Mining Italian Short Argumentative Texts

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Abstract

We present the first model for argumentation mining for Italian short argumentative texts. We adapted to Italian the software developed by (Peldszus and Stede, 2015) and built a suitable corpus of Italian "microtexts" by semi-automatically translating the original English corpus. Our results are comparable to those of (Peldszus and Stede, 2015), which proves that their model is applicable successfully to languages other than English and German.[1]

1. Introduction

In recent years, *argumentation mining* (Lippi and Torroni, 2016) has become an area of big interest in the field of natural language processing. Argumentation mining seeks to automatically recognize the structure of the argumentation in a text by identifying, classifying and connecting the central claim of a text, supporting premises, possible objections and counter-objection. Argumentation mining has many possible applications in very different fields. Recognizing automatically the argumentative structure of a text can be useful as an extension of opinion mining, in retrieval of court decisions from databases (Palau and Moens, 2011), in automatic document summarization (Teufel and Moens, 2002), in analysis of scientific papers as in biomedical text mining (Teufel, 2010; Liakata et al., 2012) in essay scoring, and more.

This task can be decomposed into several subtasks: segmentation of the text in elementary discourse units (EDUs), identification of argumentative discourse units (ADUs), classification of argumentative discourse units, identification of the relations between argumentative discourse units and classification of these relations. The argumentation structure of a text can be presented as a tree structure, with a node for each argumentative discourse unit and different edges between nodes representing the different types of relations. There are many simple models that recognize automatically the argumentation structure of a micro-text.

Our starting point is the model by (Peldszus and Stede, 2015), who developed a software to automatically mine the argumentation structure of short texts for English and German. In this paper we perform argumentation mining on a corpus of short Italian argumentative texts. To transfer the approach to Italian, we assembled a suitable corpus by semi-automatically translating the original German corpus and we adapted the features used by the software, by assembling a list of Italian connectives necessary to fulfill the task.

Our results are slightly lower than the ones for German and English, but they demonstrate that the model can be considered valid also for Italian. Besides, a major contribution of this paper is the free availability of the annotated Italian corpus.[2]

[2] https://github.com/PietroTotis/evidencegraph

2. Related works

(Peldszus and Stede, 2016) collected the *arg-microtext* corpus, a freely available parallel corpus of 112 texts with 576 argumentative ADUs (argumentative discourse units). It differs from other web-text corpora collected for argumentation mining purposes, such as the Internet Argument Corpus (Abbott et al., 2016) and the ABCD corpus (Rosenthal and McKeown, 2015), because the texts have been collected in a controlled text generation experiment.

(Peldszus and Stede, 2013) proposed an annotation scheme, which has been based on Freeman's theory of argumentation structures (Freeman, 2011) and has been used to annotate the *arg-microtext corpus.* This annotation scheme has been proven to yield reliable structure in annotation and classification experiments (Peldszus and Stede, 2015; Potash et al., 2017).

One of a few similar approaches is that of (Stab and Gurevych, 2017), who introduced a corpus of persuasive essays annotated with argumentation structures related to the *arg-microtexts* and presented a similar approach for parsing argumentation structures.

An example of argumentation mining for Italian is presented in (Basile et al., 2016), where the researchers tested their method on a corpus of user comments to online newspaper articles.

3. Original Corpus

The interest in argumentation-oriented corpora of monologue text is rising, but most of the present data are not suitable for these operations. For this reason it is necessary to have well-formed and controlled corpora of short argumentative texts.

3.1 Data collection

In order to provide a corpus of Italian short argumentative texts we translated to Italian the *arg-microtexts* corpus, a freely available[3] parallel corpus of 113 short texts and a total of 576 ADUs (Peldszus and Stede 2015). The corpus is made by 90 short texts collected in a controlled text generation experiment and by 23 written directly by Andreas Peldszus, mainly in order to teach and test the probands of the experiment.

