

# NEGES 2018: Workshop on Negation in Spanish

## *NEGES 2018: Taller de Negación en Español*

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**Abstract:** This paper presents the 2018 edition of NEGES, Workshop on Negation in Spanish, that took place on September 18 as part of the 34th International Conference of the Spanish Society for Natural Language Processing. In this edition, three tasks were proposed: Task 1: “Annotation guidelines”, Task 2: “Negation cues detection”, and Task 3: “Sentiment analysis”. The dataset used for Task 2 and Task 3 was the SFU ReviewSP-NEG corpus. About 10 teams showed interest in the tasks and 4 teams finally submitted results.

**Keywords:** NEGES 2018, negation, annotation guidelines, negation processing, cue detection, sentiment analysis

**Resumen:** Este artículo presenta la edición 2018 de NEGES, Taller de NEGación en ESpañol, que tuvo lugar el 18 de septiembre como parte de la 34 edición de la Conferencia Internacional de la Sociedad Española para el Procesamiento del Lenguaje Natural. En esta edición se propusieron 3 tareas: Tarea 1: “Guías de anotación”, Tarea 2: “Detección de claves de negación”, y Tarea 3: “Análisis de sentimientos”. El conjunto de datos utilizado para la Tarea 2 y para la Tarea 3 fue el corpus SFU ReviewSP-NEG. Unos 10 equipos mostraron interés por las tareas y 4 equipos presentaron resultados.

**Palabras clave:** NEGES 2018, negación, guías de anotación, procesamiento de la negación, detección de claves, análisis de sentimientos

## 1 Introduction

Negation is a complex linguistic phenomenon of growing interest in computational linguistics. Detection and treatment of negation is relevant in a wide range of applications such as sentiment analysis or information retrieval, where it is crucial to know when a part of the text should have a different meaning due to the presence of negation. If we want to develop systems that approach human understanding, it is necessary to incorporate the treatment of negation, a linguistic phenomenon that we use constantly. In recent years, several challenges and shared tasks have focused on processing negation (Morante and Sporleder, 2010; Farkas et al., 2010; Morante and Blanco, 2012). However, most of the research on negation has been done for English. Therefore, the 2018 edi-

tion of the NEGES Workshop<sup>1</sup> aimed to advance the study of this phenomenon in Spanish, the second most widely spoken language in the world and the third most widely used on the Internet. The main objective was to bring together the scientific community that is working on negation to discuss how it is being addressed, what are the main problems encountered, as well as sharing resources and tools aimed at processing negation in Spanish.

The rest of this paper is organized as follows. The proposed tasks are described in Section 2, and the data used in Section 3. Evaluation measures are introduced in Section 4. Participating systems and their results are summarized in Section 5. Finally, Section 6 concludes the paper.

<sup>1</sup><http://www.sepln.org/workshops/neges/index.php?lang=en>

Corpus	Domain	Annotation guidelines
UAM Spanish TreeBank	News	pp. 51-55 (Sandoval and Salazar, 2013)
IxaMed-GS	Clinical reports	pp. 322 (Oronoz et al., 2015)
SFU ReviewSP-NEG	Product reviews	pp. 538-559 (Jiménez-Zafra et al., 2018)
UHU-HUVR	Clinical reports	pp. 54-57 (Cruz Díaz et al., 2017)
IULA Spanish Clinical Record	Clinical reports	pp. 45-49 (Marimon, Vivaldi, and Bel, 2017)

Table 1: Annotation guidelines provided for Task 1

## 2 Tasks description

In the 2018 edition of the Workshop on Negation in Spanish, three tasks were proposed:

- **Task 1:** “Annotation guidelines”
- **Task 2:** “Negation cues detection”
- **Task 3:** “Sentiment analysis”

The following is a description of each task.

### 2.1 Task 1

Task 1 of NEGES 2018, “Annotation guidelines”, had as goal to reach an agreement on the guidelines to follow for the annotation of negation in Spanish texts. Although there have already been several annotation efforts, the community lacks a standard for the annotation of negation, contrary to what happens with other phenomena, such as semantic roles.

