CIRCUMSTANCE relation. Notice it is a mononuclear relation, which presents semantic information without constraints

on the nucleus. Furthermore, the satellite should present a situation realized, and the satellite necessarily provides a situation in which the reader may interpret the nucleus. Finally, Carlson and Marcu (2001) argue that in a CIRCUMSTANCE discourse coherence relation, the satellite may not present any cause, reason, or motivation for the situation presented by the nucleus. Furthermore, the reader/writer's intentions are irrelevant to determine whether such a relation holds. Accordingly, as shown in Figures 9, 10 and 11, the presented situation in the satellite should provide the context in which the presented situation in the nucleus should be interpreted.

Table 3. Circumstance relation constraints

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	S presents a realized situation (i.e., not a hypothetical one)
Constraints on the nucleus and satellite (N+S)	S provide any situation that the reader may interpret N
Effect on the reader	The reader recognizes that S provides a situation in which N must be interpreted

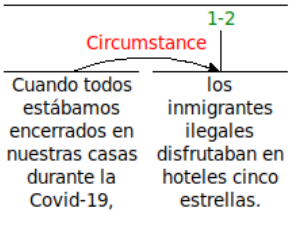

Figure 9. Circumstance Relation in Spanish.

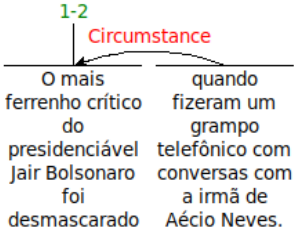

Figure 10. Circumstance Relation in Portuguese.

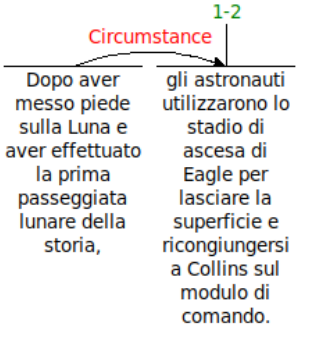

Figure 11. Circumstance Relation in Italian.

3.4.4 CONCESSION

Historically, the notion of concession according to linguistic studies, is associated with relations between the **utterance segments that imply a contrast**. Furthermore, its definition takes into account pragmatics and cognitive inferences. According to Kim (2001), the speaker asserts the propositions of the two related clauses in question against the background assumption that the two types of situations are generally incompatible. For instance, "Even if Einstein tried to solve the math problem, he could not solve it". In RST, Stede et al. (2017) define the CONCESSION discourse coherence relation, as a type of relationship between nucleus-satellite, in which the writer regards the content of the nucleus as more important than the content presented by the satellite. Besides that, in comparison to the nucleus, the writer regards the content of the satellite as less important, even though the writer does not dispute that the satellite holds. In Carlson and Marcu (2001), CONCESSION is defined as a type of relationship in which the situation indicated in the nucleus is contrary to expectation in the light of the information presented in the satellite. In other words, it is always characterized by a violated expectation. Mostly, the text span is classified as satellite, and the text span is classified as the nucleus, both do not depend on the

semantics of these spans, but rather on the intention of the writer. Furthermore, the typical connectives are *although, but, skill, despite*, which, indeed, seems to carry substantially any discourse markers. Table 4 describes the definitions for the CONCESSION relation. Notice this relation is mononuclear and presents intentional information, with constraints on the nucleus and satellite. In addition, the writer judges the nucleus and the satellite despite them being incompatible. Figures 12, 13 and 14 shown examples of CONCESSION relation. Observe that the discourse marker "but"(in Spanish: "perfo", in Portuguese: "mas", and in Italian "ma"), are example of a discourse marker, or in other words, it is also a signal of CONCESSION discourse coherence relations. Accordingly, it would be agreed that these discourse markers may be considered as "clues" to identify the CONCESSION relations. Moreover, we note an incompatibility between the satellite and the nucleus raises the reader's ability to regard the nucleus, such property distinguishes these discourse coherence relations from others.

Table 4. Concession relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	Writer regards the content of N as more important
Constraints on the satellite (S)	In comparison to N, the writer regards the content of S as less important, but s/he does not dispute that S holds
Constraints on the nucleus and satellite (N+S)	The writer acknowledges a potential or apparent incompatibility between N and S
Effect on the reader	The reader's ability to positive regard for N is increased

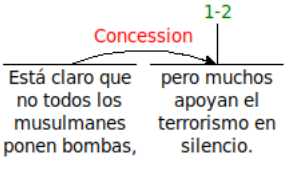

Figure 12. Concession Relation in Spanish.

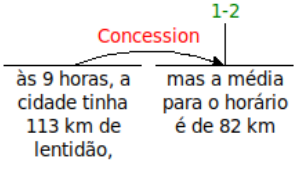

Figure 13. Concession Relation in Portuguese.

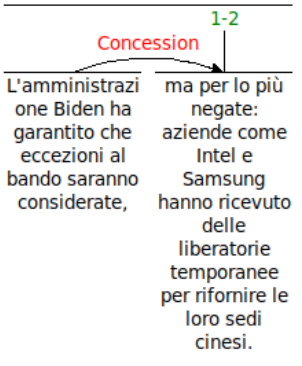

Figure 14. Concession Relation in Italian.

3.4.5 CONDITION

Conditional sentences present two main parts: (i) the antecedent titled **protasis**; and (ii) the consequent denomination titled **apodosis**. For instance, in *If you come closer, you'll be able to see the parade*, the antecedent would be *if you come closer* consists of protasis, and the consequent *you'll be able to see the parade* would be the apodosis. Furthermore, Sweetser (1990) claims that conditional semantics has three distinct domains: (i) **the content domain**, which is understood by relating the content of the two clauses to each other. For example, *If you drop it, it will break*; (b) **the epistemic domain**, which is understood as expressions of the reasoning process. For example, in *If the streets are wet, it rained last night*; and (c) **the speech act domain**, which is understood as pre-posting to a speech act. For instance, *If you leave before I see you again, have*

a good time. In RST, the CONDITION relation may be defined as a relationship between nucleus and satellite, in which the information associated with the nucleus must be a consequence of the achievement of the condition in the satellite (Mann and Thompson 1987). Carlson and Marcu (2001) suggest that the truth of the proposition associated with the nucleus is a consequence of the fulfillment of the condition in the satellite. Likewise, the satellite provides a situation that is not realized. In addition, Stede et al. (2017) claim that the satellite should present a hypothetical, future, or in other ways, unreal situation, and the realization of the nucleus depends necessarily on the realization of the satellite. Typically, this relation is signaled by connectives, such as *if .. then; in case*. Table 5 describes the definitions for this coherence relation. Notice it presents only one nucleus and semantic information. There are also no constraints on the nucleus, and the satellite presents a hypothetical situation. Figures 15, 16 and 17 show examples of the CONDITION relation. Observe that the nucleus presents a fact that may be performed whether the condition presented in the satellite will be performed. Even though all examples presented the marker "if" (in Spanish: "si", in Portuguese: "se", and in Italian: "si"), according to Mann and Thompson (1987), the CONDITION discourse coherence relation does not necessarily need to be expressed with an "if" clause.

Table 5. Condition relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	The S presents a hypothetical, future, or otherwise unrealized situation (relative to the situational context of S)
Constraints on the nucleus and satellite (N+S)	The realization of N depends on the realization of S
Effect on the reader	The R recognizes how the realization of N depends on the realization of S

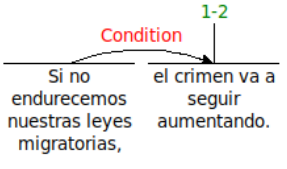

Figure 15. Condition Relation in Spanish.

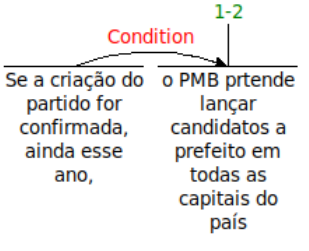

Figure 16. Condition Relation in Portuguese.

