Medical-FLAVORS: A Figurative Language And Vocabulary Open Repository for Spanish in the Medical Domain

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Abstract

Metaphors shape the way we think by enabling the expression of one concept in terms of another one. For instance, cancer can be understood as a place from which one can go in and out, as a journey that one can traverse, or as a battle. Giving patients awareness of the way they refer to cancer and different narratives in which they can reframe it has been proven to be a key aspect when experiencing the disease. In this work, we propose a preliminary identification and representation of Spanish cancer metaphors using MIP (Metaphor Identification Procedure) and MetaNet. The created resource is the first openly available dataset for medical metaphors in Spanish. Thus, in the future, we expect to use it as the gold standard in automatic metaphor processing tasks, which will also serve to further populate the resource and understand how cancer is experienced and narrated.
Keywords: Metaphors, MetaNet, MIP, Medical NLP, Linked Data

1. Introduction

Cancer has been broadly envisioned as a battle. However, this aggressive framing of the disease is not always useful, as it might put unnecessary pressure on the patient (Semino et al., 2017). To facilitate the communication of the experience in different ways that can adapt to the patient's needs, the Metaphor Menu was created (Semino and Demjen, 2017). The Metaphor Menu is a compilation of different narratives to talk about cancer. While this tool has been proven to be useful (Semino and Demjen, 2017), its creation, adaptation to different people and scenarios, and expansion to other languages require a huge amount of manual effort. Advances in the development of computational methods for metaphor processing provide us with a promising scenario for the automation of metaphor search and interpretation. The mechanisation of metaphor processing would enable flexible and faster analysis of particular discourses and people. However, while great developments have been made for English and the general domain (Ge et al., 2022), little has been done in Spanish and the medical domain. To bridge this gap, we propose Medical-FLAVOURS[1]: the first Figurative Language And Vocabulary Open Repository for Spanish in the medical domain.

As for the methodology, we have used Metaphor Identification Procedure (MIP) (Pragglejaz Group, 2007) for the detection of metaphors from discourse, and MetaNet (Dodge et al., 2015), through its implementation in Framester (Gangemi et al., 2016), for the structured representation of the metaphors. MIP is the most commonly used method for the identification of metaphors and creation of datasets for automatic metaphor identification (Ge et al., 2022), and, MetaNet is a repository that encodes a wide range of metaphors (mostly in English) with relevant information about them as their target and source domains, usage examples, or links between different metaphors. Framester provides a Linguistic Linked Data Hub where MetaNet is linked to other resources such as Framenet (Baker et al., 1998) or Ontolex (McCrae et al., 2017). Linkage to different resources in Framester enables a deeper description of metaphors.

We expect Medical-FLAVORS to be, not only a repository where to document different metaphors used to refer to cancer experience, but also, to serve as gold standard in automatic metaphor identification and interpretation tasks, and, as a basis for further studies which analyze the usage of metaphors in the medical domain.

In this work, we present the first version of Medical-FLAVOURS. In Section 2, similar works are discussed and the creation of our resource is motivated. Section 3 describes our work pipeline and the characteristics of the first version of our repository. Section 4 shows preliminary usage examples of our repository. Sections 4.1 and 4.2 aim to show the convenience of representing data as linguistic linked data by easily enabling the comparison of data from Reddit forums to data available in philosophy and philology literature in Section 4.1, and by facilitating multilingual comparison with English and Spanish examples in Section 4.2.