The corpora annotated so far in Spanish belong to 3 domains (news, clinical reports and product reviews) and are based on different guidelines. In this task, the guidelines used for the annotation of the corpora were made available to the participants so that they could analyze them (Table 1). A period of analysis was provided and once it was over, participants sent a document indicating which aspects of the guidelines they agreed with and which they did not, all duly justified. The documents describing the perspective of each team were sent to the rest of participants prior to the workshop in order to enhance a discussion about the main aspects of interest and try to reach a consensus.

### 2.2 Task 2

Task 2 of NEGES 2018, “Negation cues detection”, had the aim to promote the development and evaluation of systems for identifying negation cues in Spanish. For example, in sentence [1] the systems had to identify three negation cues: i) *En mi vida*, ii) *no* and iii) *sin*.

- [1] **En mi vida** he hecho una reserva con tanta antelación, **no** quería quedarme **sin** sitio.

Participants received a set of training and development data to build their systems during the development phase. The manual annotation of the negation cues was performed by domain experts, following well-defined annotation guidelines (Jiménez-Zafra et al., 2018; Martí et al., 2016). At a later stage, a set of tests were made available for evaluation. The participant’s submissions were evaluated against the gold standard annotations. Negation cues could be single words (e.g., “no” [*no/not*]), multiwords (e.g., “ni siquiera” [*not even*]) or discontinuous words (e.g., “no...apenas” [*not...hardly*]).

### 2.3 Task 3

Task 3 of NEGES 2018, “Sentiment analysis”, was proposed to evaluate the role of negation in sentiment analysis. In this task, participants had to develop a system that used the negation information contained in a corpus of reviews of movies, books and products (Jiménez-Zafra et al., 2018) to improve the task of polarity classification. They had to classify each review as *positive* or *negative* using an heuristic that incorporated negation processing.

## 3 Data

The SFU ReviewSP-NEG corpus<sup>2</sup> (Jiménez-Zafra et al., 2018) was the collection of documents used to train and test the systems presented in *Task 2* and *Task 3*<sup>3</sup>. This corpus is an extension of the Spanish part of the SFU Review corpus (Taboada, Anthony, and Voll, 2006) and it could be considered the

<sup>2</sup><http://sinai.ujaen.es/sfu-review-sp-neg-2/>

<sup>3</sup>To download the data in the format provided for Task 2 and Task 3 go to <http://www.sepln.org/workshops/neges/index.php?lang=en> or send an email to the organizers

counterpart of the SFU Review Corpus with negation and speculation annotations (Konstantinova et al., 2012).

The Spanish SFU Review corpus (Taboada, Anthony, and Voll, 2006) consists of 400 reviews extracted from the website Ciao.es that belong to 8 different domains: cars, hotels, washing machines, books, cell phones, music, computers, and movies. For each domain there are 50 positive and 50 negative reviews, defined as positive or negative based on the number of stars given by the reviewer (1-2=negative; 4-5=positive; 3-star review were not included). Later, it was extended to the SFU ReviewSP-NEG corpus (Jiménez-Zafra et al., 2018) in which each review was automatically annotated at the token level with PoS-tags and lemmas using Freeling (Padró and Stanilovsky, 2012), and manually annotated at the sentence level with negation cues and their corresponding scopes and events. Moreover, it is the first corpus in which it was annotated how negation affects the words within its scope, that is, whether there is a change in the polarity or an increase or decrease of its value. Finally, it is important to note that the corpus is in XML format and it is freely available for research purposes.