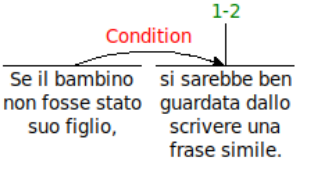

Figure 17. Condition Relation in Italian.

3.4.6 CONTRAST

Natural languages provide sophisticated mechanisms capable of connecting information. The "connectors" responsible for connecting sentences and establishing a coherent relation are called conjunctions. In general, when any speaker wishes to connect contrastive information, a particular type of conjunction is employed. They are called adversative connectives or contrastive connectives, besides contrastive discourse markers, which are connectors of discourse units whose content refers to an "opposite" or "contradictory" (Fraser 1999). In RST, parts of texts whose relationship manifests semantically as an opposition must be classified as a CONTRAST relation. The CONTRAST relation provides a type of relationship between nucleus-nucleus with exactly two nuclei being both of equal importance for the writer's purposes. Moreover, the contents are

comparable but not identical, and they differ taking into account aspects that are important to the writer. Carlson and Marcu (2001) claim the typical CONTRAST relation includes contrastive discourse markers (e.g. *but, however, while*). In addition, Stede et al. (2017) proposed discourse markers for the identification of this relation are *on the other hand, yet, but*. In a summarized way, the CONTRAST is a multinuclear relation, which establishes the relationship between nucleus-nucleus to express an opposite thought. Also, it contrasts with the previous thought, and typically at least a nucleus is introduced by *adversative conjunctions*. Table 6 describes the definitions for the CONTRAST relation. Notice it presents two or more nuclei and semantic information. Furthermore, the contrast between text spans raises the ability's reader to regard the contraction information present in the nucleus. Figures 18 and 19, 20 show examples of the CONTRAST relation. Observe that the facts presented in the nucleus are in contrast, and there are discursive markers to identify this contrast. Nevertheless, contrastive sentences may occur without any discourse marker.

Table 6. Contrast relation constraints.

Type	Description
Type of nucleus	Multinuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	Two nuclei are presented. Both are of equal importance for W's purposes. The contents are comparable yet not identical. They differ in aspects that are important to write
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	The characteristics of the satellite and nucleus are in comparison
Effect on the reader	R recognizes the comparability and the difference(s) yielded by the comparison is being made

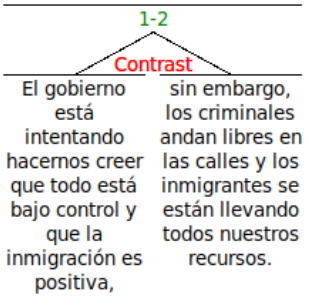

Figure 18. Contrast Relation in Spanish.

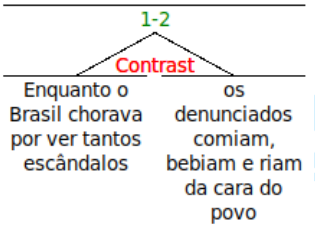

Figure 19. Contrast Relation in Portuguese.

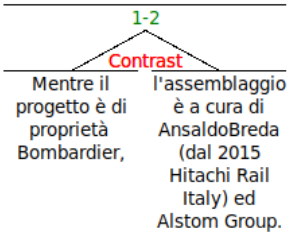

Figure 20. Contrast Relation in Italian.

3.4.7 ELABORATION

The ELABORATION is a discourse coherence relation highly ambiguous. According to a study proposed by Marcu and Echihabi (2002), the CONTRAST and ELABORATION relations presented only 61 from 238 discourse markers (26%). Moreover, Carlson and Marcu (2001) claims that this relation is extremely common at all levels of the discourse structure, and it is especially popular to show relations **across large spans of information**. In RST, in order to accurately identify the ELABORATION relation, the satellite should give additional information or detail about the situation presented in the nucleus (Carlson and Marcu 2001). Stede et al. (2017) define the ELABORATION relation as a relationship between nucleus and satellites, in which the satellite provides details or more information on the state of affairs described in the nucleus. Also, Marcu

(2000) suggest that the **ELABORATION relation may be used when none of the other relations is applied**. Finally, the typical connectives are: *in particular; for example* (Stede et al. 2017). Table 7 describes the definitions for the ELABORATION discourse coherence relation. Note this relation presents only a nucleus and semantic information. Besides, there are no constraints on the nucleus and satellite, and the satellite typically presents any additional information about the nucleus. Also, the reader's ability to recognize additional information in a satellite that refers to the nucleus. Figures 21, 22 and 23 show examples of the ELABORATION relation. Observe that the satellite typically provides a qualification or specification of the nucleus, besides the adjective subordinate clauses, which are candidates to be an ELABORATION relation.

Table 7. Elaboration relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	The S provides details or more information on the state of affairs described in N (but not on a single entity mentioned in N
Constraints on the nucleus and satellite (N+S)	The S presents additional detail about the situation or some element of subject matter which is presented in N or inferential accessible in N in one or more of the ways listed below
Effect on the reader	The R recognizes S as providing additional detail for N. Moreover, R identifies the element of subject matter for which detail is provided

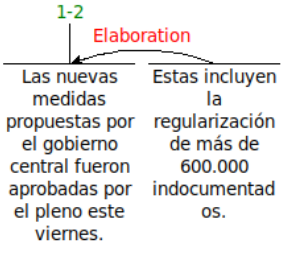

Figure 21. Elaboration Relation in Spanish.

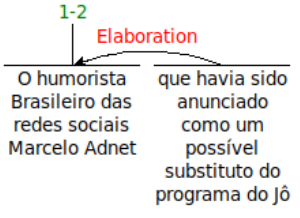

Figure 22. Elaboration Relation in Portuguese.

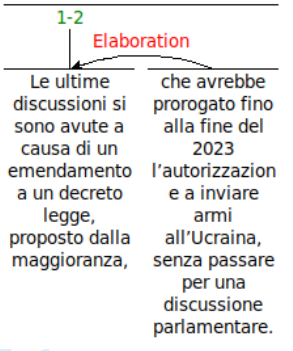

Figure 23. Elaboration Relation in Italian.

3.4.8 ENABLEMENT

According to linguistics studies, enablement sentences present possibilities or hypotheses. For instance, the particles "can" and "may" in general connect assumptions semantically organized to express a possibility, and pragmatically intended to raise the reader's belief that the fact is unrealizable. According to Mann and Thompson (1987), the ENABLEMENT relation provides information designed to increase the reader's desire to act. Stede et al. (2017) suggest that the ENABLEMENT relation is a genre of editorial, and also it is rarely found in other textual types. While it is difficult to identify, in RST, the ENABLEMENT relation is defined as a nucleus responsible for presenting information on a situation that is unrealized. Furthermore, the action presented in the satellite increases the chances of the situation in the nucleus being realized (Carlson and Marcu 2001). Table 8 describes the definitions for the ENABLEMENT relation. Notice that this

relation presents only a nucleus, hence it is a mononuclear relation. In addition, the writer's intention consists of an information intention. While there are no constraints on the satellite, the nucleus presents an action or fact that may be realized whether the possibility presented in the satellite is true. Finally, the reader's ability to act as the nucleus is increased. Figures 24, 25 and 26 show examples of the ENABLEMENT relation. Observe that the nuclei present an unrealized situation, and comprehending the satellite makes it easier for the reader to perform the action described in the nucleus (Stede et al. 2017).

Table 8. Enablement relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	The N presents an action by R (including accepting an offer), unrealized concerning the context of N
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	R comprehending S increases R's potential ability to act N
Effect on the reader	R's potential ability to act N increases

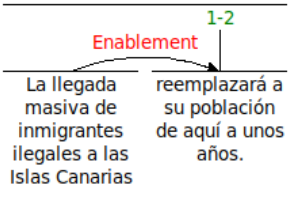

Figure 24. Enablement Relation in Spanish.

