

# Guidelines to Annotate Negations

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## 1 Introduction

This document provides guidelines to annotate the different uses of negations, in the domain of image descriptions. These guidelines were used in (van Miltenburg et al., 2016) to annotate the Flickr30K corpus (Young et al., 2014), which is a collection of crowd-sourced descriptions of over 30,000 images collected from Flickr (a social photo sharing website).

Our annotation task differs from other annotation tasks in two respects: genre and the kind of annotation. Past research has focused on negations in the biomedical domain (Szarvas et al., 2008; Bokharaeian et al., 2014) or fiction (Morante and Daelemans, 2012), looking mainly at the scope of negation terms. We propose a categorization of the uses of negations based on what is negated. For example, a description like *a man is playing tennis without a shirt* belongs to the *salient absence* category because the negation is used to communicate that the man is missing a shirt. This category can be contrasted with the *negation of action/behavior*-category, where there is no absence of a particular entity, but rather something is not happening. For example: *A kid eating out of a plate without using his hands.*

Our categorization of negation uses gives us a sense of the range of situations in which negations are used. We hope that this is useful to assess the ability of NLP-tools and models to deal with negations. For example, in automatic image description (a subfield of natural language generation), we can ask whether an automatic image description model is able to use negations only in specific situations, or whether it's able to use negations to their full potential. In information extraction, we think our categorization can be a useful guide to collect different kinds of training examples involving negations (so as not to focus on one particular use, while ignoring other uses).

These guidelines are structured as follows. Section 2 lists the different types of negations that we will consider. After this section, we will then discuss different uses of negations (Section 3). We close with a paragraph on future work (Section 4).

## 2 Kinds

Following Fodor et al. (1975), we can say that there are four kinds of negations. These negations can be adjectives, adverbs, prepositions, and verbs. Here are some examples:

1. Non-affixal negation: not, n't, never, no, none, nothing, nobody, nowhere, nor, neither.
2. Affixal negation: a-, dis-, un-, non-, un-, -less.
3. Inherent negations: without, sans, lacking, missing (not having), failing, absent.
4. Definitional negations: missing (fail to hit).

In our paper, we focused on (1,2,4). We did not look at descriptions containing affixal negations, because this would require us to compile a list of all affixal negations in the corpus, which would go beyond the scope of our exploratory study. (There is currently no general reference list of affixal negations.) We do hope to address this lacuna in future work. After some discussion, we decided to include (4) in our study. To understand why, consider the following example:

- (1) Men playing volleyball , with one player missing the ball but hands still in the air .

In the context of studying images, there is something special going on with ‘missing:’ it refers to some action (hitting the ball) that the player could have performed, but instead failed to perform. As such, ‘missing’ refers to an action that is not taking place in the picture. It is exactly this tension between what is depicted and what is said that we aimed to study.

### 3 Uses

The categories in this section originate from (van Miltenburg et al., 2016), who studied the use of negations in image descriptions. Based on their results, we refined the set of usage categories to the ones listed below. We provide additional examples for each category, and separate general uses from image-specific uses that don’t apply in other situations. Currently, we only have one image-specific category: the use of negation to indicate that a relevant entity or event is situated outside the frame. We will discuss this category in Section 3.2. False positives are discussed in section 3.3. Our pilot annotation task was followed by an adjudication session, where we settled all disagreements. The TSV file containing all disagreements and our final decisions can be found on GitHub (along with all other code and data), and serves as a reference for judging borderline cases.<sup>1</sup>

#### 3.1 General uses

We first discuss six general uses of negation. These uses are general in the sense that they also occur outside the image domain. Each time we provide some examples to illustrate the usage category. The categories considered in this section are:

1. Salient absence
2. Negation of action/behavior
3. Negation of property
4. Negation of attitude
5. (Preventing) future events
6. NEW: Negation of location

The last category has been added after examining the *Other* category in our pilot annotation task, and concluding that many of the negated phrases in this category made reference to some location.

##### 3.1.1 Salient absence

The first use of negation is to indicate that something is absent:

- (2) a. A man **without** a shirt plays drums.
- b. A woman at graduation **without** a cap on.
- c. Four boys look at the basketball hoop, which is **missing** the netting.

Shirts and shoes are most commonly mentioned as being absent in the Flickr30K dataset. From examples like (2a) speaks the norm that people are supposed to be fully dressed. These examples seem common enough for a machine to learn the association between exposed chests and the phrase *without a shirt*. But there are also more difficult cases, such as (2b). To describe an image like this, one should know that students (in the USA) typically wear caps at their graduation. This example shows the importance of background knowledge for the full description of an image.

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<sup>1</sup>[https://github.com/evanmiltenburg/annotating-negations/blob/master/results/settled\\_disagreements.tsv](https://github.com/evanmiltenburg/annotating-negations/blob/master/results/settled_disagreements.tsv)

### 3.1.2 Negation of action/behavior

The second category is the use of negation to deny that an action or some kind of behavior is occurring:

- (3) a. A kid eating out of a plate **without** using his hands.
- b. A woman in the picture has fallen down and **no** one is stopping to help her up.
- c. Two women who did **not** aim the camera at their faces.

