

# A descriptive study of metaphors and frames in the multilingual shared annotation task

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## Abstract

This work assumes that languages are structured by semantic frames, which are schematic representations of concepts. Metaphors, on the other hand, are cognitive projections between domains, which are the result of our interaction in the world, through experiences, expectations and human biology itself. In this work, we use both semantic frames and metaphors in multilingual contrast (Brazilian Portuguese, English and German). The aim is to present a descriptive study of metaphors and frames in the multilingual shared annotation task of Multilingual FrameNet, a task which consisted of using frames from Berkeley FrameNet to annotate a parallel corpora. The result shows parameters for the metaphorical comparison considering those frames.

## 1 Introduction

Understanding human language requires activating cognitive models of socially shared knowledge. The linguistic units, whether lexical or constructional items, evoke possibilities of meaning defined in the context of linguistic-conceptual models, which are called semantic frames (Fillmore, 1982, 1985).

The computational implementation of frames was created at the end of the 20th century for the English language by the FrameNet project. The semantic frames methodology was later expanded to other languages, including Brazilian Portuguese (Torrent et al., 2022).

Motivated by the interest in frame comparison in a multilingual perspective, Multilingual FrameNet completed its first task, which consisted of the parallel corpora annotation of the TED talk “Do schools Kill Creativity?” (Robinson, 2016). This work tests the alignment of its linguistic databases with the frames defined for English. The goal is to establish the means of creating multilingual lexical resources as well as a semantically referenced machine translator (Torrent et al., 2018).

This article shows a comparative study of metaphors found in these linguistic annotations for Brazilian Portuguese, English and German. Bringing the results together, we have a set of metaphorical metadata in terms of metaphors and frames. The work brought together the theoretical contributions of Frame Semantics, created by Fillmore (1982), and the Conceptual Theory of Metaphor, compiled by Lakoff and Johnson (1999).

Both theories have computational applications: FrameNet (Ruppenhofer et al., 2016) and MetaNet (Dodge et al., 2015). The present work follows the methodological guidelines of FrameNet and uses MetaNet in order to explore the metaphors described in its network.

The text is organized as follows: section 2 presents Frame Semantics and the Conceptual Theory of Metaphor are presented; section 3 discusses semantic frames and translation studies; section 4 explains the multilingual annotation task; section 5 presents the parameterization of metaphorical metadata, and section 6 presents the summary and mentions some directions to take in a future work.

## 2 Background

### 2.1 Frame Semantics

Frame Semantics was created by Fillmore (1982, 1985). It assumes that the meaning of a linguistic unit, lexical or constructional, underlies a network of other units, which suggests the interactivity of meaning in a natural language. The term *frame* designates the socially shared linguistic-conceptual model that structures this knowledge representation.

“By the term ‘frame’ I have in mind any system of concepts related in such a way that to understand any one of them you have to understand the whole structure in which it fits; when one of the things in such a structure is introduced in a text, or

into a conversation, all of the others are automatically available” (Fillmore, 1982, 111).

The study of semantic frames is a precursor of Cognitive Linguistics as a field. Different authors may use their own terminology and have their own specific purposes in using concepts such as ‘domains’ in Langacker (1987), ‘Idealized Cognitive Models’ and ‘scripts’ in Lakoff and Turner (2009) or may use frames to develop a concept such as the Mental Spaces theory in Fauconnier (1994).

- (1) [The company <sub>Employer</sub>] **HIRED** [him <sub>Employee</sub>] [after going through a lengthy selection process <sub>Time</sub>].
- (2) [She <sub>Employee</sub>] was **DISMISSED** [by the manager <sub>Employer</sub>] [after fifteen years in the role <sub>Time</sub>].

To understand the concept of frames, take the employment event as an example. In this situation, an employee and an employer begin an employment relationship, in which the employee will perform some predetermined activity for the employer, in exchange for payment. For a period of time, the employee remains employed, and the relationship ends when the employee quits the job, the employer dismisses him or the employee retires.

Sentences (1) and (2) show parts of the sequence of events in an employment activity. The Lexical Units *hire.v* and *fire.v* evoke *Hiring* and *Firing* frames, respectively. These frames are defined in terms of its participants, props and other conceptual roles, which are the semantic roles of the lexical units shown in bold above, called frame elements.

## 2.2 Conceptual Metaphor Theory

The Conceptual Metaphor Theory was proposed by Lakoff and Johnson (2008) with complementary contributions added later on Lakoff (2008); Lakoff and Turner (2009); Lakoff and Johnson (1999). Many studies show that metaphors are not limited to ornaments of speech or writing, but are the result of our interaction in the world, through experiences, expectations and human biology itself.