### 3.1 Datasets Task 2

The SFU ReviewSP-NEG corpus was randomly splitted into development, training and test sets with 33 reviews per domain in training, 7 reviews per domain in development and 10 reviews per domain in test. The data was converted to CoNLL format (Buchholz and Marsi, 2006) where each line corresponds to a token, each annotation is provided in a column and empty lines indicate the end of the sentence. The content of the given columns is:

- Column 1: domain\_filename
- Column 2: sentence number within domain\_filename
- Column 3: token number within sentence
- Column 4: word
- Column 5: lemma
- Column 6: part-of-speech
- Column 7: part-of-speech type
- Columns 8 to last: if the sentence has no negations, column 8 has a "\*\*\*" value and there are no more columns. Else, if the sentence has negations, the annotation for each negation is provided in three columns. The first column contains the word that belongs to the negation cue. The second and third columns contain "-".

The distribution of reviews and negation cues in the datasets is provided in Table 2. Moreover, in Figure 1 and Figure 2, we show 2 examples of the format of the files with different types of sentences. In the first example (Figure 1) there is no negation so the 8th column is "\*\*\*" for all tokens, whereas the second example (Figure 2) is a sentence with two negation cues in which information for the first negation is provided in columns 8-10, and for the second in columns 11-13.

	Reviews	Negation cues
Training	264	2,511
Development	56	594
Test	80	836

Table 2: Distribution of reviews and negation cues in the datasets of Task 2

### 3.2 Datasets Task 3

For this task, we provided the SFU ReviewSP-NEG corpus with the original format (XML). The meaning of the labels used are the following:

- <review polarity="positive/negative">. It describes the polarity of the review, which can be "positive" or "negative".
- <sentence complex="yes/no">. This label corresponds to a complete phrase or fragment thereof in which a negation structure can appear. It has associated the *complex* attribute that can take one of the following values:
  - "yes", if the sentence contains more than one negation structure (<neg\_structure>).
  - "no", if the sentence only has a negation structure.
- <neg\_structure>. This label corresponds to a syntactic structure in which a negation cue appears. It has 4 possible

coches_no_1_21	5	1	Solo	solo	rg	-	***	
coches_no_1_21	5	2	tenia	tener	vmi3s0	main	***	
coches_no_1_21	5	3	57000	57000	z	-	***	
coches_no_1_21	5	4	km	kilómetro	ncmn000	common	***	
coches_no_1_21	5	5	y	y	cc	coordinating	***	
coches_no_1_21	5	6	algo	algo	pi0cs000	indefinite	***	***
coches_no_1_21	5	7	menos	menos	rg	-	***	
coches_no_1_21	5	8	de	de	sps00	preposition	***	
coches_no_1_21	5	9	tres	3	z	-	***	
coches_no_1_21	5	10	años	año	ncmp000	common	***	
coches_no_1_21	5	11	.	.	fp	-	***	