The texts are short but at the same time "complete" and the underlying argumentation structure is relatively clear. The probands were asked to first gather a list with the pros and cons of the trigger question, then take stance for one side and argue for it in a short argumentative text, which had to be at least five segments long with each segment argumentatively relevant, had to contain at least one objection and finally had to be understandable without having its trigger question as a headline. All of the microtexts were originally written in German and have been successively professionally translated in English.

3.2 Annotation scheme

The annotation scheme we used for our corpus is the same used for the original corpus, developed by Peldszus and Stede on the basis of different ideas from literature about argumentation structures (Peldszus and Stede, 2013). Two important steps in the development of a theory of argumentation are Toulmin's influential analysis of argument (Toulmin, 1958) and Grewendorf's dialog-oriented diagram method (Grewendorf, 1980).

The annotation scheme used for the *arg-microtexts* corpus is based mainly on Freeman's theories, which integrate Toulmin's ideas into the argument diagraming techniques of the informal logic tradition (Freeman, 1991, 2011). The central claim of Freeman's theory is that the different ways in which premises and conclusions combine to form larger complexes, can be modeled as a hypothetical dialectical exchange between a proponent and an opponent. An argument is a non-empty set of premises supporting some conclusion. The argumentation structure of a text is defined as a graph with the text segments as nodes. Each node is associated with a specific argumentative role: the "proponent", who presents and supports a central claim, and the "opponent", who questions the proponent's claims. Argumentative

3 https://github.com/peldszus/arg-microtexts

relations are represented by the edges between the nodes and have a specific argumentative function, which can be “support” or “attack”. Support relations can be of different types: basic, linked, multiple, serial and the example relation. Attack relations can target both premises or conclusions and can be of two different types: they are a “rebut” if they target another node or “undercut” if they target an edge between two nodes.

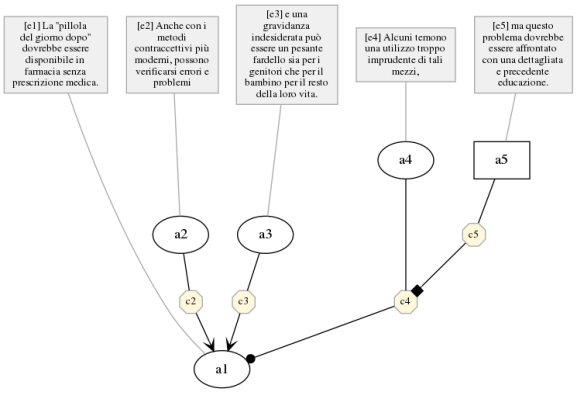

Figure 1: An example text (*micro_b037*) and its reduced argumentation structure: texts segments, proponent and opponent nodes (rounds and boxes), supporting, attacking and undercutting relations (arrow-head, circle-head and square-head).

4. Translation

The choice of translating into Italian the *arg-microtexts* corpus, likewise it was previously done for English, is motivated by the controlled setting of the experiment. The translation process had two phases. In the first phase we automatically translated the entire corpus using DeepL Translator[4], a free and multilingual translation service. In the second phase, all the translations have been manually checked and, if needed, post-edited.

4.1 Post-editing

Some corrections were necessary in almost every microtext: from a syntactic point of view the translator respected most of the dependencies, losing however accuracy with increasingly complex syntactic structures. As foreseeable, a lot of words were translated with the most common Italian translation, but not the most appropriate. All the microtexts have been thereby post edited in order to look as they were generated directly in Italian. Connectives have a fundamental role in the identification of function, role and attachments of a sentence. We therefore dedicated special attention to this aspect; in the automatic translation, many different original forms converged to the most common connective in the target language. For example, almost all the connectives expressing similarity were translated with “e” (“and”) and most of the connectives expressing contrast were translated with “ma” (“but”). In order to have a more realistic corpus we tried to use a more various set of connectives, comparable to the set used in the original corpus.