Lakoff (2012) takes into account the intrinsic relationship of metaphors with human biology itself, and discusses metaphor as evidence of embodied cognition. He suggests that neural mappings in the brain are related to metaphorical domain correspondences.

As a result of the metaphorical phenomenon, we understand things that are more abstract or subjective and less structured in terms of others that are more concrete, objective or more structured.

- (3) And my contention is, all kids have tremendous talents. And we squander them, pretty ruthlessly. (TEDTalk)

In the example (3), the metaphor TALENT IS A RESOURCE is used. Through it, an element of the experiential domain of an attribute is understood as an entity or, more specifically, a finite resource.

A metaphorical projection presupposes a correspondence between domains: the source domain structures what is intended by the target. In this work, the relation between domains is explained through FrameNet frames. According to the FrameNet’s annotation procedure, metaphors are marked by an extra annotation layer. If the metaphor is productive, it is indicated in the source domain. If it occurs at the level of the lexicon, the lexical unit will be in the target frame, the one that specifies the speaker’s intention when producing an utterance (Ruppenhofer et al., 2016).

## 3 Frames and translation

Schäffner (2004, 2016) approaches the metaphorical phenomenon through a connection between Cognitive Linguistics and translation studies. She revisits the analytical methods of theorists such as Newmark (1981) and Toury (1995).

The Primacy of Frame Model of Translation hypothesis (Czulo, 2017) proposes the use of semantic frames as a descriptive basis for translational comparison. Czulo’s hypothesis is based on one of the premises of Frame Semantics: when a frame is evoked, several others are automatically activated. As the author points out, metaphors are candidates for this frame co-activation process.

Theoretical and descriptive advances on the topic of frames and translation have been made. However, computational models and applications to automatically assess the translation of metaphors according to cognitive linguistics assumptions is an open topic that requires multidisciplinary research.

## 4 The multilingual annotation task

The first task of the Multilingual FrameNet initiative was to create a semantically refined linguistic analysis sample that would allow database alignment tests. FrameNets developed for different lan-

guages were responsible for annotating parallel corpora aligned at the sentence level. These annotations were produced using the text of a conference in the TED Talk model (Robinson, 2016)<sup>1</sup>.

The analyses were carried out using the full-text annotation method, which consists of all semantic frame-evoking lexical units being submitted for annotation. The semantic frames used for the annotation task were those from Berkeley FrameNet, which highlights the initiative of developing computer applications for multilingual alignment purposes based on the Berkeley FrameNet database (Baker and Lorenzi, 2020).

Figure 1 shows an example of the annotation in English. The highlighted items are the Lexical Units under analysis. Each lexical unit evokes a frame, and the frame, in turn, brings a series of elements, the so-called Frame Elements, all named specifically in relation to the frame they belong to, as shown in the lower description of the respective figures.

In addition to the semantic analysis, the syntactic treatment is also included. It distinguishes the Grammatical Functions of Frame Elements as well as their Phrase Types. For this reason, the linguistic analysis of a framenet is commonly called a three-layer annotation. Although other layers may exist, the three essential ones are: essentially, Frame Element (FE), Grammatical Function (GF) and Phrasal Type (PT).

<sup>1</sup>[https://www.ted.com/talks/sir\\_ken\\_robinson\\_do\\_schools\\_kill\\_creativity/transcript](https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity/transcript)

## 5 The parameterization of metaphorical metadata

In this present work, fifty sentences from the corpus were analyzed. One of the procedures adopted was to start the comparative study using the metaphors in the Brazilian Portuguese text and, then, to interpret such translation choices in German and check the original text in English.

The result of this process is a set of analyses that indicate paths to a descriptive method of extracting semantic information. The parameters for the metaphorical comparison considering the frames evoked in the three languages were: total, directly related, indirectly related, and unrelated.

- i Total: the frames are the same.
- ii Directly related: the relation is direct. The frames are connected by one of the frame-to-frame relations.
- iii Indirectly related: the relation is indirect. They are connected by one of the frame-to-frame relations, while expanding the network.
- iv Unrelated: there is no relation between frames in the FrameNet database.

The analysis took into account the metaphorical projections in Brazilian Portuguese. As shown through the examples, a metaphor in Brazilian Portuguese may have resulted from different translation options of the original in English, and the correlation with the German version also occurred in different ways.