Examples like these require an understanding of what is likely or supposed to happen, or how people are expected to behave.

### 3.1.3 Negation of property

The next use of negation is to note that an entity in the image lacks a property. In (4a), the negation does two things: it highlights the fact that the buildings are not finished, but also (in its combination with *yet*) suggests that they *will be* finished.

- (4) a. A man wearing a hard hat stands in front of buildings **not** yet finished being built.
- b. There are four boys playing soccer, but **not** all of them are on the same team [...].
- c. Park ranger Dave cites a car for **not** having a license plate in the proper place.

In (4b), the negated phrase also performs two roles: it communicates that there are (at least) two teams, and it denies that the four boys are all in the same team. For both examples, the negated parts (*being finished* and *being on the same team*) are properties associated with the concepts of BUILDING and PLAYING TOGETHER, and could reasonably be expected to be true of buildings and groups of boys playing soccer. The negations ensure that these expectations are cancelled.

Example (5) shows a completely different effect of negating a property. Here, the negation is used to *compare* the depicted situation with a particular *reference point*. The implication here is that the picture is not taken in the USA.

- (5) A wild animal **not** found in america jumping through a field.

### 3.1.4 Negation of attitude

This use of negation concerns attitudes of entities toward actions or others. The examples in (6) illustrate that this use requires an understanding of emotions or attitudes, but also some reasoning about what those emotions are directed at.

- (6) a. The dog in the picture does**n't** like blowing dryer.
- b. A man sitting on a panel **not** enjoying the speech.
- c. People outside , this young woman does **n't** look too happy.

### 3.1.5 (Preventing) future events

This category generally covers any case where some future event is negated. In images, we typically see cases where people depicted in the photograph want to prevent something from happening. Here are two examples:

- (7) a. A girl tries holding onto a vine so she **won't** fall into the water.  
 b. A man is riding a bucking horse trying to hold on and **not** get thrown off.  
 c. The person looks cautiously into traffic to be sure **no** car is coming.

What is interesting about these sentences is that the ability to produce them does not only require an understanding of the depicted situation (someone is holding on to a vine/horse), but also of the possibilities within that situation (they may or may not fall off/into the water), depending on the actions taken.

### 3.1.6 Negation of location

This use of negation concerns the location of some relevant entity. Examples are:

- (8) a. A man with a cap and jeans is washing the window **not** on ground level .  
 b. A bicycle rider flies over a hill while a competitor is **not** far behind .  
 c. Two guys are in the air with **neither** foot touching the ground.

## 3.2 Image-specific uses: Outside the frame

Negation is often used with images to note that particular entities are not depicted or out of focus:

- (9) a. A woman is taking a picture of something **not** in the shot with her phone.  
 b. Several people sitting in front of a building taking pictures of a landmark **not** seen.  
 c. A boy raises his arms amongst a crowd of people who are **not** in focus.

The use of negation in this category requires an understanding of the events taking place in the image, and what entities might be involved in such events. (9b) is a particularly interesting case, where the annotator specifically says that there is a *landmark* outside the frame. This raises the question: how does she know and how could a computer algorithm recognise this?

## 3.3 False positives

There are two kinds of false positives that we have found in the data: (1) typing and string matching errors and (2) quotes and idioms. The former are typically very easy to identify, as their interpretation is not coherent. The latter are harder to detect automatically, as they are still grammatical.

### 3.3.1 Typos & wrongly matched

(10a) shows a clear example of a typo, where someone wrote 'lack' instead of 'black'. We also found several descriptions where people misspelled 'lake' as 'lack'. We can see the limits of the string matching approach in (10b), where the search for strings starting with 'miss' also yields sentences containing words like *mission* or *missionary* which are clearly not negations. Finally, (10c) shows an example where 'no' is used in place of 'number'.

- (10) a. a **lack** dog leaps in front of a tree branch in the snow .  
 b. a soldier training a german shepherd for a **mission** .  
 c. a yellow bus with **no** 3113 on the bus stop and people hopping in .

### 3.3.2 Quotes and Idioms

Some instances of negations are merely *mentions* rather than *uses*. This is the case in (11).

- (11) A girl with a tattoo on her wrist that reads “**no** regrets” has her hand outstretched.

Other times, the use of a negation isn’t concerned with the image as much as it is with the English language. The examples in (12) illustrate this *idiomatic* or *conventional* use of negation.

- (12) a. Strolling down path to **nowhere**.  
b. Three young boys are engaged in a game of **don’t** drop the melon.

## 4 Future work

In future work, we hope to annotate negations in the MS COCO dataset, as well as negations in other genres, to see how well our taxonomy of negation uses holds up. Beyond that, we aim to investigate the extent to which automatic image description systems are able to produce negations. We will use the categories established in these guidelines to assess which kinds of negation uses these systems exhibit, and which kinds they lack.

## References

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