2. Background

Metaphor identification is one of the most basic and explored tasks in Computational Metaphor Processing. In such tasks, the most used dataset is VUA (Krennmayr and Steen, 2017), created using the Metaphor Identification Procedure (MIP) (Pragglejaz Group, 2007). MIP takes a discourse-based approach, in which the text is initially read and understood to annotate as metaphors those utterances that differ with the literal interpretation of the text. In MIP methodology this is named as the basic versus metaphorical

[1]Openly available at: https://github.com/4dpicture/Medical-FLAVORS

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meaning comparison. Basic meaning as described in MIP tend to be: "a) More concrete; what they evoke is easier to imagine, see, hear, feel, smell, and taste. b) Related to bodily action. c) More precise (as opposed to vague) d) Historically older". MIP has already been used in Spanish to create the COMETA dataset (Sanchez-Bayona and Agerri, 2022). We take inspiration from this work and expand it by analyzing different Spanish varieties other than the peninsular one, and, by focusing on the medical domain.

The thorough guidelines, the need for professional annotators, and word-by-word analysis allow replicability, exhaustivity, and quality of the dataset. However, such a deep and human-focused method is very time-consuming and subjective. Further, metaphor identification alone does not provide a clear understanding of how an overall idea is being expressed, nor what conceptual patterns are being conveyed. Symbolic methods such as taxonomies and ontologies used to organize and structure knowledge can aid in the interpretation of metaphors.

Conceptual metaphors are the vertebral column of MetaNet. Other characteristics of the metaphor and other metaphors are linked to conceptual metaphors to further describe them. For example, in MetaNet[2], the conceptual metaphor LIFE IS A JOURNEY is linked to verbalisations as 'She hasn't gone as far in life as her parents had hoped', defined by its linked source domain *JOURNEY* and target domain *LIFE*, and related to other metaphors as CANCER IS A JOURNEY. By providing not only the verbalisations but also other relevant properties of the metaphors, MetaNet makes them comparable conceptually and cross-linguistically (see Section 4.2) and provides cues to metaphors that are only conceptualized but not yet verbalized (see Section 4.1). Further, the modelisation of MetaNet via Framester Hub (Gangemi et al., 2016) as Linguistic Linked Data, provides more sophisticated tools for a deeper analysis and identification, and linkage of metaphors to other lexical resources[3].

Works as Amnestic Forgery (Gangemi et al., 2018) and ImageSchemaNet (Giorgis et al., 2022) have explored metaphors as linked data and provided very interesting insights. However, they have been only explored for English. And, while in Magaña (2020), they claim to work with their data for Spanish oncological metaphors in MetaNet format, their resource is not openly available. Our resource contributes by expanding these resources to Spanish, fostering cross-lingual and domain-focused approaches to metaphor research.

3. Resource Description

For the metaphor annotation we started by scraping the Reddit forums (Section 3.1), once we had the relevant posts we identified the metaphors in the texts using MIP (Section 3.2) and modeled them using MetaNet as base (Section 3.3). As a result, we end up with a dataset in tabular format compatible with State of the Art algorithms for automated metaphor identification (Ge et al., 2022), and with a turtle file that can be inspected and linked to other relevant lexical resources.

3.1. Data Selection and Scraping

Using PRAW[2] (Python Reddit API Wrapper), we retrieved a small sample of Spanish Reddit posts from five subreddits ('r/argentina', 'r/chile', 'r/columbia', 'r/espanol', and 'r/mexico'), using the search term *cáncer*. The relevant threads were manually selected using the selection criteria of excluding texts that used cancer as a metaphor to describe something else, such as poverty or crime, and only choosing the ones entailing the cancer experience. We finally selected 11 threads with around 700 comments and 50,000 words. The threads were written in different Spanish varieties: 3 in Mexican Spanish, 1 in Chilean, 1 in Colombian, and 6 in Argentinian. Some threads focus on different kinds of cancer: testicular in the case of the Chilean thread, cerebral cancer and leukemia in the case of the Mexican threads, while others focus on other issues related to cancer as the funding of medicines and governmental aid, and others are rather general. Given the scarcity of threads and comments, we were unable to gather sufficient threads for different aspects of cancer, such as treatment phases, stages, and people involved (patients, healthcare professionals, or carers).