Ted_Creativity_corpus : doc_ted_en	
idSentence	Sentence
1043	What you have there is a person of extraordinary dedication who found a talent.
Sentences	
What you have there is a person of EXTRAORDINARY <sup>Desirability</sup> [ <sub>Valuee</sub> dedication] who found a talent. What you have there is a [ <sub>Person</sub> person] of extraordinary dedication who found a talent. PERSON <sup>People</sup> [ <sub>Entity</sub> What] [ <sub>Topical_entity</sub> you] HAVE <sup>Have_associated</sup> [ <sub>Place</sub> there] is a person of extraordinary dedication who found a talent. What you have there is [ <sub>Perceiver</sub> a person of extraordinary dedication] [ <sub>Perceiver</sub> who] Found <sup>Locating</sup> [ <sub>Sought_entity</sub> a talent]. What you have there is a person of extraordinary dedication who found a TALENT <sup>Capability</sup> [ <sub>Entity</sub> CNI] [ <sub>Event</sub> DNI]	
© 2014, 2021 FrameNetBrasil Project	

Figure 1: Semantic annotation of the multilingual task in English.

Table 1 summarizes the process of analyzing an example in which the match is total. The metaphorical sentence in Brazilian Portuguese has *perder.v* as a Lexical Unit which evokes the `Losing` frame in the FrameNet database. In German, the translation choice is *verloren.v*, evoking the same frame, and, in the original text, the speaker’s lexical option was *lose.v*, evoking the same frame.

The parallel corpora contrasts each corpus to the original. In Table 1, both German and Brazilian Portuguese languages start from a metaphor and are translated through the same metaphor: ATTRIBUTES ARE ENTITIES. In addition to that, there is also information about related metaphors and semantic annotation for each language.

Another regularity was the directly related. Frame-to-frame relations<sup>2</sup> are the evidence for such a match. Table 2 is an example of this pattern. The Lexical Units *conduzir.v*, *take.v*, *gedacht.v* are examples of the same metaphor: LIFE IS A JOURNEY.

The frame evoked in English and Brazilian Portuguese is `Bringing`, while in German it is `Cause_motion`. Checking the frame network, there is a direct relation between them, as `Cause_motion` is used by `Bringing`. In this relation, not all Frame Elements of `Cause_motion` occur linguistically in `Bringing`. However, there is a part of its structure presupposed as what is considered a conceptual background.

<sup>2</sup>The frame network is accessed from FrameGrapher on FrameNet. The frame-to-frame relations are Inheritance, Subframe, Perspective\_on, Using, Precedes, Inchoative\_on, Causative\_on, See\_also and the Metaphor relation, which was added to the others in the Berkeley team’s last systematic update and still lacks empirical validation (Ruppenhofer et al.,

Table 3 is an example of a situation in which the metaphorical behavior is identical in the three languages through the use of the metaphor TALENT IS AN OBJECT. However, the frame evoked by the Lexical Unit *find.v* in English is `Locating`, while *achar.v* in Brazilian Portuguese and *finden.v* in German is `Becoming_Aware`. Analysing both frames, `Locating` is defined by a Perceiver looking for something, a `Sought_entity`. And `Becoming_aware`’s definition says that words in this frame have to do with a Cognizer adding some Phenomenon to their model of the world.

Checking the network of frames, we notice that `Locating` uses `Seeking`, which, through the *See\_also* relation, links to the `Scrutiny` frame, which, in turn, *uses* `Becoming_aware`. Even though they are indirectly related on the network of FrameNet frames, the annotation divergence seems to be in the choice between the metaphorical source and target domains. `Locating` is a frame related to the source domain, while `Becoming_aware` relates to the metaphorical target domain.

The other pattern in frame comparison was unrelated. In Table 4, the three sentences are an example of the TALENT IS A RESOURCE metaphor. In FrameNet, the lemma *squander.v* is a Lexical Unit in `Expand_resource` and also in `Frugality`. The annotation choice was to insert it in `Expand_resource`, which outlines the use of a resource. In Brazilian Portuguese and in German, the Lexical Units *desperdiçar.v* and *vergeuden.v* evoke `Frugality`, which focuses on how the resource is used.

2016).

<sup>2</sup>The signal is used when the sentence segmentation is different.