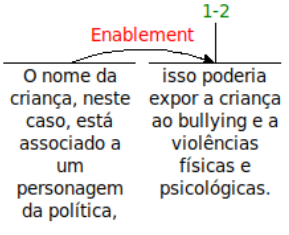

Figure 25. Enablement Relation in Portuguese.

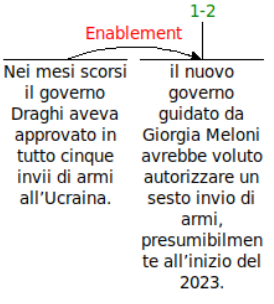

Figure 26. Enablement Relation in Italian.

3.4.9 EVALUATION

Subjective information or subjectivity in natural language refers to aspects of language used to express opinions, evaluations, and speculations (Wiebe et al. 2004). Worldviews and points of view are built to evaluate situations, events, and objects in the world, and this information is analyzed at the discourse level. According to the Rhetorical Structure Theory framework, the EVALUATION discourse coherence relation provides subjective information. In other words, this type of discourse coherence relation should contain a point of view, appraisal, estimation, rating, interpretation, or assessment of a situation. Therefore, the entire and each piece of subjective information is signaled by EVALUATION discourse coherence relation.

According to Carlson and Marcu (2001), the EVALUATION relation is defined as a relationship between nucleus-satellites, in which one span evaluates the situation presented in the other span of the relationship on a scale of good to bad. Besides, according to Stede et al. (2017), usually the "evaluating" segment follows the "evaluated" one. Nevertheless, sometimes the order is the opposite. Therefore, the EVALUATION relation occurs when the satellite typically presents any subjective information. Table 9 describes the definitions for the EVALUATION relation. As shown in Table 9, the EVALUATION relation is mononuclear and presents semantic information.

While there are no constraints on the nucleus and satellite, the satellite provides subjective content. Furthermore, the reader recognizes the subjective value of information in the satellite. Figures 27, 28 and 29 show examples of the EVALUATION discourse coherence relation. Observe that the satellites provide subjective information. Hence, towards identifying the EVALUATION discourse coherence relation, the satellite must necessarily present any point of view on the topic presented in the nucleus at a scale between bad and good.

Table 9. Evaluation relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	Description of a state of affairs, or a subjective statement (but not from a writer's perspective)
Constraints on the satellite (S)	A subjective evaluation (positive/negative, desirable/undesirable) from the writer's perspective
Constraints on the nucleus and satellite (N+S)	S relates N to the degree of the writer's positive or negative regard toward N
Effect on the reader	Reader recognizes that S assesses N and recognizes the value it assigns

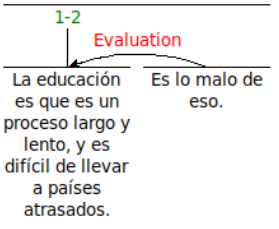

Figure 27. Evaluation Relation in Spanish.

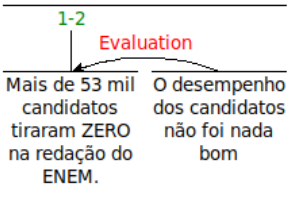

Figure 28. Evaluation relation in Portuguese.

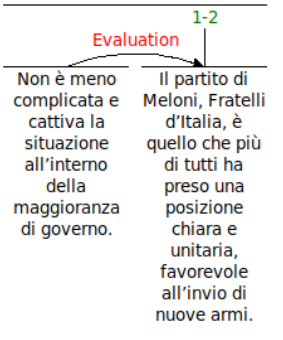

Figure 29. Evaluation Relation in Italian.

3.4.10 EVIDENCE

Stede et al. (2017) define the EVIDENCE discourse coherence relation as a type of relationship between nucleus-satellites, in which the nucleus presents a subjective statement or thesis or claim, whereby the reader might not accept or might not regard as sufficiently important or positive, and the satellite provide a statement that the reader is likely to accept. Carlson and Marcu (2001) argue that it is a type of discourse coherence relation in which the satellite should present a situation that is responsible for providing any evidence or justification concerning the situation described in the nucleus. Additionally, the EVIDENCE relation pertains to actions and situations that are independent of the will of an animate agent, as well as the evidence is data on which judgment of a conclusion may be based, and is presented by the writer or an agent in the article to convince the reader of a point. Moreover, the typical connectives found in the EVIDENCE relations are the *causal connectives* (Stede et al. 2017). Table 10 describes the definitions for EVIDENCE relation. Notice it is mononuclear and presents semantic information. Even though there are no constraints on the nucleus and satellite, the relationship between satellites is performed through the writer's subjective content. Furthermore, the reader recognizes the subjective value of information in the satellite. In addition, the reader also recognizes the intention of the writer to provide credibility to the information presented in the nucleus. Finally, according to Stede et al. (2017), the EVIDENCE

relation often provides connections between a larger satellite segment to a shorter nucleus. For instance, in evidence whose source is a thesis, as shown in Figures 30, 31 and 32. Observe that he satellite provides explicit information that serves as contestable or incontestable evidence to support information claimed in the nucleus. Furthermore, the EVIDENCE discourse coherence relation may also present statistical information.

Table 10. Evidence relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	Reader might not believe N to a degree satisfactory to the writer
Constraints on the satellite (S)	Reader believes S or will find it credible
Constraints on the nucleus and satellite (N+S)	Reader's comprehension of S increases the reader's belief of N
Effect on the reader	Reader's belief in the N is increased

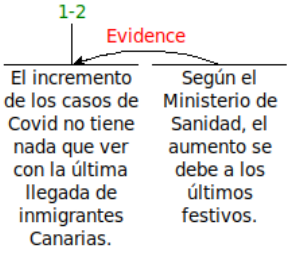

Figure 30. Evidence Relation in Spanish.

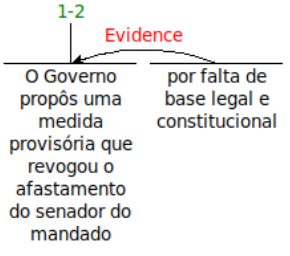

Figure 31. Evidence Relation in Portuguese.

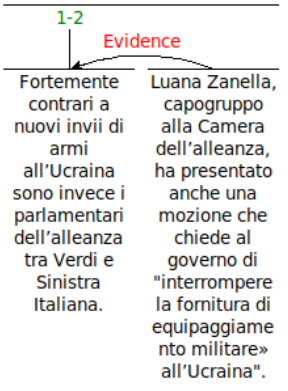

Figure 32. Evidence Relation in Italian.

3.4.11 INTERPRETATION

The INTERPRETATION discourse coherence relation may be complex to identify. According to Mann and Thompson (1987), the INTERPRETATION relation is mononuclear and may be defined as a type of relationship between nucleus-satellite, in which the satellite relates the situation presented in the nucleus to a framework of ideas not involved in the nucleus itself and not concerned with the writer's positive or negative regard. Moreover, it presents the satellite evaluating the knowledge presented by the nucleus in terms of the writer's positive or negative regard. Carlson and Marcu (2001) claim that to identify this relation one side of the relationship gives a different perspective on the situation presented in the other side. It is subjective, presenting the personal opinion of the writer or a third party". Additionally, Stede et al. (2017) suggests that the nucleus precedes the satellite in the text, and the satellite "shifts the content of the nucleus to a different conceptual frame. It should be pointed out that this does not imply an evaluation of the nucleus (or the evaluation is of only secondary importance)". In addition, towards identifying the INTERPRETATION discourse coherence relation, the reader should keep in mind that whenever the satellite primarily provides an assessment (on the positive/negative scale) of the nucleus, the EVALUATION discourse coherence relation is to be used, rather than

INTERPRETATION. Finally, the typical connective is *thus*. Table 11 describes the definitions for the INTERPRETATION relation. Notice the content of the nucleus is presented to a different conceptual frame. This does not imply an evaluation of the nucleus (or the evaluation is of only secondary importance). Furthermore, the reader recognizes that the satellite relates the nucleus to a framework of ideas not involved in the knowledge presented in the nucleus itself (Stede et al. 2017). Figures 33, 34 and 35 show examples of the INTERPRETATION relation.