3.2. Metaphor Identification

For the Metaphor Identification, we used MIP procedure, described in Section 2. First the whole reddit thread was read to get the general meaning of it. Then, the text was split into words using the PyMUSAS rule based tagger for Spanish (Rayson et al., 2004). Thirdly, the comment is inspected word by word comparing its most basic meaning to its contextual meaning, if the word's meaning in context is different from its most basic meaning, then, it is marked as metaphorical. As suggested in MIP, dictionaries were used to support the basic meaning identification: namely, Diccionario de la Real Academia de la Lengua (Real Academia de la Lengua, 2023) and Diccionario de Americanismos (Asociacion de Academias de la Lengua Española, 2010) for the non-peninsular varieties.

Annotations were made by two Spanish linguists trained in MIP and doubtful annotations were then discussed with a third annotator expert in MIP and the analysis of metaphors in the medical domain. The third annotator is not a Spanish speaker, however, translating the challenging examples to English by the main annotators was beneficial for clarifying the meaning and usage of the analyzed words.

When performing the manual annotation, we encountered several problems or borderline cases in

[2]see https://metaphor.icsi.berkeley.edu/pub/en/index.php/Metaphor:LIFE_IS_A_JOURNEY

[3]Framester can be accessed and queried through https://framester.github.io/

[2]PRAW available at https://praw.readthedocs.io/en/latest/.

which the decisions taken had to be agreed upon.

1. We decided to focus on words considered open class: verbs, nouns, adjectives, and adverbs.

2. When the Reddit comment was insufficient to elucidate what the actual meaning was (see Example 1), we first tried reading the original post (see Example 2)[3], if even with the original post the interpretation was not possible no annotation was made.

(1) Amigo, qué bien que todo **salió** bien
Friend how good that everything **went-out** well
'Dude, I'm glad everything went well'

(2) Me operaron y me pusieron una prótesis (que real, ni se nota) y la biopsia salió que no tenía ningún rastro de cáncer (tumor benigno).
'I had an operation and a prosthesis (which is not even noticeable) and the biopsy showed that I had no trace of cancer (benign tumor).'

3. Another issue had to do with the limits that the topic of cancer has. For instance, in example 3, the metaphor is about money rather than about cancer, however, the money needed for medicines or the paperwork that must be done to get into a hospital also influences the cancer experience. Discussions about where to establish the limits on what resonates with the cancer experience and what not, were the main cause of disagreement between the annotators.

(3) Quizá te podemos ayudar con eso si teniendo algo de plata es más **rápido**.
'Maybe we can help you with that if having some money makes it **faster**.'

4. In some cases, Reddit comments had some figurative speech, but it is not enough to affirm that those are metaphors 4. In the example below, first there is a metonymy, where the balls are being used to refer to the patient. Secondly, there is a personification of the testicles as they are attributed the feeling of sadness. While this could be interpreted as having balls with tumors is having sad balls, or as the person with cancer is a sad person, several interpretations appear. With this example we were sure there was some figurative speech, but not how to mark it, thus, we left it unannotated.

(4) El bolas tristes
The balls sad
'The person with testicle cancer has sad testicles'

5. Regarding multi-word expressions we followed the decision taken in (Sanchez-Bayona and Agerri, 2022): if a word had its own entry in the dictionary and could be annotated as metaphor, so was the case.

In this initial effort we have completed the annotation of 3 Reddit threads, 79 comments, and 5565 words. From the annotated data, just 1.5% of the words were annotated as metaphorical. This ratio of metaphor/literal expressions is lower than ratios presented in other general domain datasets (Krennmayr and Steen, 2017; Sanchez-Bayona and Agerri, 2022), we hypothesize the decrease is due to the constraint of focusing on a very particular domain as the medical domain instead of looking for metaphors on any domain. The low number of metaphors and imbalance with literal words further highlight the need to find computational methods for metaphor processing that adapt to low-data scenarios. Our current Inter Annotator Agreement was 0.37 using Cohen's K, usually interpreted as fair agreement in the literature. Similar works on metaphor annotation using MIP report kappas between 0.6 and 0.8 (Pragglejaz Group, 2007; Steen, 2010). We expect to increase our Inter Annotator Agreement in future annotations, after the discussions and training for our first results.

