

Guidelines for the annotation of argumentation structures in student-written peer reviews

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1. Introduction

Argumentation mining is an interdisciplinary research area that includes philosophy, psycholinguistics, and computer science for building argumentation models and automated methods for identifying arguments in written texts. These tools not only provide new opportunities educational applications such as intelligent writing support, information retrieval platforms, or automated assessment tools, but also open new possibilities for improving current legal information retrieval platforms or policy modeling platforms (Christian Stab and Iryna Gurevych 2015, 2).

In this work, a corpus of one thousand annotated student reviews was created and then the argumentation was evaluated in terms of how helpful the argumentation was, how high quality it was, and how good the argumentation structure was. How helpful an argument was was rated on how understandably arguments were expressed and how meaningful they seemed to the reader. Quality was rated according to how strong an argument was, i.e., if arguments were supported by one or more meaningful premises. The more meaningful premises, the stronger an argument. Structure was evaluated by how easily and logically relationships could be established between the components of an argument. Students each argumentatively evaluated a written paper by another student. In doing so, they addressed the strengths and weaknesses of a paper and then suggested improvements for revision.

The ability to formulate persuasive arguments is a crucial aspect of acquiring writing skills. On the one hand, well-defined arguments are the basis for convincing the reader, on the other hand, good argumentation skills are essential for analyzing different positions in general decision making (Christian Stab and Iryna Gurevych 2014, 1501). In the case of student reviews, sound argumentation gives a good impression of how well the underlying student work has been handled. It uses expressive arguments to show the strengths and weaknesses to the student who wrote the paper and provides argumentatively supportive suggestions for improvement. Rules were established for the annotation of the student reviews, which build on the basis of the rules created by Christian Stab and Iryna Gurevych 2015. The rules were adapted because these are German-language reviews and not English-language persuasive essays.

2. Argument components

An argument consists of several statements. In its simplest form, it contains a statement (claim) supported by a single premise (premise) (Peldszus and Stede 2013; Britt and Larson, 2003; Toulmin 1958). The statement represents a controversial proposition that the author is trying to convince the reader of. It is usually a proposition or assumption and should not be accepted by the reader without additional support (Christian Stab and Iryna Gurevych 2015, 2). Premises can thereby not only support an opinion, but also attack it, which is used as a stylistic device or can also illustrate uncertainty in the argument. There can also be more complicated constellations of statements and premises, in which a statement is supported by several different premises or by a chain of premises, in which each premise is in turn supported by another premise. Similarly, an opinion may be supported by one premise and attacked by another, or supported by a premise which is in turn attacked by another premise. The simplest form can look like this:

<opinion> because <premise>.

3. Limits of argumentation components

Argument components do not necessarily cover a complete sentence, because often a sentence can also consist of several argument components, which are annotated separately. For example, a sentence can consist of a statement and one or more premises. Likewise, a sentence can begin with so-called phrases such as "In my opinion...". These are not relevant for the content of the argumentation component as long as the rest still makes a complete sentence, but more about this in the following established rules.

3.1 Completeness rule

An argument component should always include a point of view, which can also be a complete sentence.

In English, you can check whether an annotated component represents a complete point of view by prefixing the statement with the phrase "It is true that, <claim>" and the sentence still remains grammatically correct. If this is fulfilled, then the annotation is correct according to the completeness rule (Christian Stab and Iryna Gurevych 2015, 7).

In German, and especially in the case of reviews, the rule cannot be applied one-to-one, since the German sentence structure differs from the English sentence structure and the wording in reviews is also different. Thus, as soon as you put the sentence part "It is true that <opinion>" in front of the opinion, the sentence structure of the opinion must be changed so that it still remains grammatically correct. The following examples illustrate this. The sentence part in the square brackets contains the correct boundaries of the argument component of the annotation.

English example: "[The customer Process is not described in sufficient detail]."

German translation: „[Der Kundenprozess ist nicht genügend detailliert beschrieben].“

Rule application in English: It is true that, "[the customer Process is not described in sufficient detail]."

Rule application in German: Es ist wahr, dass „[der Kundenprozess ist nicht genügend detailliert beschrieben].“

English example: "[You'd have to justify that a bit more] because [that's a very important point that has a big impact on your cost structure]."