Figure 1: Sentence without negation in CoNLL format

hoteles_no_2_6	9	1	Aun	aun	np00000	proper	-	-	-	-	-	-
hoteles_no_2_6	9	2	estoy	estar	vai000	auxiliary	-	-	-	-	-	-
hoteles_no_2_6	9	3	esperando		esperar	vmg0000	main	-	-	-	-	-
hoteles_no_2_6	9	4	que	que	cs	subordinating	-	-	-	-	-	-
hoteles_no_2_6	9	5	me	me	pp1cs000	personal	-	-	-	-	-	-
hoteles_no_2_6	9	6	carguen	cargar	vmssp3p0	main	-	-	-	-	-	-
hoteles_no_2_6	9	7	los	el	da0mp0	article	-	-	-	-	-	-
hoteles_no_2_6	9	8	puntos	punto	ncmzp000	common	-	-	-	-	-	-
hoteles_no_2_6	9	9	en	en	sps00	preposition	-	-	-	-	-	-
hoteles_no_2_6	9	10	mi	mi	dplcss	possessive	-	-	-	-	-	-
hoteles_no_2_6	9	11	tarjeta	tarjeta	ncfs000	common	-	-	-	-	-	-
hoteles_no_2_6	9	12	más	más	rg	-	-	-	-	-	-	-
hoteles_no_2_6	9	13	,	,	fc	-	-	-	-	-	-	-
hoteles_no_2_6	9	14	no	no	rn	negative	no	-	-	-	-	-
hoteles_no_2_6	9	15	sé	saber	vmipis0	main	-	-	-	-	-	-
hoteles_no_2_6	9	16	dónde	dónde	pt000000	interrogative	-	-	-	-	-	-
hoteles_no_2_6	9	17	tienen	tener	vmip3p0	main	-	-	-	-	-	-
hoteles_no_2_6	9	18	la	el	da0fs0	article	-	-	-	-	-	-
hoteles_no_2_6	9	19	cabeza	cabeza	ncfs000	common	-	-	-	-	-	-
hoteles_no_2_6	9	20	pero	pero	cc	coordinating	-	-	-	-	-	-
hoteles_no_2_6	9	21	no	no	rn	negative	-	-	-	no	-	-
hoteles_no_2_6	9	22	la	lo	pp3fsa00	personal	-	-	-	-	-	-
hoteles_no_2_6	9	23	tienen	tener	vmip3p0	main	-	-	-	-	-	-
hoteles_no_2_6	9	24	donde	donde	pr000000	relative	-	-	-	-	-	-
hoteles_no_2_6	9	25	deberian		deber	vmic3p0	main	-	-	-	-	-
hoteles_no_2_6	9	26	.	.	fp	-	-	-	-	-	-	-

Figure 2: Sentence with two negations in CoNLL format

attributes, two of which (*change* and *polarity\_modifier*) are mutually exclusive.

- polarity: it presents the semantic orientation of the negation structure (*“positive”*, *“negative”* or *“neutral”*).
- change: it indicates whether the polarity or meaning of the negation structure has been completely changed because of the negation (*change*=*“yes”*) or not (*change*=*“no”*).
- polarity modifier: it states whether the negation structure contains an element that nuances its polarity. It can take the value *“increment”* if there is an increment in the intensity of the polarity or, on the contrary, it can take the value *“reduction”* if there is a reduction.
- value: it reflects the type of the negation structure, that is, *“neg”* if it expresses negation, *“contrast”* if it indicates contrast or opposition between terms, *“comp”* if it expresses a comparison or inequality.

ity between terms or “*noneg*” if it does not negate despite containing a negation cue.

- `<scope>`. This label delimits the part of the negation structure that is within the scope of negation. It includes both, the negation cue (`<negexp>`) and the event (`<event>`).
- `<negexp>`. It contains the word(s) that constitute(s) the negation cue. It can have associated the attribute *discid* if negation is represented by discontinuous words.
- `<event>`. It contains the words that are directly affected by negation (usually verbs, nouns or adjectives).

The distribution of reviews in the training, development and test sets is provided in Table 3, as well as the distribution of the different negation structures per dataset. The total of positive and negative reviews can be seen in the rows named as *+ Reviews* and *- Reviews*, respectively.

Total	Training	Devel.	Test
Reviews	264	56	80
+ Reviews	134	22	44
- Reviews	130	34	36
neg	2511	594	836
noneg	104	22	55
contrast	100	23	52
comp	18	6	6

Table 3: Distribution of reviews and negation cues in the datasets of Task 3

#### 4 Evaluation measures

The evaluation script used to evaluate **Task 2** was the same used to evaluate the \*SEM 2012 Shared Task: “Resolving the Scope and Focus of Negation” (Morante and Blanco, 2012). It is based on the following criteria:

- Punctuation tokens are ignored.
- A True Positive (TP) requires all tokens of the negation element have to be correctly identified.
- To evaluate cues, partial matches are not counted as False Positive (FP), only as False Negative (FN). This is to avoid penalizing partial matches more than missed matches.

The measures used to evaluate the systems were Precision (P), Recall (R) and F-score (F1). In the proposed evaluation, FN are counted either by the system not identifying negation elements present in the gold annotations, or by identifying them partially, i.e., not all tokens have been correctly identified or the word forms are incorrect. FP are counted when the system produces a negation element not present in the gold annotations and TP are counted when the system produces negation elements exactly as they are in the gold annotations.