Table 11. Interpretation relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	Reader's comprehension of S increases the reader's belief of N
Effect on the reader	Reader's belief in the N is increased

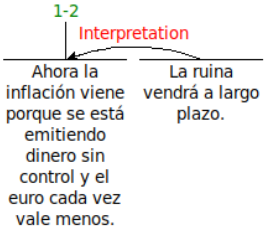

Figure 33. Interpretation Relation in Spanish.

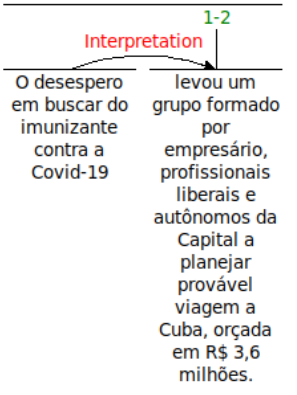

Figure 34. Interpretation Relation in Portuguese.

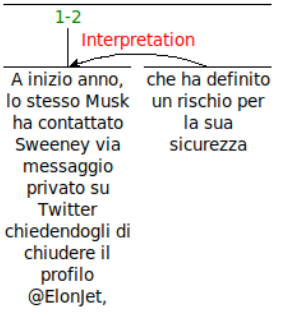

Figure 35. Interpretation Relation in Italian.

Observe the expression of a viewpoint of the writer or another agent in the text is observed in this relation(Carlson and Marcu 2001). We should reiterate that the INTERPRETATION relation presents high ambiguity with the EVALUATION relation. Therefore, it is important to salient the importance of a specialist to accurately identify the discourse coherence relations taking into account the Rhetorical Structure Theory framework.

3.4.12 JOINT

The JOINT multinuclear relation holds between two segments that reflect different topics (Marcu 2000). This relation establishes a type of relationship between nucleus-satellite, in which the nucleus provides different information, that are not of the same type. Hence they are not in an identifiable semantic or pragmatic relation, nor do they form an enumeration (Stede et al. 2017). Furthermore, it is also used when a multinuclear relation is needed (from the text-global perspective). However, it is no specific relations are applicable. Moreover, the nucleus adds information that is not comparable and is not in temporal sequence. For instance, observe the following sentence *I bought a boot, a sneaker, and a slipper*. The terms "boot", "sneaker", and "slipper" are semantically compatible, but it is not an example of the JOINT relation. Differently, in the sentence *the talented young plays the piano and constantly enjoys traveling to Asia*, the information is

distinct and not comparable, hence this is an example of the JOINT relation. Besides that, according to Stede et al. (2017), the typical connectives for the JOINT relation are *additive connectives*. Table 12 describes the definitions for the JOINT coherence relation. Notice it provides semantic information and presents at least two nuclei. Therefore, it is a multinuclear discourse coherence relation. Even though there are not any constraints on the nuclei, the reader recognizes that the nucleus holds between two segments that denote different things. Figures 36, 37 and 38 show examples of the JOINT discourse coherence relation.

Table 12. Joint relation constraints.

Type	Description
Type of nucleus	Multinuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	The nuclei provide different kinds of information, which are not of the same type. They are not in an identifiable semantic or pragmatic relation, nor do they form an enumeration. Still, there is a coherent link, as they contribute in similar ways to the overall text function
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	N/A
Effect on the reader	Reader recognizes that each nucleus contributes its message, which however serves the same overall text purpose

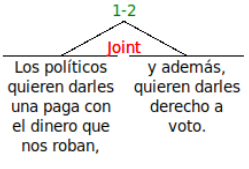

Figure 36. Joint Relation in Spanish.

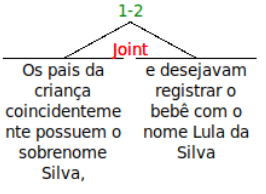

Figure 37. Joint Relation in Portuguese.

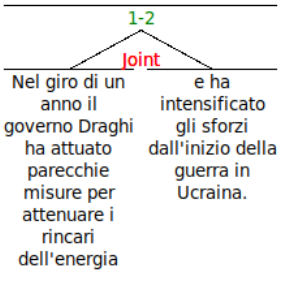

Figure 38. Joint Relation in Italian.

Observe that the nuclei present a segment of information that even though related denotes different aspects. We also note that the additive connective "and" is a strong clue to identify the JOINT discourse coherence relation. Nevertheless, it is necessary to evaluate firstly whether it would be classified as SEQUENCE discourse coherence relation (see Section 3.4.20). Other examples of additive connectives are *in addition, additionally, also*.

3.4.13 JUSTIFY

The "justifications" consist of linguistic structures with argumentation functions. As claimed by Ducrot et al. (1980); Ducrot (1987), the justification phenomenon presents two main elements: **argumentation conjunctions** and **argumentation indicators**. Tseronis (2011) explains that augmentation conjunctions present a function of connecting two or more propositions while argumentation indicators are expressions or words like "only" and "almost", which change the argumentation potential within the boundaries of a proposition and connect a sentence to another sentence. In RST, the JUSTIFY relation provides to the reader's comprehension of the satellite increases the reader's readiness to accept the writer's right to the effect (Mann and Thompson 1987). Carlson and Marcu (2001) claims that the satellite acts as an argument to converse with the reader on the information presented by the writer within the nucleus. In addition, the nucleus

presents a subjective statement or thesis or claim, which the reader might not accept or might not regard as sufficiently important or positive, besides the satellite, provides a statement of a fundamental (e.g., political, moral) attitude of the acting person(Stede et al. 2017). Finally, the typical connectives are *explanatory coordinate conjunction*. Table 13 describes the definitions for the JUSTIFY relation. Note that there are not any constraints on the nucleus and satellite. In addition, the constraints on the nucleus and satellite consist of the understanding that the satellite will make it easier for readers to accept the nucleus, or to share the particular viewpoint of the writer. Also, the JUSTIFY relation affects the reader's readiness to better accept the writer's information presented in the nucleus. Figures 39, 40 and 41 show examples of the JUSTIFY discourse coherence relation. Observe that the nucleus presents a fact related to the writer, which is justified by information provided in the satellite. Therefore, to identify the JUSTIFY relation, the nucleus should present a proposition, which is justified by the proposition presented in satellite.

Table 13. Justify relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	Reader's comprehension S increases the reader's readiness to accept the writer's right to present N
Effect on the reader	Reader's readiness to accept writer's right to present N is increased

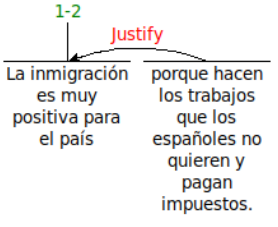

Figure 39. Justify Relation in Spanish.

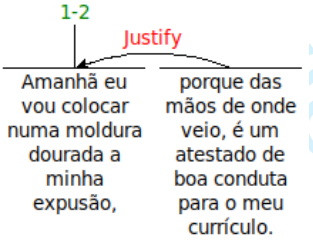

Figure 40. Justify Relation in Portuguese.

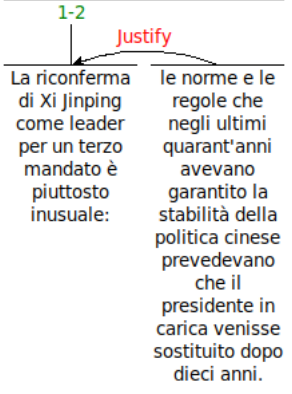

Figure 41. Justify Relation in Italian.

3.4.14 MOTIVATION

Mann and Thompson (1987) claim that the MOTIVATION relation is commonly found in texts evoking an action on the part of the reader, although advertising text typically largely consists of motivating material. According to Stede et al. (2017), it establishes a relationship between nucleus-satellite, in which the nucleus should present an action to be performed by the reader, and the satellite presents a reason for performing the action described in the nucleus. Moreover, typical connectives used by the MOTIVATION relation are *causal connectives*. In a summarized way, the MOTIVATION relation relates to any utterance that expresses the speaker's desire that the hearer performs some action (the nucleus) which material will justify the requested action (the satellites). Table 14 describes the definitions for the MOTIVATION relation.