	Portuguese	English	German
IdSentence	820	1087	1348
Sentence	E quando chegam à fase adulta, a maioria das crianças <b>perdeu</b> essa capacidade.	And by the time they get to be adults, most kids have <b>lost</b> that capacity.	Wenn sie erst erwachsen sind, haben die meisten Kinder diese Fähigkeit <b>verloren</b> .
<b>Metaphor behaviour relating to the English text</b>	Metaphor to same metaphor		Metaphor to same metaphor
<b>Metaphor</b>	ATTRIBUTES ARE ENTITIES		
<b>Related metaphor</b>	ATTRIBUTES ARE POSSESSIONS (Grady, 1998; Lakoff, 1999)		
<b>Lexical Unit evoked</b>	<i>perdeu.v</i>	<i>lost.v</i>	<i>verloren.v</i>
<b>Semantic frame</b>	<code>Losing</code>	<code>Losing</code>	<code>Losing</code>
<b>Semantic annotation</b>	[a maioria das crianças <sub>Owner</sub> ] PERDEU [essa capacidade <sub>Possession</sub> ]	[most kids <sub>Owner</sub> ] have LOST [that capacity <sub>Possession</sub> ]	[Kinder <sub>Owner</sub> ] diese [Fähigkeit <sub>Possession</sub> ] VERLOREN
<b>Match Levels</b>	Total		Total

Table 1: Total semantic frame match level.

	Portuguese	English	German
IdSentence	762	1034	1298
Sentence	Nos interessamos tanto por ela em parte porque é da educação o papel de nos <b>conduzir</b> a esse futuro misterioso.	We have a huge vested interest in it, partly because it's education that's meant to <b>take</b> us into this future that we can't grasp.	Wir haben ein großes, persönliches Interesse, teilweise Bildung dazu gedacht ist, uns in diese Zukunft zu <b>bringen</b> , die wir nicht fassen können.
Metaphor behaviour relating to the English text	Metaphor to same metaphor		Metaphor to same metaphor
Metaphor	LIFE IS A JOURNEY		
Related metaphor	PROGRESSING THROUGH LIFE IS MOVING ALONG A PATH		
Lexical Unit evoked	<i>conduzir.v</i>	<i>take.v</i>	<i>bringen.v</i>
Semantic frame	Bringing	Bringing	Cause_motion
Semantic annotation	[educação Agent] o papel de [nos Theme] CONDUZIR [a esse futuro misterioso Goal]	[education Agent] [that Agent]'s meant to TAKE [us Theme] [into this future that we can't grasp Goal]	[uns Theme] [in diese Zukunft Goal] zu BRINGEN
Match Levels	same		directly related

Table 2: Total semantic frame match level and directly related.

	Portuguese	English	German
IdSentence	772	1043	1307
Sentence	O que vemos ali é uma pessoa de extrema dedicação que <b>achou</b> seu talento.	What you have there is a person of extraordinary dedication who <b>found</b> a talent.	Sie ist eine Person mit außerordentlicher Hingabe, die ihr Talent <b>gefunden</b> hat.
Metaphor behaviour relating to the English text	Metaphor to same metaphor		Metaphor to same metaphor
Metaphor	TALENT IS AN OBJECT		
Related metaphor	A TALENT IS A RESOURCE IDEAS ARE OBJECTS (Lakoff, 1987)		
Lexical Unit evoked	<i>achou.v</i>	<i>found.v</i>	<i>gefunden.v</i>
Semantic frame	Becoming_aware	Locating	Becoming_aware
Semantic annotation	[uma pessoa de extrema dedicação Cognizer] [que Cognizer] ACHOU [seu talento Phenomenon]	[a person of extraordinary dedication Perceiver] [who Perceiver] FOUND [a talent Sought_entity]	[die Cognizer] [ihr Phenomenon] [Talent Phenomenon] GEFUNDEN hat
Match Levels	indirectly related		indirectly related

Table 3: Indirectly related semantic frame match level.

	Portuguese	English	German
IdSentence	774	1045	1308
Sentence	E o <b>desperdiçamos</b> , implacavelmente.	And we <b>squander</b> them, pretty ruthlessly.	(#) <sup>3</sup> und dass wir sie <b>vergeuden</b> und zwar ziemlich rücksichtslos.
Metaphor behaviour relating to the English text	Metaphor to same metaphor		Metaphor to same metaphor
Metaphor	TALENT IS A RESOURCE		
Related metaphor	A TALENT IS AN OBJECT		
Lexical Unit evoked	<i>desperdiçamos.v</i>	<i>squander.v</i>	<i>vergeuden.v</i>
Semantic frame	Frugality	Expend_resource	Frugality
Semantic annotation	E [o Resource] DESPERDIÇAMOS, implacavelmente	And [we Agent] SQUANDER [them Resource], [pretty ruthlessly Manner]	[wir Resource_controller] [sie Resource] VERGEUDEN
Match Levels	unrelated		unrelated

Table 4: Unrelated semantic frame matching level (1).