A sample of the data with the annotated metaphors can be found in Table 3.2.

3.3. Metaphor Modeling as Linked Data

Once metaphorically used words were annotated with MIP, the evoked conceptual metaphor was also annotated. E.g., taking the example in Table 3.2 '¿en cuanto tiempo te mata un cancer testicular?' which means 'how much time does it take to testicular cancer to kill you?', once the word *mata* (*kill* in English) is identified as metaphorically used, the conceptual metaphor being evoked in the sentence is annotated, in this case CANCER IS A MURDERER. To verbalize the conceptual metaphors, English was used as metalanguage, which is the language used in MetaNet. By using English as metalanguage we could reuse and compare our data to the one in MetaNet (through Framester). To avoid slightly different verbalisations of the same conceptual metaphor (e.g., CANCER IS ASSASAIN instead of CANCER IS MURDERER) both annotators shared a common list of identified conceptual metaphors. This shared list has the metaphors in Framesters version of MetaNet as a base and was further populated by the annotators. In cases in which the same word can be associated with different conceptual metaphors (e.g., CANCER IS MURDERER and CANCER IS PERSON) both were annotated. As in MIP, conceptual metaphors were initially annotated individually by two different linguists, then results were compared and discussed. The Interannotator agreement in this case was unanimous, and in the cases where both annotators had difficulties verbalizing the metaphors a third annotator counseled them.

With the MetaNet procedure, 79 comments from 3 different Reddit threads have been analyzed. Among

[3]All orthographic mistakes have been corrected by the annotators

DocID	SentenceID	WordIndex	Sentence	ConceptualMetaphor
12yxw6r	51	5	¿en cuanto tiempo te mata un cáncer testicular?	CANCER_IS_MURDERER

Table 1: Sample of FLAVORS metaphor annotations in tabular format compatible with SoTA automatic metaphor identification methods. DocID references the Reddit thread where the sentence is found, SentenceID is the particular comment from the thread, WordIndex is the index of the metaphorically marked word from the sentence.

them, 94 metaphoric expressions were identified and linked to 59 different conceptual metaphors (54 novel metaphors found by the annotators and 5 reused from MetaNet). Conceptual metaphors belong to 41 different source frames and 38 different target frames.

Once the linguistic metaphors in the Reddit posts were annotated with MIP and their relative conceptual metaphors, the data was translated into Resource Description Framework (RDF) structured format, following Framester's model, and with the properties shown in Figure 1.

In Figure 2 a brief quantitative analysis of the attested conceptual metaphors can be seen. While some of the metaphors in Figure 2 are very frequent given the particular focus of the thread (e.g., TESTICLES ARE COCONUTS was only attested on the thread about testicular cancer) other metaphors were common among the different threads (e.g., CANCER IS OBJECT OR STRENGTH IS TREATMENT). Similarly, the bias of domains given the thread's focus can also be observed on the target and source domain frequencies. We expect to decrease such biases when adding more examples from different threads.

4. Usage Examples

FLAVORS dataset could be used to train and test SoTA models on automated metaphor identification, where progress has been made for English and the general domain, but less for Spanish and the medical domain. Improving these models could aid in finding relevant narratives about the experience of cancer.

Further, modeling metaphors as linked data can structure the information encoded in metaphors (e.g., which semantic domains are being mostly used to refer to particular experiences of cancer), what metaphors are being expressed, and which ones could be potentially expressed but have not been yet verbalized in daily discourse and just in critical literature revisiting cancer experience or allow multilingual comparison. Further, the linkage of our FLAVORS to other resources such as FrameNet (Baker et al., 1998) could elucidate what elements of the cancer experience are being highlighted (e.g, the patient's role as in CANCER IS WAR in sentences such as 'I am tired of fighting cancer') or it could be linked to other lexical resources as WordNets to group metaphors and find their hypernymic and hyponimic metaphors (e.g., CANCER IS JOURNEY by using WordNets could be linked to CANCER IS MOVEMENT).