For evaluating **Task 3**, the traditional measures used in text classification were applied: Precision (P), Recall (R), F-score (F1) and Accuracy (Acc). P, R and F-score were measured per class and averaged using macro-average method.

$$P = \frac{TP}{TP + FP} \quad (1)$$

$$R = \frac{TP}{TP + FN} \quad (2)$$

$$F1 = \frac{2PR}{P + R} \quad (3)$$

$$Acc = \frac{TP + TN}{TP + TN + FP + FN} \quad (4)$$

#### 5 Participants

10 teams showed interested and 4 teams submitted results.

**Task 1** had two participants: the CLiC team composed of M. Antonia Martí and Mariona Taulé from the University of Barcelona, and Lucia Donatelli from the Georgetown University.

Martí and Taulé (2018) carry out an analysis of 5 fundamental aspects of the corpora analyzed: i) the negation cue, ii) the scope and the inclusion of the subject in the scope, iii) the coordinated structures, iv) the negative locutions and v) the lexical and morphological negation. Taking into account the differences observed in the annotation of the corpora, they proposed the following guidelines:

- Annotate the negation cue whenever possible, as it will allow to use it whenever necessary or to ignore it otherwise. Moreover, they consider that it should be distinguished between simple markers (e.g. “no” [no/not], “sin” [without]) and complex markers (e.g. “no...nadie” [no...nobody]), where one implies the presence of the other. They propose to make use of the typology defined for the annotation of the SFU ReviewSP-NEG corpus.
- Annotate the scope including the subject within it. They mention that in many cases the focus of negation corresponds to the subject and this would facilitate future annotations of the corpus.
- Perform coordinated negation treatment. They propose to distinguish between coordinated structures affected by the same predicate and negation marker [2] and coordinated structures with independent negation cues and predicates [3], so that in the first case a single negation marker is considered and the rest of the negation structure as scope and, in the second case, a separate scope is annotated for each coordinated negation marker.

- Annotate negative locutions (e.g. “en absoluto” [*not at all*]), even if they do not contain explicit negation markers.
- Annotate lexical and morphological negation, which have only been addressed restrictively in the UHU-HUVR and IULA Spanish Clinical Record corpora.
- Annotate the focus of negation, which is not deal with in any of the guidelines analyzed.

[2] No [es ni muy pesado ni muy ligero] (SFU Review<sub>SP</sub>-NEG)

[3] No [soy muy alta] tampoco [un pitufo] (SFU Review<sub>SP</sub>-NEG)

Donatelli (2018) describes each corpus individually and indicates which elements are missing in the annotation of each of them and those aspects that should have been taken into account. She considers that some components of the different guidelines can be combined in order to set linguistically precise guidelines and neutral guidelines with regard to the domain. She indicates that in order to represent the semantic of negation, the following elements must be annotated:

- The negation cue: lexical item that expresses negation.
- The scope: part of the text that is negated.
- The focus: part of the scope that is prominently or explicitly negated.
- The reinforcement (if exists): auxiliary negation or element of negative polarity, known as NPI (Negative Polarity Item) (Altuna, Minard, and Speranza, 2017).

Below we can see, in an example provided by the author [4], the different elements explained above. The negation cue appears in bold, the scope in brackets, the focus in *italics*, and the reinforcement underlined.

[4] John **no** [come *carne* sino verduras].

Donatelli considers that the scheme proposed by Jiménez-Zafra et al. (2018) for the annotation of the SFU Review<sub>SP</sub>-NEG corpus is suitable for capturing the layers of

negation complexity and proposes to combine it with the use of the label *NegPolItem* used by Marimon, Vivaldi, and Bel (2017) in the annotation of the IULA Spanish Clinical Record corpus to annotate items of negative polarity (NPI) or auxiliary negations.