Rule application in English: It is true that, "[you'd have to justify that a bit more]," / It is true that, [that's a very important point that has a big impact on your cost structure].

German example: „[Das müsstest du noch etwas genauer begründen], da [das ein sehr wichtiger Punkt ist, der einen hohen Einfluss auf deine Kostenstruktur hat].“

Rule application in German: Es ist wahr, dass „[das müsstest du noch etwas genauer begründen],“ / Es ist wahr, dass [das ein sehr wichtiger Punkt ist, der einen hohen Einfluss auf deine Kostenstruktur hat].“

The first example illustrates that the German sentence must be rearranged to keep the sentence grammatically correct. The sentence should read as follows: It is true that "[the customer process is not described in sufficient detail]."

The second example shows that there only the first part of the sentence must be grammatically adjusted. So that the rule applies. The sentence would have to read as follows: It is true that "[you would need to justify this a little more],".

German rule: If "It is true that" can be placed in front of the argument component and the sentence structure of the argument component can be rearranged with the same words in such a way that the sentence remains grammatically correct, then the annotation is fulfilled according to the completeness rule.

3.2 Relevance rule

All words that are relevant for the argumentation component must be included in it. This means that all subordinate clauses relevant to the content must be included in the annotated component. Temporal information such as "in the past", "recently" or "nowadays", which can be at the beginning of a sentence, must also be included in the annotated component, otherwise the content cannot be understood (Christian Stab and Iryna Gurevych 2015, 8).

English example: "[At the moment, I still see a weakness in your business model]."

German translation: „[Momentan sehe ich noch eine Schwäche in deinem Business Modell].“

This rule can be adopted into German, since here it is further facilitated by the fact that such information is in most cases not separated from the rest of the sentence by any punctuation mark. Furthermore, what is meant here is that the business model represents a weakness before a revision and not that it represents another weakness, as one would otherwise interpret the word "noch".

3.3 Shell language rule

In English, shell language has no relevance to the context of an argument component because the component is nevertheless grammatically correct and thus irrelevant to it. Examples of such shell words include "For example," "According to the previous fact," "As can be seen," "Another important

point which contributes to my argument is that", "In this context", "because", "though", "in my view", "i think", "also", "furthermore", etc.

In the exceptional case that shell words are relevant to the context of an argument component, they should be included in the component. Examples are: "I do not agree that", "I disagree with the view that", "i don` t think", "i do not believe", etc. (Christian Stab and Iryna Gurevych 2015, 8).

In German recessions, this rule cannot always be adopted one-to-one either, since after such shell words the argumentation component is not always grammatically correct, unless you add another word like "es".

Translating the English shell words into German gives the following examples of shell words: "For example", "According to the previous fact", "As you can see", "Another important point which supports my argument is that", "In the context", "because", "since", "however", "nevertheless", "In my opinion", "I think", "also", "Furthermore", etc. The translation of the shell words relevant to the context of an argument component are: "I disagree with that", "I disagree with the view that", "I don't think that", "I don't believe that".

In the following, I show an example where the shell word can be omitted and the German sentence remains grammatically correct and then an example where the sentence remains grammatically incorrect by omitting the shell word without adding another word.

English example: "I think [the description of the short-characteristics of your company is a bit too long]. "

Deutsche Übersetzung: „Ich denke [die Beschreibung zu den Kurzcharakteristika deines Unternehmens ist etwas zu lang geraten].“

English example: "Furthermore, [it is clear that the business model was developed from a consumer perspective]."

Deutsche Übersetzung: „Des Weiteren [ist klar ersichtlich, dass das Geschäftsmodell aus Konsumentensicht entwickelt wurde].“

As can be seen in the second example, the German argumentation component as a stand-alone sentence so grammatically does not make sense without adding the word "es". The argument component is grammatically correct as follows: "Furthermore, [it is clearly evident that the business model was developed from the consumer's point of view]." You can rephrase the sentence as follows according to the completeness rule so that the grammar remains correct: "Furthermore [it is clearly evident that the business model was developed from a consumer perspective]." I.e. here shell word "furthermore" should be included in the argumentation component and the sentence should be annotated as follows: "Furthermore [it is clearly evident that the business model was developed from the consumer's point of view]."