In this section we introduce two brief examples to illustrate how modeling metaphors as MetaNet can be beneficial to show gaps and potential metaphors both monolingually (Section 4.1) and crosslingually (Section 4.2).

4.1. With Manual Efforts in Spanish Data

By modelling metaphors as Linked Data we can compare the ones elicited in the Reddit posts with the ones described in literature which might not be yet verbalized.

We reviewed the following works: Chacón (2008), Paituví (2019), Taylor and Velázquez (2020), Barrera (2016), Barbosa and Coll-Planas (2015). At first sight, we could observe that many metaphors used by patients on Reddit were very common and also represented in the more scientific literature: CANCER IS A JOURNEY (Paituví, 2019), CANCER IS A MURDERER (Chacón, 2008), CANCER IS A BATTLE (Chacón, 2008), CANCER IS A STOP IN LIFE (Barbosa and Coll-Planas, 2015), LOSE TESTICLES IS LOSING MANHOOD (Barrera, 2016). However, other metaphors are not usually spoken by the patients or families of cancer patients, while still having significance to understanding how cancer is perceived by general society. The "Pink Ribbon Culture" as it is explained in Paituví (2019) related to breast cancer women makes a metaphor that could be something like: women with breast cancer are like children. Another example is the concept of silence related to cancer showed in Taylor and Velázquez (2020) article. The cancer is seen as something taboo, something to avoid or something shameful, some of the metaphors we could find are: BEING SILENT IS BEING ASHAMED (Paituví, 2019), SILENCE IS INVISIBILIZATION (Paituví, 2019). This can have serious consequences, such as patients not voicing their concerns for fear of not being taken seriously. Other kind of examples are those that from a metaphor like CANCER IS A BATTLE (Chacón, 2008) entails other metaphors like DYING IS LOSING THE BATTLE (Chacón, 2008), so that the patient with cancer that dies is drawn in society as a loser, or people might think that they haven't fought enough to get ride of cancer.

Modelling metaphors as Linked Data allowed us to see not only what is being said, but also what is being silent and gives us cues to see where new metaphors might be verbalized to explore other framings of cancer.

4.2. With English Data

In comparison to MetaNet, where only seven mappings are cancer-related, our Medical-FLAVORS provides a more nuanced differentiation of different aspects of the cancer experience, including cancer itself (e.g., CANCER IS MURDERER), cancer patients (e.g., BODY IS CONTAINER), their general experience of being ill with cancer (e.g., HAVING CANCER IS BEING DEPRIVED), their psychological wellbeing (e.g., BEING PSYCHOLOGICALLY BAD IS BEING MADE OF SHIT), their relationships with other key stakeholders,