Table 14. Motivation relation constraints.

Type	Description
Type of nucleus	Multinuclear
Type of relation	Intentional / Pragmatic
Constraints on the nucleus (N)	N is an action in which the reader is the actor (including accepting an offer), unrealized concerning the context of N
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	The comprehension related to S increases the reader's desire to act on the N
Effect on the reader	Reader's desire to act on the N is increased

Note that it presents only one nucleus (mononuclear) and provides pragmatic (intentional) information. It includes constraints on the nucleus, which should present an action unrealized. Moreover, there are not any constraints on the satellite. As is well-known from the previous discussion, each RST discourse coherence relation holds different effects on the reader. In addition, there is a desire of the reader to act on the nucleus. As claimed by Mann and Thompson (1987), in the MOTIVATION relation, the nucleus should present an action in which the reader is the actor (including accepting an offer), unrealized concerning the context of the nucleus. Corroborating this definition, in Figures 42, 43 and 44, the nucleus provides an action to be performed, and in the satellite some information that fruitfully motivates the reader to perform that action. Lastly, according to Stede et al. (2017), taking into account the set of intentional (pragmatics) relations, the MOTIVATION discourse coherence relation may only be used when the reader is encouraged to perform a certain activity (nucleus), on the grounds of the satellite.

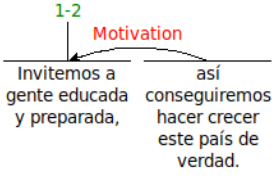

Figure 42. Motivation Relation in Spanish.

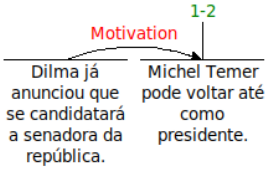

Figure 43. Motivation Relation in Portuguese.

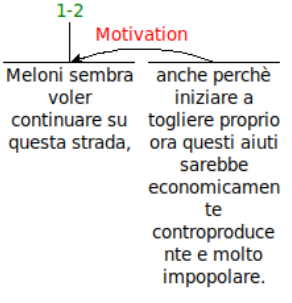

Figure 44. Motivation Relation in Italian.

3.4.15 NON-VOLITIONAL CAUSE

More broadly, the definition for "volition", taking into consideration linguistic studies, is related to the intentional or unintentional nature of a subject or agent to act. According to the typology of modalities, and later revisited and expanded according to Discursive-Functional Grammar (GDF) (Hengeveld 2008), the volitional modality, as it is denominated by authors, the volitional concept is understood, concerning the domain semantic, as a type of modularization relating to what is (un)desirable, being situated, therefore, on the axis of volition, and presenting three types of modal orientation: **participant**, **event** and **proposition**(Hengeveld 2004). The NON-VOLITIONAL CAUSE discourse coherence relation, according to the RST, is defined by a nucleus that provides a volitional action unrealized, and on the satellite, there are no constraints. Table 15 describes the definitions in terms of constraints on the nucleus, and satellite, as well as the combination of both for the NON-VOLITIONAL CAUSE relation. Notice this relation

presents only a nucleus and semantic information. Besides that, the nucleus should hold at least one non-volitional action. Otherwise, there are no constraints on the satellite. As previously stated, the RST discourse coherence relations carry an effect on the reader. Therefore, in this case, the reader recognizes the satellite's direct cause of the nucleus. Figure 45, 46 and 47 shown examples of the NON-VOLITIONAL CAUSE relation. Notice this relation presents the satellite with a situation that, by means other than motivating a volitional action caused the situation presented in the nucleus, without the presence of the satellite (Mann and Thompson 1987). Finally, the nucleus is caused by the non-volitional fact provided in the satellite.

Table 15. Non-Volitional Cause relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N is not a volitional action
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	S, by means other than motivating a volitional action, caused N; without the presentation of S, the reader might not know the particular cause of the situation; a presentation of N is more central than S to the writer's purposes in putting forth the N-S combination
Effect on the reader	Reader recognizes S as a cause of N

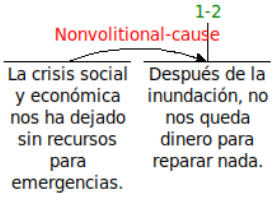

Figure 45. Non-Volitional Cause Relation in Spanish.

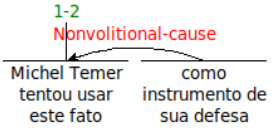

Figure 46. Non-Volitional Cause Relation in Portuguese.

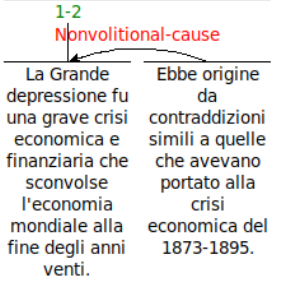

Figure 47. Non-Volitional Cause Relation in Italian.

3.4.16 NON-VOLITIONAL RESULT

The point of departure to understand the NON-VOLITIONAL RESULT relation consists of the fact that it presents the same set of proprieties from NON-VOLITIONAL CAUSE. However, the position of the nucleus and satellite are inversely proportional. As discussed previously, the definition of "volition" refers to the intentional or unintentional nature of a subject or agent to act. In RST, the NON-VOLITIONAL RESULT relation is defined as a type of relationship between nucleus and satellite, in which the satellite accommodates necessarily a non-volitional action, even though there are no constraints on the nucleus. Once again, the nucleus-satellite relation is inversely proportional to the NON-VOLITIONAL CAUSE. Table 16 describes the definitions for the NON-VOLITIONAL RESULT relation. Notice this relation is mononuclear and provides semantic information. There are no constraints on the nucleus, however, the satellite should supply a non-volitional action. Additionally, in the NON-VOLITIONAL RESULT relation, the reader recognizes that the nucleus could have caused the information provided in the satellite. Figures 48, 48 and 48 show examples of NON-VOLITIONAL RESULT. Observe that in this relation, the nucleus presents information more relevant than the situation presented in the satellite.

Corroborating this definition. In addition, the nucleus provides relevant information to understand the context, and the information presented in the nucleus is caused by the situation provided in the satellite.

Table 16. Non-Volitional Result relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	S is not a volitional action
Constraints on the nucleus and satellite (N+S)	N caused S; presentation of N is more central to the writer's purposes in putting forth the N-S combination than is the presentation of S.
Effect on the reader	R recognizes that N could have caused the situation in S

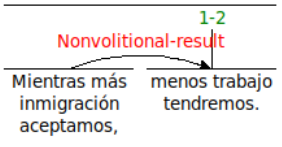

Figure 48. Non-Volitional Result Relation in Spanish.

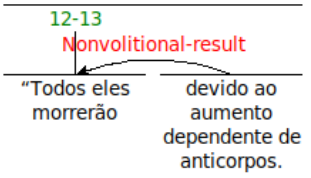

Figure 49. Non-Volitional Result Relation in Portuguese.

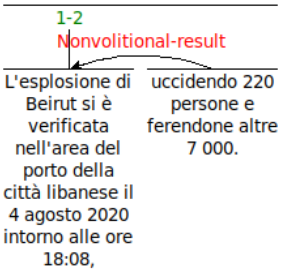

Figure 50. Non-Volitional Result Relation in Italian.