An example of shell words that are Relevant to the context of an argument component is as follows:

English example: "I do not believe that [good IT skills are a USP]."

Deutsche Übersetzung: „Ich glaube nicht, dass [gute IT-Kenntnisse ein USP sind].“

In this case, one can clearly see that without the phrases, the context of the argument component says exactly the opposite. Therefore, the phrases are included in the annotation here and the sentence is thus annotated as follows:

"[I don't believe that good IT skills are a USP]." For these reasons, the following German rule can be established:

German rule: If an argumentation component can be rearranged according to the completeness rule and the context of the component is not changed by this, then shell words or phrases should not be included in the annotation. If the context of the argument component is changed by leaving out shell words, then they should be included in the annotation. Additionally, shell words in English as well as in German serve as a good indicator for identifying argument components.

3.4 Separation rule

A sentence may only be fully annotated if the corresponding sentence does not contain a conclusion and shell words between different opinions. I.e. a sentence may not be split into two argument components if there are several complete opinions. Only if one opinion is the reason for another opinion, the sentence may be split into two or more argument components. It is important not to separate sentences with multiple opinions connected by words such as "and", "or", and punctuation marks as in a bulleted list, and which do not contain a conclusion between different opinions. This can often occur when one sentence contains multiple reasons for an opinion from another sentence. In this case, the different reasons (premises) from one sentence must be annotated as one argument component. This also applies to conditional sentences, which contain a condition under which something occurs (Christian Stab and Iryna Gurevych 2015, 8). An indicator of such sentences are words like "if", or "in that". The subordinate clause formulates the condition that must be met in order for the consequence stated in the main clause to be realized.

English example: "This is due to the fact that, [you could add more examples and you should describe them in more detail]."

German translation: „Dies ist dem Grund geschuldet, dass [du noch viele Beispiele ergänzen könntest und du diese noch genauer beschreiben solltest].“

In this example, the argument component contains two premises: "You could add more examples" and "You should describe these in more detail". These are connected by the word "and". I.e. this rule can be adopted for German reviews, which means that these two premises should be combined into one argumentation component

3.5 Punctuation rule

Punctuation marks that come at the end of an argument component must not be included in the annotation (Christian Stab and Iryna Gurevych 2015, 8).

English example: "[EasyHealth is a business model that largely meets the vision of WellBeing]."

Deutsche Übersetzung: „[Bei EasyHealth handelt es sich um ein Geschäftsmodell, das größtenteils die Visionen des WellBeings erfüllt].“

This rule can also be transferred one-to-one for German reviews, since English and German grammar do not differ there.

3.6 Interpretation rule

Sentences which only represent an unambiguous statement through an interpretation should be annotated as an argumentation component. In particular, statements that explain what the author of the work has done and can be interpreted as a weakness; statements in which the author writes that he has not understood something and can be interpreted to the effect that these should be explained in more detail; or questions that suggest that an explanation or an important point has been forgotten by the author of the work. It must be remembered that these statements or questions always fall under the points of strength or weakness of the work. I.e. it is assumed with the statement or question that a point from the work of the author represents a weakness or that an important point is simply missing in the eyes of the evaluator or was inaccurately explained. These statements or questions may be supported by premises or, in some cases, may be written alone without a premise. All of these sentences suggest an opinion, if interpreted correctly. Such sentences occur frequently in a review, making this rule particularly relevant to this corpus. Indicators of such sentences are expressions such as "You have," "I don't understand," "I'm not quite clear," or a punctuation mark such as "?". In these cases, as already mentioned, an interpretation is often necessary to present a statement. If an unambiguous statement can be interpreted, this argument component is included in the annotation. Premises can strengthen the unambiguity of a statement.

Deutsches Beispiel: „[Du hast gute IT-Kenntnisse als USP aufgeführt]. Ich glaube nicht, dass [gute IT-Kenntnisse ein USP sind].“

Deutsches Beispiel: „[Ich verstehe nicht, was du mit Steuerung und Modifizierung der App meinst].“

Deutsches Beispiel: „[Was ist mit den Kosten für deine Entwickler?].“

These examples show that the previously described statements or questions can each be interpreted as an opinion, provided that one considers that these statements and question were each listed under the item weakness. Therefore, such sentences should each be annotated as an argument component and, as in these examples, as an opinion. Only the first example is additionally supported by a premise.