4.2 Projection annotations

The annotated graph structures are stored in XML format. The main advantage of translating the *arg-microtexts* corpus was that it was not necessary to make the annotations from scratch. As expected, there was a one by one correspondence between original sentences in German and the translations in Italian. In order to have Italian annotated graph structures it was only necessary to automatically substitute every German sentence in the XML file with the corresponding Italian sentence. In case a sentence contained more ADUs, it has been divided manually.

5. Software

The code for computing the tree predictions have been taken over from the work of Peldszus and Stede (Peldszus and Stede, 2015).

5.1 Original model

In order to recognize the argumentation structure, the model considers not only the probability of attachment of each segment pair, but also the probabilities of role, function and of being the central claim. In order to do so it is necessary to predict probabilities for each argumentative unit on different levels:

4 https://www.deepl.com/translator

attachment, central claim, role (proponent or opponent) and function (supporting or attacking).

The first step is to build a fully connected multigraph that connects every segment pair with as many edges as the function types. In order to get central claim, role, function and attachment probabilities, the model uses different classifiers and then jointly combines these probabilities in a single edge score, defined as the weighted sum of the level specific edge scores, on which it is possible to apply a MST (minimum spanning tree) algorithm (Chu and Liu, 1965; Edmonds, 1967).

The result represents the best global attachment structure for the text. This model outperformed other baseline and simpler models when tested on the German and English parallel corpus (Peldszus and Stede, 2015).

5.2 Adaptation to Italian

In order to run the original experiments on the Italian corpus, we adapted the sections of the code related to the corpus and the NLP tools. The latter represents the major divergence from the original setting, since it entailed upgrading the *spaCy* package, along with its language models. This also involved upgrading other packages and porting the whole project to *Python 3.x*, but these were minor modifications that should not have a meaningful impact on the performances.

A language-specific set of connectives is essential for the classification of the relations between ADUs. For this purpose, we used *LiCo*[5], a lexicon of Italian connectives (Feltracco et al. 2016). The connectives are stored in XML format, each entry contains:

- Part type (phrasal or single).
- Syntactic type (preposition, adverb, coordinating conjunction, subordinating conjunction).
- Relation type (as cause, concession, contrast, purpose).
- An example of use in a sentence.

5 http://connective-lex.info/

6. Results

The metrics to evaluate our adaptation are Macro F1 and Micro F1 for each sub-task: central claim, role, function and attachment detection. The results are reported in Table 1.

Compared to the results obtained in the experiment with the English and the German corpus (Peldszus and Stede, 2015), the results for Italian are slightly lower. The results are almost the same for central claim and attachment detection and lower in function and role classification. The most significant drop of the F1 scoring regards the task of function classification. Nonetheless, the overall performances are sufficient to confirm the validity of the model for Italian. The smaller size of the Italian model provided by spaCy might explain the gap in performance with the other two languages.

	cc	ro	fu	at
Macro F1	0.813	0.724	0.413	0.690
Micro F1	0.883	0.811	0.593	0.792

Table 1: Results for Italian

	cc	ro	fu	at
Macro F1	0.825	0.765	0.431	0.706
Micro F1	0.888	0.841	0.618	0.796

Table 2: Results for English

	cc	ro	fu	at
Macro F1	0.817	0.750	0.671	0.663

Table 3: Results for English (Peldszus and Stede, 2015)

6.1 Error analysis

We investigated the reason for the lower performances in the task of function classification: Figure 2 and 3 show an example of misclassification. The prediction for the microtext mistakenly detects an attacking and an undercutting relation in place of two supporting relations. Wrong function classification of some argumentative unit can be found in most of the outputs of the corpus.

Another common error is the wrong attachment: Figure 3 and 4 present an interesting error for this task. In place of an “attach to first” structure, which is typical of the English style of

essay writing and can be used as baseline, our model has attached all the argumentative units to the preceding segment, which is also a typical baseline in discourse parsing (Muller et al., 2012).