3.4.17 OTHERWISE

In RST, Carlson and Marcu (2001) define the OTHERWISE relation as a type of mutually exclusive relation between two elements of equal importance, in which the situations presented by both the satellite and the nucleus are unrealized. In addition, the realization of the situation associated with the nucleus will prevent the realization of the consequences associated with the satellite. In the same settings, Stede et al. (2017) argue that the OTHERWISE relation consists of a type of relationship between nucleus-satellite, in which the nucleus presents a hypothetical, future, or in other words, unreal situation, and the satellite presents a hypothetical, future, or in other ways unreal situation. Finally, the realization of the nucleus impedes the realization of the satellite. Table 17 describes the definitions for the OTHERWISE relation. Note that this relation is mononuclear and provides semantic information. Furthermore, the satellite, as well as the nucleus, should hold an unrealized situation. Finally, the reader recognizes the dependency relation of prevention between the realization of the nucleus and the realization of the satellite (Stede et al. 2017). Figure 51, 52 and 53 show examples of the OTHERWISE relation. Observe that the nucleus provides a hypothetical or future situation. Likewise, the satellite also provides a hypothetical or future situation. Accordingly, in the OTHERWISE relation, the nucleus and satellite should accommodate an unrealized situation.

3.4.18 PURPOSE

Carlson and Marcu (2001) claim that in the PURPOSE relation, the situation presented in the satellite is only putative, i.e., it is yet to be achieved. Besides that, this relation may be paraphrased as

Table 17. Otherwise relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N is an unrealized situation
Constraints on the satellite (S)	S is an unrealized situation
Constraints on the nucleus and satellite (N+S)	The realization of N impedes the realization of S
Effect on the reader	Reader recognizes the dependency relation of prevention between the realization of N and the realization of S

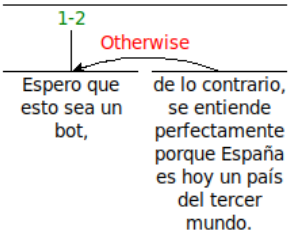

Figure 51. Otherwise Relation in Spanish.

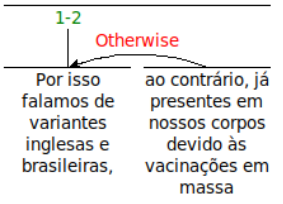

Figure 52. Otherwise Relation in Portuguese.

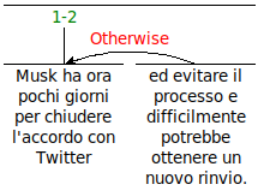

Figure 53. Otherwise Relation in Italian.

"nucleus to satellite". In the same settings, Stede et al. (2017) defines the PURPOSE relation as a causal relationship in a wide sense. In other words, the difference between the relations volitional and non-volitional cause and result is that within the PURPOSE relation, the satellite is signaled as hypothetical/unrealized, and represents the intention or goal of the acting person. Typical connectives in PURPOSE relation are to, and to. Therefore, the PURPOSE relation expresses purpose, objective, or end, and typical PURPOSE relation is introduced by the final adverbial subordinate conjunctions (e.g. *to, that, in order to*), as well as clauses classified as final adverbial subordinate clauses are candidates for this relations. For example, "It is necessary for us to fight so that we can triumph". Table 18 describes the definitions in terms of constraints on the nucleus, satellite, and the combination of both for the PURPOSE relation. Note that this relation presents only a nucleus and semantic information. Moreover, the nucleus provides an action, and the satellite provides a situation that is unrealized. Regarding the effect on the reader, the information provided in the nucleus is recognized as a starting activity to realize the satellite. Figures 54, 55 and 56 show examples of the PURPOSE relation. Notice that the nucleus supplies an activity or action, and in the satellite, a hypothetical or unrealized situation is presented. Moreover, Carlson and Marcu (2001) claim that a PURPOSE clause with the particle "to" to indicate the infinitive verbs, should not be confused with a post-nominal modifier due to the correct rhetorical relation is ELABORATION. For instance observe the following sentence *[SA Brewing, an Australian brewer, last Thursday was given approval], [to acquire an option for up to 20% of Bell Resources Ltd., a unit of Bond Corp].*

Table 18. Purpose relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N is an activity
Constraints on the satellite (S)	S is a situation that is unrealized
Constraints on the nucleus and satellite (N+S)	S is to be realized through the activity in N
Effect on the reader	Reader recognizes that the activity in N is initiated to realize S

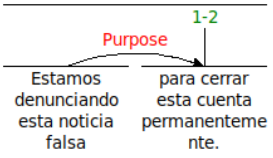

Figure 54. Purpose Relation in Spanish.

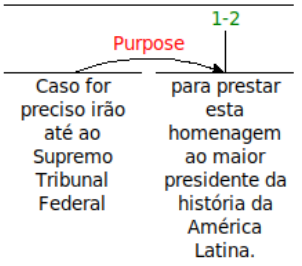

Figure 55. Purpose Relation in Portuguese.

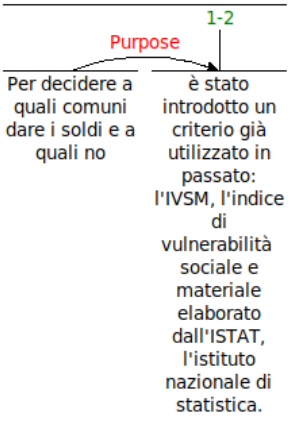

Figure 56. Purpose Relation in Italian.

3.4.19 RESTATEMENT

Mann and Thompson (1987) define the RESTATEMENT relation as a type of relation mononuclear that establishes a relationship between nucleus-satellite, in which "the satellite restates the nucleus, where the satellite and the nucleus are of comparable bulk". Furthermore, Carlson and Marcu (2001) claims that the RESTATEMENT relation is always mononuclear, where the satellite and nucleus are of (roughly) comparable size. Besides, the satellite reiterates the information presented in the nucleus, typically with slightly different wording, nevertheless, it does not add to or interpret the information. Stede et al. (2017) claim that it provides a nucleus that precedes the satellite in the text, and the satellite repeats the information given in the nucleus using different wording. Therefore, the nucleus and satellite are of roughly equal size, and the reader recognizes the satellite as a restatement of the nucleus. Lastly, the typical connective that occurs in the RESTATEMENT relation is *in other words*. Finally, the RESTATEMENT establishes a relationship between the nucleus and the satellite, in which the satellite presents a reformation of the information from the nucleus. Finally, **paraphrases**[5] are candidates for the RESTATEMENT relation. Table 19 describes the definitions for the RESTATEMENT relation. Notice it is a mononuclear relation and provides semantic information. Furthermore, in the absence of any constraints on the nucleus and satellite, according to Stede et al. (2017), the nucleus precedes the satellite in the text, and the satellite repeats the information given in the nucleus using different wording. Also, the nucleus and satellite are of roughly equal size. Figures 57, 58 and 59 show examples of the RESTATEMENT relation. Observe that the nucleus presents information, which was reformulated by a piece of information given by the satellite.

Table 19. Restatement relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	S restates N, where S and N are of comparable bulk; N is more central to writer's purposes than S is.
Effect on the reader	Reader recognizes S as a restatement of N

[5]Paraphrase consists of a linguistic phenomenon in which to repeat something written or spoken using different words, often in a humorous form or in a simpler and shorter form that makes the original meaning clearer - Cambridge Dictionary

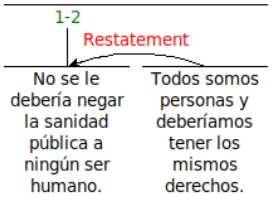

Figure 57. Restatement Relation in Spanish.

Figure 58. Restatement Relation in Portuguese.

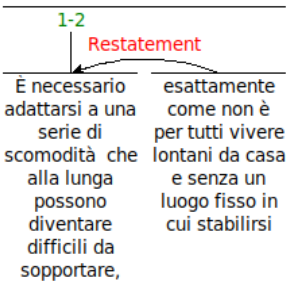

Figure 59. Restatement Relation in Italian.