**Task 2** also had two participants: the UPC team composed of Henry Loharja, Lluís Padró and Jordi Turmo from the Universitat Politècnica de Catalunya (Loharja, Padró, and Turmo, 2018), and Hermenegildo Fabregat, Juan Martínez-Romo and Lourdes Araujo from the National Distance Education University of Spain (UNED) (Fabregat, Martínez-Romo, and Araujo, 2018). The official results are shown in Tables 4, 5 and 6, evaluated in terms of P, R and F1.

Domain	P	R	F1
Cars	94.23	72.06	81.67
Hotels	97.67	71.19	82.35
Washing machines	92.00	66.67	77.31
Books	79.52	66.27	72.29
Cell phones	93.33	73.68	82.35
Music	92.59	57.47	70.92
Computers	-	-	-
Movies	86.26	69.33	76.87
Total	79.45	59.58	67.97

Table 4: Official results by domain for the UNED team

Domain	P	R	F1
Cars	95.08	85.29	89.92
Hotels	94.00	79.66	86.24
Washing machines	94.74	78.26	85.72
Books	84.19	84.52	84.35
Cell phones	89.80	77.19	83.02
Music	92.96	75.86	83.54
Computers	91.36	91.36	91.36
Movies	89.68	85.28	87.42
Total	91.48	82.18	86.45

Table 5: Official results by domain for the UPC team

The results by domain, described in Tables 4 and 5, show that there are sub-collections such as books and music in which both systems obtain worse results compared to the rest of the sub-collections. The system developed by the UNED team obtains the highest performance in cell phones and hotels sub-collections, while the UPC system

shows a better detection of negation cues in the computers sub-collection, in particular, it obtains an F1 of 91.36%.

The overall results presented in Table 6 correspond to the performances without considering the computers subset, since the UNED team could not submit the results for computers due to technical problems. In terms of overall performance, both systems obtain similar precision. However, the recall achieved by the UNED system is lower. Therefore, the best result is obtained by the UPC team with an F1 of 85.74%.

Team	P	R	F1
UNED	90.80	68.10	77.68
UPC	91.49	80.87	85.74

Table 6: Overall official results for Task 2

In terms of the approaches applied, both proposals use the standard labelling scheme *BIO* where the first word of a negation structure denotes by *B* and the remaining words by *I*. The label *O* indicates that the word does not correspond with a negation cue.

The UNED team applies a model of deep learning inspired by named entity recognition architectures and negation detection models. Specifically, this system is focused on the use of several neural networks together with a bidirectional LSTM (Long Short-Term Memory). This supervised approach is based on pretrained word embeddings for Spanish. For its part, the UPC team uses Conditional Random Fields with a set of features such as the part-of-speech of the word and information about how the words are written.

Finally, the resources used by the participants are diverse. The UNED team uses Keras (Chollet and others, 2015) and TensorFlow (Abadi et al., 2016) libraries, as well as pretrained word embeddings for Spanish (Cardellino, 2016), and the UPC team uses NLTK (Loper and Bird, 2002).

**Task 3** had no participants. Some of the teams registered for the workshop showed interest in the task, but expressed that they did not participate due to lack of time.

## 6 Conclusions

This paper presents the description of the 2018 edition of NEGES, which consisted of three different tasks related to different aspects of negation: Task 1 on reaching an

agreement on the guidelines to follow for the annotation of negation in Spanish, Task 2 on identifying negation cues, and Task 3 on evaluating the role of negation in sentiment analysis. The SFU ReviewSP-NEG corpus was the collection of documents used to train and test the systems presented in Task 2 and Task 3. As far as we know, this is the first task that focuses on the development and evaluation of systems for identifying negation cues in Spanish in the area of sentiment analysis.

A total of 4 teams participated in the workshop, 2 for developing annotation guidelines and 2 for cues detection. Task 3 had no participants. For a future edition of the workshop we would like to continue working on the unification of the annotation schemes and propose different tasks to detect negation in other domains such as biomedical.

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