In the same way, however, such examples can also represent premises, especially if suggestions for improvement have been written by the evaluator.

German example: „[Du hast gute IT-Kenntnisse als USP aufgeführt]. Ich glaube nicht, dass [gute IT-Kenntnisse ein USP sind]. [Du solltest die IT-Kenntnisse in der SWOT-Analyse unter Stärken aufführen].“

German example: „[Ich verstehe nicht, was du mit Steuerung und Modifizierung der App meinst]. [Ich empfehle dir genauer zu beschreiben, was du mit Steuerung und Modifizierung der App meinst].“

German example: „[Was ist mit den Kosten für deine Entwickler?]. [Du solltest die Kosten für Entwickler auf jeden Fall mit in deine Kostenaufstellung mit reinnehmen].“

These examples illustrate that the argument components previously annotated as opinions are now supported by the subsequent improvement proposals and should be annotated as premises.

3.7 Grammar rule

Sentences that are constructed like bullet points, in which grammatically important words are omitted but still represent a clear statement or premise, should be treated as if those words were present. This occurs frequently in reviews when examples are given. Likewise, sentences that

are grammatically incorrect should be annotated as argumentative. Statements or premises that are split into several sentences and only together make a meaningful argument component are annotated as one argument component.

German example: „[Klar verständliches Geschäftsmodell].“

German example: „[Es gibt extra ein BMC für Two-Sided Markets, das halte ich aber für unübersichtlich unnötig].“

In the first example, the subject and predicate are missing. Correctly, this sentence should read as follows: This is a clearly understandable business model. The context is clearly understandable despite the missing subject and predicate. Therefore, this statement should be annotated as an argument component.

In the second example, the context becomes clearer if you formulate the sentence grammatically correctly as follows: [I consider the extra BMC for Two-Sided Markets to be confusing and unnecessary]. The statement is thus unambiguous and the argument component is annotated.

3.8 Chapter name rule

In reviews, opinions may be divided by chapter and misinterpreted without the chapter name. Chapter names can be relevant to the context of an argument component and should be annotated with in such cases.

German example: „[Revenue Streams Die sind gut beschrieben].“

German example: Value Proposition Ich finde [die Value Proposition ist umfassend und ausführlich beschrieben].

The first example shows that the chapter name is relevant to the context of the statement and should therefore be annotated. In the second example, on the other hand, the chapter name is not relevant to the context of the statement and should therefore not be included in the annotation.

4. Annotation of opinions and premises in reviews

A statement in the context of this work is directly related to the overall criteria of how the review should be written by the students. These criteria are that in each case the strengths and weaknesses should be highlighted to the work to be evaluated, as well as suggestions for improvement should be attached. That is, a statement always suggests a strength, weakness, or suggestion for improvement. Thus, one should always be able to formulate the following: A strength is that [opinion], A weakness is that [opinion] and a suggestion for improvement is that [opinion].

German example: Eine Stärke ist, dass „[du dein Geschäftsmodell sehr detailliert erläutern hast].“

German example: Eine Schwäche ist, dass „[der Kundenprozess nicht genügend detailliert beschrieben ist].“

German example: Ein Verbesserungsvorschlag ist, dass [du die IT-Kenntnisse in der SWOT-Analyse unter Stärken aufzuführen solltest].“