3.4.20 SEQUENCE

The SEQUENCE relation provides information sequentially chained. Additionally, temporal succession is not the only type of succession for which the SEQUENCE relation might be appropriate. Others could include descriptions of a group of cars according to size or cost, colors of the rainbow, who lives in a row of apartments, etc (Mann and Thompson 1987). Carlson and Marcu (2001) define the SEQUENCE relation as a type of relation multinuclear that establishes a relationship between nuclei in which a list of events is presented according to **chronological order** or **inverted chronological order**. Stede et al. (2017) suggest that it consists of a relationship between two or various nuclei, in which the nuclei describe states of affairs that occur in a particular temporal order, and the reader recognizes the succession relationships among the nuclei. Lastly, the typical connectives are *then, before, afterward*. Table 20 describes the definitions for the SEQUENCE relation. Notice that the relevant property of this relation consists of the fact that the nuclei present situations in a temporal sequence. Furthermore, the main difference between the SEQUENCE relation and other multinuclear relations such as the JOINT is the **secession temporal relationships among nuclei**. Figures 60, 61 and 62 show examples of the SEQUENCE relation. Observe that the information presented in the nuclei provides a type of semantic information in sequence. Therefore, the reader must recognize the presence of a temporal sequence among the nucleus.

Table 20. Sequence relation constraints.

Type	Description
Type of nucleus	Multinuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	There is a succession relationship between the situations in the nuclei
Effect on the reader	Reader recognizes the succession relationships among the nuclei

3.4.21 SOLUTIONHOOD

The SOLUTIONHOOD relation establishes a relationship between nucleus and satellite, in which the reader recognizes that the body of the text presents a solution to the problem of having to clean floppy disk heads too often (Stede et al. 2017). Furthermore, the terms “problem” and “solution” are broader than one might expect. In Carlson and Marcu (2001), the authors titled PROBLEM-SOLUTION this relation For instance, one textual span presents a problem, and the other text span presents a solution. As a result, this relation can be mononuclear or multinuclear, depending on the context. When the problem is perceived as more important than the solution, the problem is assigned the role of the nucleus and the solution is the satellite. Also, Stede et al. (2017) claim that

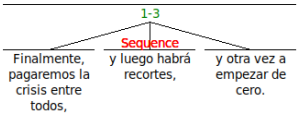

Figure 60. Sequence Relation in Spanish.

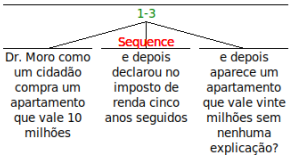

Figure 61. Sequence Relation in Portuguese.

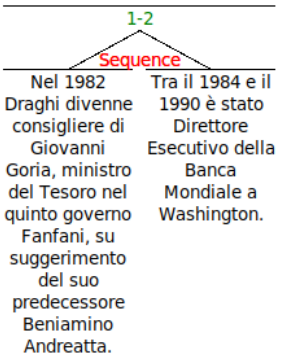

Figure 62. Sequence Relation in Italian.

the nucleus precedes the satellite in the text, and the reader recognizes the nucleus as a solution to the problem presented in the satellite. Finally, the SOLUTIONHOOD relation rarely is signaled by connectives (Stede et al. 2017). Table 21 describes the definitions for the SOLUTIONHOOD relation. Notice the content of the satellite may be regarded as a problem. Otherwise, the nucleus presents a solution to the problem presented in the satellite. Moreover, the reader should recognize the nucleus as a solution to the problem presented in the satellite. Figures 63, 64 and 65 show examples of the SOLUTIONHOOD relation. Observe that the nucleus and satellites do not present any discourse marker or connective. We also observe that the satellite explicitly provides a solution proposal for the event presented in the nucleus.

Table 21. Solutionhood relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N is a solution to the problem presented in S
Constraints on the satellite (S)	S presents a problem
Constraints on the nucleus and satellite (N+S)	N is a solution to the problem presented in S
Effect on the reader	R recognizes N as a solution to the problem presented in S

3.4.22 SUMMARY

Here, a relevant point of departure consists of the fact that the size of the summary presented in the satellite is shorter than the size of the information presented in the nucleus. Therefore, in the SUMMARY relation, the satellite summarizes the information presented in the nucleus, and the emphasis is on the situation presented in the nucleus. Stede et al. (2017) define the SUMMARY relation as mononuclear that establishes a type of relationship between nucleus and satellite, in which the satellite succeeds the nucleus in the text and repeats the information given in the nucleus, however in a shorter form. Furthermore, the typical connectives are *short* and *shortly*. Table 22 describes the definitions for SUMMARY relation. Notice that the nucleus presents more than one EDU. Even though there are no constraints on the satellite, the nucleus position is succeeded by the satellite position. The satellites present the same information presented in the nucleus, however, shortly. Figures 66, 67 and 68 show examples of the SUMMARY relation. Observe that this relation establishes a relationship between the nucleus and the satellite, in which the satellite

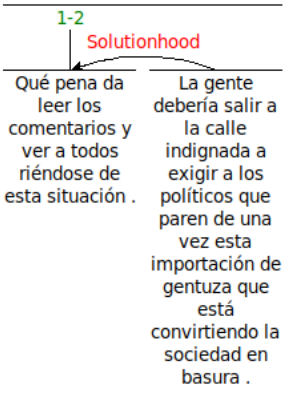

Figure 63. Solutionhood Relation in Spanish.

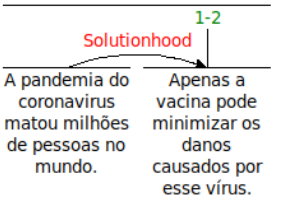

Figure 64. Solutionhood Relation in Portuguese.

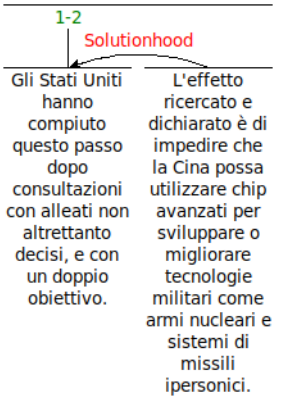

Figure 65. Solutionhood Relation in Italian.

presents a restatement of the content of the nucleus, which is shorter in the bulk. Finally, the satellite summarizes the information presented in the nucleus.

Table 22. Summary relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N must be more than one unit
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	The S presents a restatement of the content of N, which is shorter in bulk
Effect on the reader	R recognizes S as a shorter restatement of N

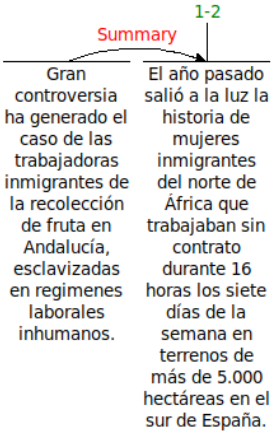

Figure 66. Summary Relation in Spanish.

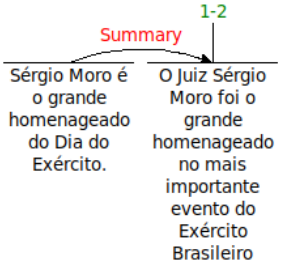

Figure 67. Summary Relation in Portuguese.

Figure 68. Summary Relation in Italian.

3.4.23 VOLITIONAL CAUSE

According to Mann and Thompson (1987), the VOLITIONAL CAUSE relation is defined as a type of relationship between nucleus-satellite in which the nucleus provides the cause of the volitional[6] action presented in the satellite. In the same settings, Stede et al. (2017) claim that in the VOLITIONAL CAUSE relation, the nucleus and satellite should provide a state or event in the world. In order words, the state/event in the nucleus should be caused by the state/event in the satellite, and the reader should recognize the satellite as a cause of the content provided in the nucleus. Finally, the VOLITIONAL CAUSE relation is frequently confused with the MOTIVATION relation (see Section 3.4.14). Nonetheless, the main element that distinguishes them consists of the intended effect of the MOTIVATION relation to make the reader want to perform an action evoked in the text. In Table 23, we describe the definitions in terms of constraints on the nucleus and satellite along with the combination of both for the VOLITIONAL CAUSE relation. Notice it is a mononuclear relation and provides semantic information. Moreover, it is defined as a type of relationship between nucleus-satellites without any constraints on the satellite, while the nucleus must provide information on a volitional action. Besides, there are constraints on the nucleus and satellite together, and typical connectives are *because, since, therefore*. Figures 69, 70 and 71 show examples of the VOLITIONAL-CAUSE relation. Notice the nucleus presents necessarily a volitional information. As it is known from previous discussions, the conception of "volition" according to linguistics studies is related to the intentional or unintentional nature of a subject or agent to act.

