Representing second-order arguments with Adpositional Argumentation (AdArg)

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This paper extends a high-precision method for representing 'first-order' arguments to the linguistically and pragmatically more complex 'second-order' arguments (such as the argument from authority). It thereby contributes to the further development of *Adpositional Argumentation* (AdArg), an approach to representing argumentative discourse with applications in corpus linguistics and computational argumentation that combines Gobbo and Benini's linguistic representation framework of *Constructive Adpositional Grammars* (CxAdGrams) and Wagemans' argument categorisation framework of the *Periodic Table of Arguments* (PTA).

KEYWORDS: *Adpositional Argumentation*, argument from authority, argument type, argument scheme, argumentative adpositional trees, *Constructive Adpositional Grammars*, constructive pragmatics, *Periodic Table of Arguments*, second-order arguments

1. INTRODUCTION

In response to the need for high-precision tools for analysing and evaluating arguments, Gobbo and Benini's (2011) linguistic representation framework of *Constructive Adpositional Grammars* (CxAdGrams) has recently been combined with Wagemans' (2016, 2019) argument categorisation framework of the *Periodic Table of Arguments* (PTA). The resulting approach of *Adpositional Argumentation* (AdArg) (Gobbo & Wagemans, 2019a, 2019b, 2019c; Gobbo, Benini & Wagemans, to appear) enables the analyst of argumentative discourse to represent arguments expressed in natural language by means of so-

called ‘argumentative adpositional trees’ (or ‘arg-adtrees’). Such trees contain not only very detailed linguistic information about the statements that make up the argument, but they also include pragmatic information concerning the order of presentation of these statements, the type of argument they substantiate, and the argumentative function of their constituents.[1] At the same time, an arg-adtree is flexible in that the analyst can show, hide, and highlight any piece of information according to her needs.

So far, this method for representing arguments has been successfully applied to so-called ‘first-order’ arguments such as the ‘argument from sign’ and the ‘argument from analogy’. In the process of identifying their type, the statements that function as the premise and the conclusion are analysed on the level of the proposition, i.e., the specific constellation of their subjects and predicates is determined (see Wagemans, 2019).

Argumentative discourse, however, also contains so-called ‘second-order’ arguments such as the ‘argument from authority’ and the ‘argument from disjuncts’. These arguments differ from first-order ones in that the analyst, in the process of identifying their type, has to shift from the level of propositions to that of assertions. This means that the statement functioning as the conclusion (and sometimes also that functioning as the premise) should be complemented with a predicate expressing the arguer’s epistemic commitment regarding its truth or acceptability, thereby changing the nature of the statement from a proposition to an assertion (see Wagemans, 2019). The addition of ‘is true’ to one or both of the statements poses a challenge to the method for representing arguments just described. As yet, it is unclear how this additional pragmatic information about the statements that make up the argument should be included in the corresponding arg-adtree.

In this paper, we make a proposal for constructing arg-adtrees of second-order arguments by examining the consequences of the abovementioned shift in the level of the analysis for the representation of the linguistic and pragmatic information contained in the argument. We start with a short exposition of our representation method as applied to first-order arguments (Section 2). Then, we explain the nature and constituents of second-order arguments, emphasising how they differ from first-order ones, and describe the extra steps the analyst should take in order to identify their type (Section 3). Next, we consider how to represent the additional linguistic and pragmatic information in an arg-adtree and illustrate our solution by providing the arg-adtrees of two examples of second-order arguments (Section 4). We

[1] For an explanation of the very possibility of representing pragmatic information in adtrees see Gobbo and Benini (2011, chapter 6).

conclude with a summary of our findings and a brief discussion of newly arisen challenges that should be addressed in further research (Section 5).

2. BUILDING ARGUMENTATIVE ADPOSITIONAL TREES

Our high-precision method for representing arguments expressed in natural language is the result of combining the linguistic representation framework of *Constructive Adpositional Grammars* (CxAdGrams) with the argument categorisation framework of the *Periodic Table of Arguments* (PTA). We have explained the theoretical background of both frameworks and their combination into an approach we named *Adpositional Argumentation* (AdArg) elsewhere (see Gobbo & Wagemans, 2019a, 2019b, 2019c; Gobbo, Benini & Wagemans, to appear). For the present purposes, we shall briefly elucidate the characteristics of the argumentative adpositional tree (arg-adtree) of the example of a first-order argument pictured in Figure 1, *The suspect was driving fast, because he left a long trace of rubber on the road*.