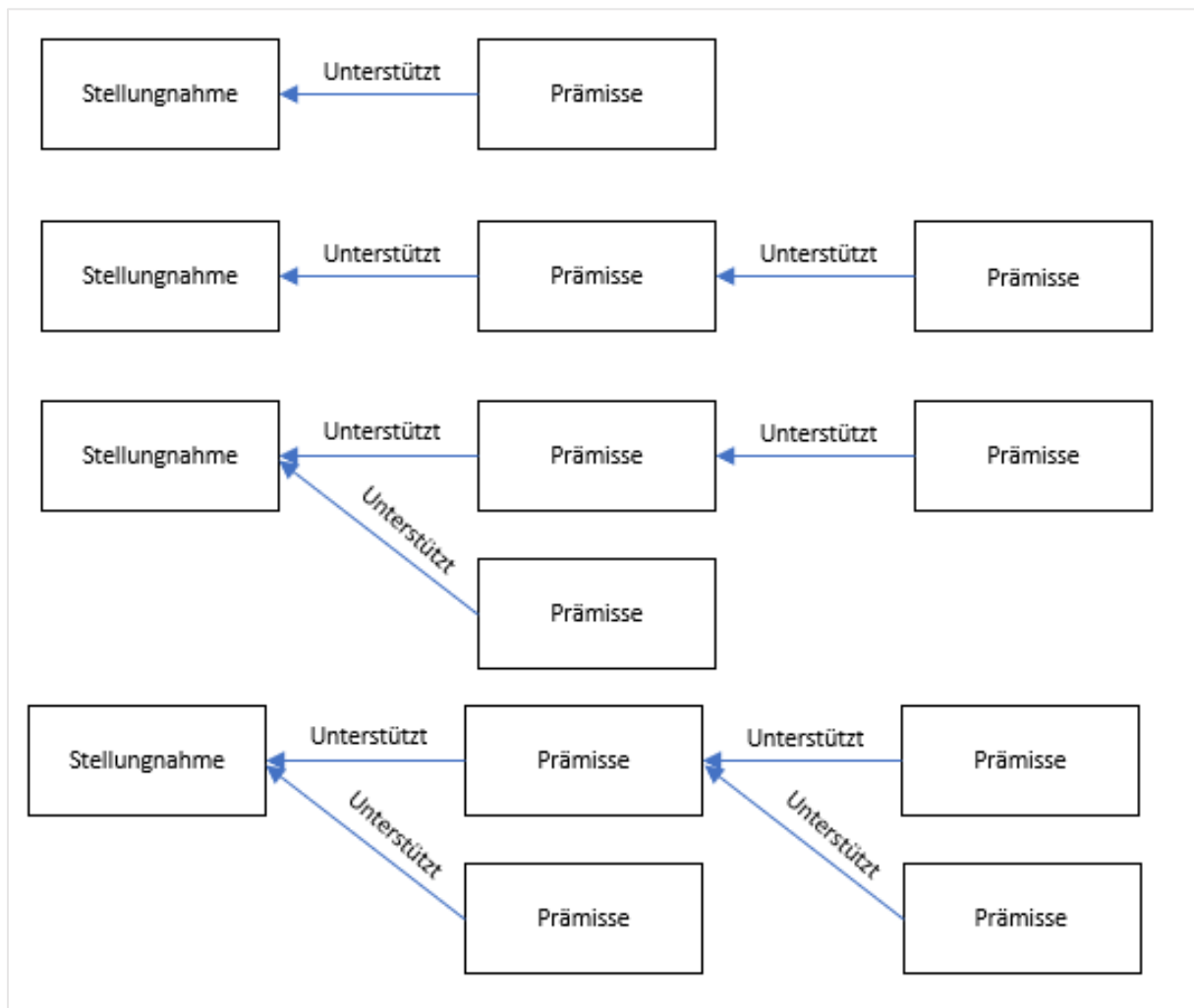
Premises, on the other hand, are a reason why an argument component (an opinion or other premise) is supported or attacked. That is, a premise represents a justification or a refutation of an argument component in order to convince the reader of the truth or falsity of an opinion or other premise.

German example: „[Es ist sehr schwierig eine solche Lösung zu vermarkten], da [sie viel zu viele verschiedene Features hat]“

5. Argumentative relations

Argument components form a tree structure of an argument through relationships (Christian Stab and Iryna Gurevych 2015, 17). An argument always contains a statement, which can be supported or attacked by one or more premises. In turn, individual premises can also be supported or attacked by a chain of other premises.

The following figure shows a few relationship possibilities. Here, "supported" can be replaced by "attacked" at any point. Likewise, the argumentation tree can be extended infinitely by other premises and relations.



Source: Self-generated image

6. Sources

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