Table 23. Volitional Cause relation constraints.

Type	**Description**
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N is a volitional action or else a situation that could have arisen from a volitional action
Constraints on the satellite (S)	N/A
Constraints on the nucleus and satellite (N+S)	S could have caused the agent of the volitional action in N to perform that action; without the presentation of S, R might not regard the action as motivated or know the particular motivation; N is more central to W's purposes in putting forth the N-S combination than S is
Effect on the reader	R recognizes S as a cause for the volitional action in N

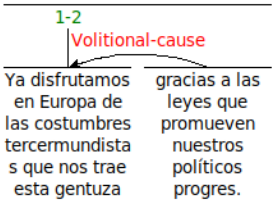

Figure 69. Volitional Cause relation in Spanish.

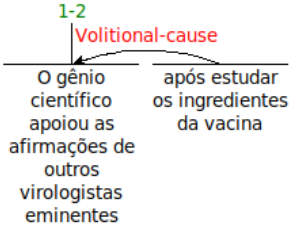

Figure 70. Volitional Cause relation in Portuguese.

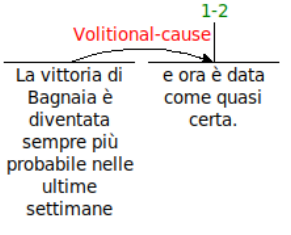

Figure 71. Volitional Cause Relation in Italian.

[6]Volitional is acting as a result of a decision or choice; done because someone has decided or chosen to fundamental processes over which we have volitional control The action is not mechanical; it is volitional (Cambridge dictionary)

3.4.24 VOLITIONAL RESULT

According to Mann and Thompson (1987); Carlson and Marcu (2001), the VOLITIONAL RESULT discourse coherence relation presents a volitional action or situation that could appear from a volitional action. In Stede et al. (2017), the VOLITIONAL RESULT relation is titled only "RESULT" relation, and in the same settings, they define this relation as a discourse coherence relation, in which the information presented in the satellite is the cause of the situation presented in the nucleus. Furthermore, the result, which is the nucleus, is the most important part of this discourse coherence relation. Therefore, without accessing the satellite, the reader may not know what caused the result in the nucleus. Lastly, the typical connectives are *because, since, therefore*. Table 24 describes the definitions in terms of constraints on the nucleus, and satellite, and the combination of both. Notice the mononuclear VOLITIONAL RESULT relation accommodates semantic information and the relationship nucleus-satellite. In this relation, the very important point that we should keep in mind consists of the fact that the constraints on the nucleus and satellite present information that are inversely proportional to the VOLITIONAL CAUSE relation.

Table 24. Volitional Result relation constraints.

Type	Description
Type of nucleus	Mononuclear
Type of relation	Informational / Semantic
Constraints on the nucleus (N)	N/A
Constraints on the satellite (S)	S is a volitional action or a situation that could have arisen from a volitional action
Constraints on the nucleus and satellite (N+S)	N could have caused S; the presentation of N is more central to the writer's purposes than is the presentation of S
Effect on the reader	Reader recognizes that N could be a cause for the action or situation in S

Furthermore, in VOLITIONAL RESULT relation, there are no contractions on the nucleus, and the satellite provides a volitional action. Whether it is compared with the VOLITIONAL CAUSE, the nucleus provides a volitional action and no contractions are on the satellite. Additionally, in VOLITIONAL RESULT the reader recognizes that the nucleus probably has caused the action supply in the satellite. Figures 72, 73 and 74 show examples of SUMMARY relation. Observe that both satellites provide necessarily the presence of volitional information. Besides that, as is known from previous discussions, the conception of "volition" according to linguistics studies is related to the intentional or unintentional nature of a subject or agent to act.

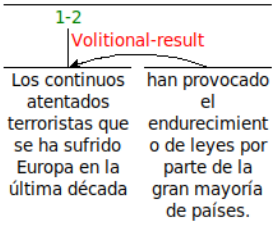

Figure 72. Volitional Result Relation in Spanish.

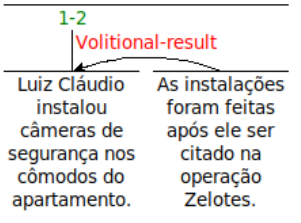

Figure 73. Volitional Result in Portuguese.

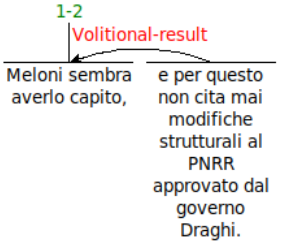

Figure 74. Volitional Result in Italian.

4. Annotation bias

Annotation bias or annotator bias consists of differences between annotator preferences for subjective reasons (Amidei et al. 2020). According to Sampson and Babarczy (2008); Amidei et al. (2018), annotators most diverge in language annotation tasks due to a range of ineliminable factors such as background knowledge, preconceptions about language, and general educational level. In this survey, we aim to provide a well-structured and accurate discourse annotation guideline focused on low-resource languages, which is easy to follow and rich in examples of discourse coherence relations, **as a strategy to mitigate potential annotator bias**. We further recommend two strategies to mitigate bias: (i) **selection of expert annotators**, (ii) **diverse profile of annotators (gender, origin, etc.)**.

5. Evaluation of RST trees

Evaluation metrics of discourse coherence are important to distinguish coherent texts from incoherent texts. The evaluation of RST trees has focused on (i) **human-based evaluation**, which uses expert human raters, and (ii) **automatic-based evaluation**, which uses classical and neural ML algorithms. Guz et al. (2020) propose to evaluate the RST tree using neural networks leveraging its representations as features to evaluate coherent texts. Wan et al. (2019) compared automatically RST trees. Naismith et al. (2023) produced ratings by training GPT-4 to assess discourse coherence compared them with expert human raters.

6. Main Challenges and Opportunities

While the RST has been applied to a wide variety of successful applications, we should not simply see it without any criticism. For instance, discourse coherence relations may present a relevant level of ambiguity. In addition, the segmentation process was not accurately defined. Hence, the identification automatic of an EDU is a complex task. Nevertheless, discourse-aware computational resources have proved to be useful and efficient in different NLP applications. In Lei et al. (2022) showed that embedded discourse structure for sentence-level media bias effectively increases the recall by 8.27% - 8.62%, and precision by 2.82% - 3.48%. Devatine et al. (2022) predicted the political orientation (left, center, right) of news articles using a discourse framework. Aldogan and Yaslan (2015); Appel et al. (2016) evaluated different features including discourse structures for sentiment analysis. Alós (2015) used discourse structure for automatic translation. Huang (2013) applied RST to building clinical question-answering systems. Hewett (2023) applied RST for the text simplification task, and Vargas et al. (2021) used RST for multilingual fake news detection. Xu et al. (2020) proposed a discourse-aware neural summarization model, which extracts sub-sentential discourse units (instead of sentences) as candidates based on RST trees and coreference mentions. And, Li et al. (2020) showed that an EDU is a more appropriate textual unit of content selection than the sentence unit for abstractive summarization. RST is also successfully used for natural language generation (Adewoyin et al. 2022; Isard 2016; Hovy 1990; Mann 1984), and for building of discourse parsing (Li et al. 2014; Mabona et al. 2019).

7. Final Remarks

We provide the first discourse annotation guideline using the Rhetorical Structure Theory for low-resource languages. Specifically, we accurately described 24 (twenty-four) discourse coherence relations in three romance languages: Italian, Portuguese, and Spanish. We further present a comprehensive survey addressing discourse analysis in artificial intelligence, hence offering an accessible resource to new researchers and annotators.

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