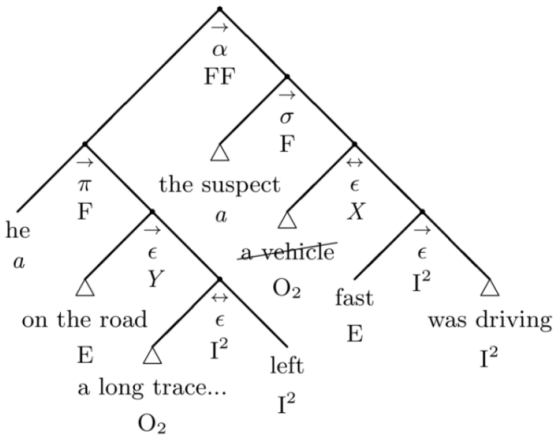

Figure 1 – The arg-adtree of a first-order argument (Gobbo & Wagemans, 2019c, p. 417)

The arg-adree consists of two main branches: the right one conventionally representing the statement that functions as the conclusion (σ) of the argument, *The suspect was driving fast*, and the left one representing the statement that functions as its premise (π), *He left a long trace of rubber on the road*. Each of the two branches contains linguistic information on the word level expressed by means of five different grammar characters (A, E, I, O, U), which are taken from the

linguistic representation framework of CxAdGrams. Table 1 explains their meaning – adapted from Gobbo and Benini (2011, p. 41).[2]

gc	*name*	*function*	*examples*
A	adjunctive	modifier of O	adjectives, articles, determiners
E	circumstantial	modifier of I	adverbs, adverbial expressions
I	verbant	valency ruler	verbs, interjections
O	stative	actants	nouns, pronouns, name-entities
U	underspecified	transferer	prepositions, derivational morphemes

Table 1 – The meaning of grammar characters in adtrees

Under the top hook of the arg-adtree, where the two main branches connect, one finds first of all pragmatic information about the order of presentation in the discourse. In this case, the order is retrogressive (conclusion, *because* premise), which is represented by a right arrow (→). Under this arrow, the analyst places information about the type of argument in terms of the theoretical framework of the PTA. The example can be identified as a first-order predicate argument combining a statement of fact with another statement of fact, which is represented in the arg-adtree in abbreviated form (α FF).

Moving down to the branches representing the statements themselves, one finds information about their argumentative function as conclusion (σ) or premise (π). This level of the arg-adtree also reiterates the information about the type of statement in terms of the tripartite typology of statements distinguished within the PTA: statements of fact (F), statements of value (V) and statements of policy (P). In this case, both the conclusion and the premise of the argument are classified as a statement of fact (F).

Finally, the arg-adtree contains information about the predicates and subjects of the propositions expressed in the conclusion and the premise of the argument. Following logical conventions, the predicates are indicated with *a*, *b*, etc., and the subjects with *X*, *Y*, etc. In this case, *the suspect* (*a*) / *he* (*a*) is the shared subject of these propositions, while *was driving fast* (*X*) and *left a long trace of rubber on the road* (*Y*) are their respective predicates. The argument thus has the form '*a* is *X*, because *a* is *Y*', which is why it is identified as a first-order predicate argument.

[2] The apexes and pedices serve to indicate the valency of the verbants, to identify their actants, and to indicate their level of saturation. For a more detailed explanation of the linguistic information represented in this argumentative adtree, see for instance Gobbo and Wagemans (2019c, pp. 414-419).

3. WHAT ARE SECOND-ORDER ARGUMENTS?

As we have illustrated in the previous section, first-order arguments can be identified on the basis of an analysis of the components of the propositions that express their conclusion and premise. More precisely, the form of the argument is determined by the constellation of the linguistic subjects and predicates of these propositions. The theoretical framework of the PTA distinguishes two possible constellations, which we will now describe in more detail.

If the propositions share a common subject, they have the form '*a* is *X*, because *a* is *Y*' and are classified as 'predicate' arguments. In technical terms, the common subject (*a*) functions as the 'fulcrum' of the argument and the relationship between the different predicates (*Y* and *X*) as its 'lever', i.e., as its underlying argumentative mechanism (see Wagemans, 2019). The example just mentioned, for instance, has *the suspect* (*a*) / *he* (*a*) as its fulcrum and the relationship between *leaving a long trace of rubber on the road* (*Y*) and *driving fast* (*X*) as its lever.

> Example 1
> *The suspect* (*a*) *was driving fast* (*X*)*, because he* (*a*) *left a long trace of rubber on the road* (*Y*)

A subsequent determination of the types of statement gives the analyst the systematic name of the argument under scrutiny (in this case, '1 pre FF' or '*α* FF'), while a determination of the nature of the relationship between the predicates provides its traditional name (in this case, 'argument from effect').

The other possible constellation is when the propositions expressed in the conclusion and the premise share a common predicate. In this case, the argument has the form '*a* is *X*, because *b* is *X*' and is classified as a 'subject' argument. An example is *Cycling on the grass is forbidden, because walking on the grass is forbidden*, which has *is forbidden* (*X*) as its fulcrum and the relationship between *cycling on the grass* (*a*) and *walking on the grass* (*b*) as its lever.