We investigated the role of connectives in the attachment prediction and ran the same experiment on a less specific list of connectives, i.e. with more general relation types. With this simplified version of the connectives, the classifier achieved lower results in all the tasks. This suggests that specificity is not the reason behind these errors and at the same time proves the central role of the connectives in the recognition of an argumentation structure.

7. Conclusion

We presented, to our knowledge, the first model that transfers on an Italian microtexts corpus the approach developed by (Peldszus and Stede, 2015). We ran the experiment on an Italian corpus obtained by translating the original German one and by designing a suitable list of connectives. We adapted the code by changing the sections related to the corpus and the NLP tools. Our results are comparable to those of Peldszus and Stede, which proves that their model is applicable successfully to languages other than English and German.

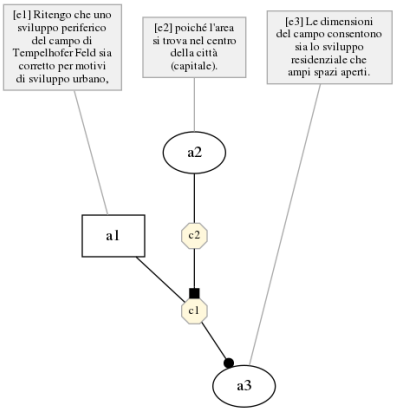

Figure 2: *micro_b033* wrong output

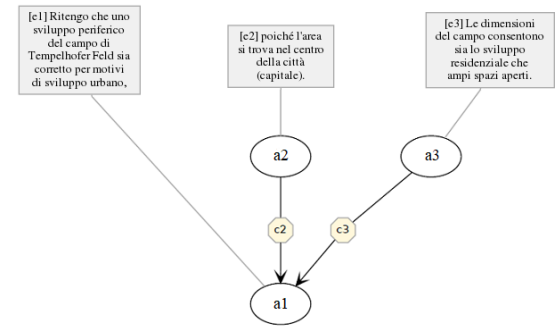

Figure 3: *micro_b033* expected output

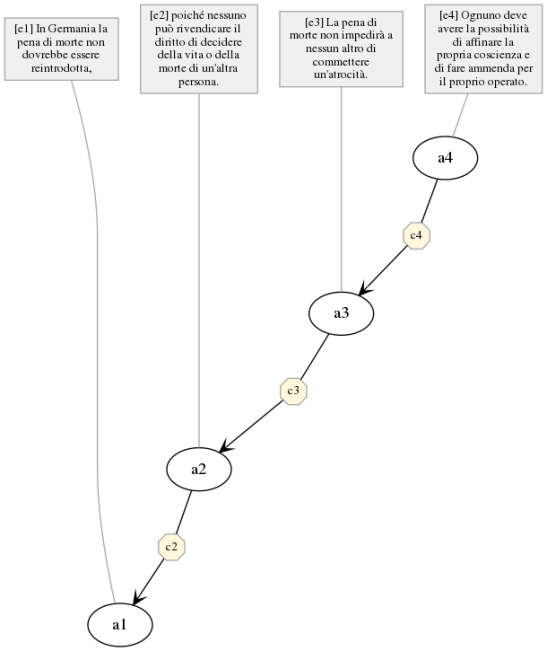

Figure 4: *micro_b031* wrong output

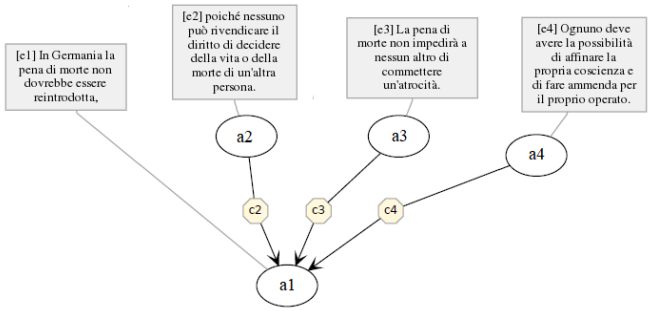

Figure 5: *micro_b031* expected output

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