7.4.2.2 Overlap with Specificity

Specificity has a nearly equal overlap within all the other relations. In the pairs annotated with paraphrase or entailment, 73% are also annotated with specificity. The high number of pairs that are in a paraphrase relation, but also have a difference in specificity is interesting, as it seems more natural for paraphrases to be on the same specificity level. One example of this is pair #7 in Table 7.8. Although they are paraphrases (with 100% agreement), the first one is more specific, as it 1) specifies the ability of speaking a language and 2) says "more than one language".

There are also 27% of uni-directional entailment relation pairs that are not in any specificity relation. One example of this is pair #8 in Table 7.8. Although the pair contains uni-directional entailment (backward entailment), none of the sentences is more specific than the other.

If we look at the other direction of the overlap, we can observe that in 62% of the cases involving difference in specificity, there is no uni-directional nor bi-directional entailment. An example of such a relation pair is pair #9 in Table 7.8. The two sentences are on the same topic and thus can be compared on their specificity. The first sentence is clearly more specific, as it gives information on what needs to be learned and where the Bible was written, whereas the second one just gives an information on what Christian clergymen do. These findings indicate that entailment is not specificity.

7.4.3 Discussion

Our methodology for generating text pairs has proven successful in creating a corpus that contains all relations of interest. By selecting different sentence pairings, we have obtained a balance between the relations that best suit our needs.

The inter-annotator agreement was good for all relations. The resulting corpus can be used to study individual relations and their interactions. It should be emphasized that our findings strongly depend on our decisions concerning the annotations setup, the guidelines in particular. When examining the interactions between the different relations, we found several interesting tendencies.

Findings on the Interaction between Entailment and Paraphrases   We showed that paraphrases and any-directional entailment had a high correlation, high overlap, and a similarly high semantic similarity. Almost all bi-directional entailment pairs are paraphrases. However, only 64% of the paraphrases are bi-directional entailment, indicating that paraphrasing is the more general phenomena, at least in practical tasks.

Findings on Specificity With respect to specificity, we found that it does not correlate with other relations, showing that it is independent of those in our corpus. It also shows no clear trend on the similarity scale and no correlation with the difference in word length between the sentences. This indicates that specificity cannot be automatically predicted using the other meaning relations and requires further study.

In the examples that we discuss, we focus on interesting cases, which are complicated and unexpected (ex.: paraphrases that are not entailment or entailment pairs that do not differ in specificity). However, the full corpus also contains many conventional and non-controversial examples.

7.5 Conclusion and Further Work

In this paper, we made an empirical, corpus-based study on interactions between various semantic relations. We provided empirical evidence that supports or rejects previously hypothesized connections in practical settings. We release a new corpus that contains all relations of interest and the corpus creation methodology to the community. The corpus can be used to further study relation interactions or as a more challenging dataset for detecting the different relations automatically[10].

Some of our most important findings are:

1) there is a strong correlation between paraphrasing and entailment and most paraphrases include at least uni-directional entailment;

2) paraphrases and bi-directional entailment are not equivalent in practical settings;

3) specificity relation does not correlate strongly with the other relations and requires further study;

4) contradictions (in our dataset) are perceived as dis-similar.

As a future work, we plan to: 1) study the specificity relation in a different setting; 2) use a linguistic annotation to determine more fine-grained distinctions between the relations; 3) and annotate the rest of the 11,000 sentences in a semi-automated way.

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[10]The full corpus, the annotation guidelines, and the control examples can be found at `https://github.com/MeDarina/meaning_relations_interaction`. The annotation guidelines are also available in Appendix B of the thesis.

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