As much as *Frugality* highlights human social behavior, as mentioned in the frame definition, its conceptualization requires the idea of spending or using a resource. Potentially, a frame-to-frame relation connects both of them. However, it has yet

to be more deeply studied and attested. In order to achieve this goal, it will be necessary to update the network of frame-to-frame relations.

In Table 5, we can say THE BODY IS A CONTAINER FOR THOUGHTS, VALUES

	Portuguese	English	German
IdSentence	760	1031	1296
Sentence	Porque é uma dessas coisas <b>arraigadas</b> nas pessoas, estou certo?	Because it's one of those things that <b>goes deep</b> with people, am I right?	Denn es ist eines dieser Themen, die Leute tief <b>berühren</b> , wie Religion, Geld und andere Sachen. (#) Metaphor to same metaphor
<b>Metaphor behaviour relating to the English text</b>	Metaphor to same metaphor		
<b>Metaphor</b>	THE BODY IS A CONTAINER FOR THOUGHTS, VALUES, PRINCIPLES		
<b>Related metaphor</b>	THE BODY IS A CONTAINER FOR EMOTIONS (Lakoff, 1987)		
<b>Lexical Unit evoked</b>	<i>arraigada.a</i>	<i>goes.v / deep.a</i>	<i>berühren.v</i>
<b>Semantic frame</b>	Presence	Motion / Measurable_attributes	Stimulus_focus
<b>Semantic annotation</b>	[coisas Entity] ARRAIGADAS [nas pessoas Location]	[those things Theme] [that Theme] GOES [deep Goal]	[Themen, die Stimulus] [Leute Experiencer] [tief Degree] BERÜHREN, [wie Religion, Geld und andere Sachen Comparison_set]
<b>Match Levels</b>	unrelated		unrelated

Table 5: Unrelated semantic frame matching level (2).

AND PRINCIPLES is the general metaphor in the three languages. However, there are differences in the framing of each one. In English, *go deep* evoke Motion and Measurable\_attributes, while, in German, *berühren.v* (which can be literally translated into English as *touch.v*) evokes Stimulus\_focus.

In both cases, the metaphor THOUGHTS, VALUES AND PRINCIPLES ARE OBJECTS is used. Unlike previous uses where the metaphor is related to dynamic events, in Brazilian Portuguese, the lexical unit is *arraigado.a* (which can be literally translated into English as *rooted.a*). The lemma was annotated in the Presence frame. A specific metaphor that licenses this use is THOUGHTS, VALUES, PRINCIPLES ARE PLANTS. Through this metaphor, just as a plant takes root and becomes fixed in the ground, a thought, value and principle can also become established in a person.

On preliminary analysis, the unrelated pattern includes different situations. Cases in which some relation may exist, but is not in the database, are included here. A possible explanation is the dynamic character of the database updating. Other possible reasons for such a pattern may lie in the perspectives assumed in the face of the linguistic framework of a given situation, as well as features of idiomaticity and typological specificities of languages.

## 6 Summary

This paper compared metaphors and frames in the FrameNet multilingual annotation task. The result

of this process is a set of analyses that indicate paths to a descriptive method of extracting semantic information from FrameNet database. Future work may validate the taxonomy presented in a larger sample of semantically annotated parallel corpus and expand the analysis to other languages. Beyond that, including computational works on multilingual approaches to frame semantics and metaphors can contribute to a method to automatically parameterize these data.

## Acknowledgements

The work reported in this article has received financial support from the CAPES PROBAL (grant 88887.387875/2019-00). The author would like to thank Dr. Oliver Czulo who supervised the post-doctoral fellowship at the University of Leipzig in 2020, and Dr. Tiago Torrent who contributed to this research as well. I extend the thanks to Dr. Helen de Andrade, the anonymous reviewers and the editors for their important comments and suggestions to improve the final version of the paper. Finally, I am also thankful for all the researchers who put effort to the shared annotation task and provide their data for studies like this present one.

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## Language Resource References

FrameNet:  
<https://framenet.icsi.berkeley.edu>

MetaNet:  
<https://metaphor.icsi.berkeley.edu>

Multilingual FrameNet initiative:  
<https://www.globalframenet.org>