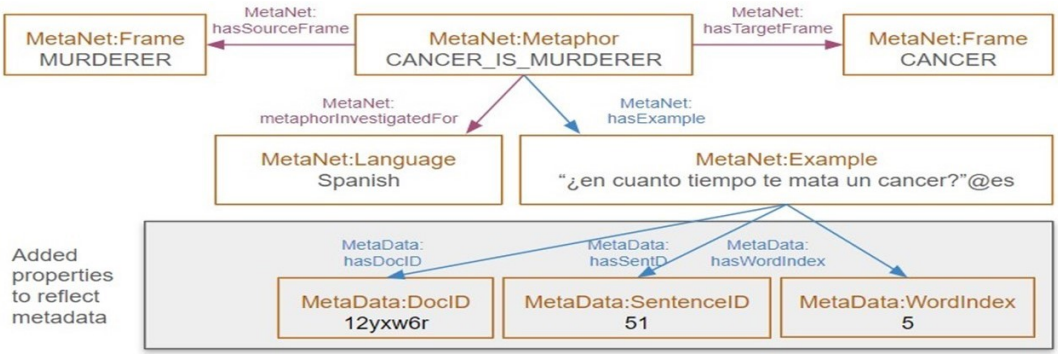

Figure 1: Example of our adaptation of MetaNet model to our examples

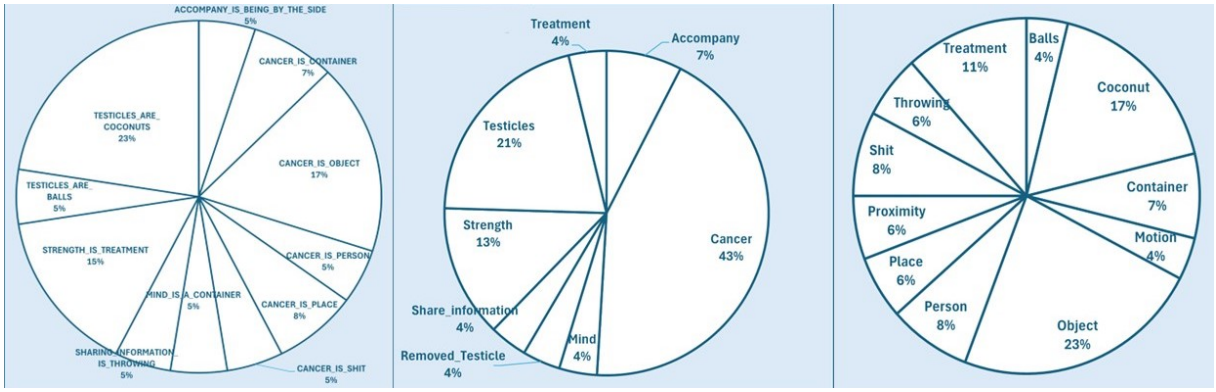

Figure 2: Frequency count of most attested conceptual metaphors, target domains, and source domains in the annotated Reddit threads

such as families and friends (e.g., ACCOMPANY IS BEING BY THE SIDE) and health professionals (e.g., BAD DOCTORS ARE SHIT), as well as treatment (e.g., TREATMENT IS A BALANCE). Nevertheless, while our study is more contextualized in a cancer scenario, it also shares or builds up on the more generic mappings in MetaNet, especially in terms of the Orientation and Container metaphors that are common in human thinking (cf. CANCER IS CONTAINER, IMPROVEMENT IN MOOD IS UPWARD MOTION). On the other hand, our project's contextualization is also illustrated through the use of more specific mappings under a generic mapping, such as the specific mapping CANCER IS A STOP IN LIFE in Medical-FLAVORS under the generic mapping LIFE IS A JOURNEY in both our project and the MetaNet project.

However, the current datasets are quite limited, as many generic but essential mappings in the MetaNet were not found in the current study. For instance, mappings related to "Action", "Change-of-state", "Communication" and "Control" are not commonly witnessed in our current Spanish data, even though these elements are indispensable in a cancer scenario regardless of the country contexts. Moreover, as we have found for the mappings above, the language used in the cancer domain is usually more specific but also closely linked to some generic mappings. Hence, it is likely to find the specific versions of those mappings related to "Action", "Emotion", "Change-of-state", "Communication" and "Control" in our Medical-FLAVORS project, if more data is analyzed and trained.

5. Conclusions and Future Work

In this paper we present the first version of Medical FLAVORS, the first openly available resource for the computational and manual analysis of Spanish metaphors in the medical domain. We present our data both in VUA dataset format which can be exploited with state-of-the-art automated metaphor identification algorithms to further populate the dataset, and in MetaNet Linked Data format which enables the further linking of the resource and inference-making on the metaphors with other relevant resources as FrameNet or Ontolex based lexical resources.

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