> Example 2
> *Cycling on the grass* (*a*) *is forbidden* (*X*)*, because walking on the grass* (*a*) *is forbidden* (*X*)

Like with first-order predicate arguments, the systematic name of first-order subject arguments indicates their argument form as well as the specific combination of the types of statement (in this case, '1 sub VV' or '*β* VV'). The determination of the nature of the relationship between the subjects provides their traditional name (in this case, 'argument from analogy').

How do second-order arguments deviate from first-order ones? One way to explain the difference is to assume that in order to identify an argument, the analyst has to determine the 'fulcrum', i.e., the common term of the propositions involved (see Wagemans, 2019). As illustrated by means of Example 3 and Example 4, this sometimes poses a problem.

The first problematic case is when the conclusion does not have anything in common with the premise and the search for the fulcrum thus yields a negative result.

Example 3
He must have gone to the pub, because the interview is cancelled

From analysing the conclusion and the premise in terms of the constituents of the propositions, the only thing to report is that the argument has the form '*a* is *X*, because *b* is *Y*'. As a result, it also remains unclear how the premise supports the conclusion or, in other words, how to formulate the 'lever' or underlying mechanism of the argument.

In other cases, as illustrated by means of Example 4, the propositions do share a common element, but it cannot unambiguously be identified as their common term (subject or predicate).

Example 4
We only use 10% of our brain, because that was said by Einstein

In analysing the conclusion, one may take the proposition *we only use 10% of our brain* to consist of the subject *we* and the predicate *only use 10% of our brain*. But neither of these terms functions as such in the premise. Since instead, it is the proposition as a whole that functions as the subject of the premise, the only thing the analyst can say is that the argument has the form '*a* is *X*, because *a* is *X* is *Z*'.

As Wagemans (2019) explains, the problems illustrated through these two examples can be solved by adding the predicate 'is true' to the conclusion or to both the conclusion and the premise of the argument. This epistemic predicate expresses the commitment of the arguer to the truth or acceptability of the statements, which means that the level of analysis changes from that of the 'proposition' to that of the 'assertion'.

If we revisit the examples and perform this shift in the level of the analysis, Example 3 now has the predicate 'is true' (⊤) as its fulcrum and the relationship between the propositions *he must have gone to the pub* (*q*) and *the interview is cancelled* (*r*) as its lever.

Example 3 – revisited
He must have gone to the pub (*q*) [*is true*] (⊤)*, because the interview is cancelled* (*r*) [*is true*] (⊤)

The addition of the epistemic commitment of the speaker as a predicate to the statements allows the analyst to employ the same procedure for argument type identification as with the previous examples of first-order arguments. Example 3 now has the form '*q* is ⊤, because *r* is ⊤' and can therefore be called a second-order subject argument. Given that the predicate 'is true' (⊤) is labelled within the framework of the PTA as a statement of value (V), the systematic type indicator is '2 sub VV' or 'γ VV'. Finally, the determination of the nature of the relationship between the subjects provides their traditional name (in this case, 'argument from disjuncts').

In revisiting Example 4, it suffices for the analyst to add 'is true' (⊤) to only the conclusion of the argument. For in so doing, it becomes clear that the argument has the subject *we only use 10% of our brain* (*q*) as its fulcrum and that its working is based on the relationship between *being said by Einstein* (*Z*) and *being true* (⊤).

> Example 4 – revisited
> *We only use 10% of our brain* (*q*) [*is true*] (⊤), *because that* (*q*) *was said by Einstein* (*Z*)

Given that the conclusion can be labelled as a statement of value and the premise as a statement of fact, this argument can now be identified as a second-order predicate argument with the form '*q* is ⊤, because *q* is *Z*' and the systematic name '2 pre VF' or 'δ VF'. Traditionally, such an argument is known as the 'argument from authority'.

In sum, the addition of the epistemic predicate 'is true' (⊤) allows the analyst to identify the type of argument on the basis of determining the common term in the statements expressing the conclusion and the premise of the argument. Following this strategy not only brings the classification of second-order arguments in line with that of first-order arguments, it also has the advantage of enabling the determination of their argumentative lever. In the case of second-order subject arguments, it reveals that their working is based on a relationship between complete propositions. This category thus covers all the arguments that are distinguished in propositional logic, such as the argument from disjuncts. In the case of second-order predicate arguments, the strategy reveals that their working is based on a relationship between something that is predicated of a complete proposition and the truth or acceptability of that proposition. This category thus covers all the arguments that depend in some way or another from the trustworthiness of their source, such as the argument from authority. It is in this sense that the theoretical framework of the *Periodic Table of Arguments* can be seen as a systematic and

comprehensive framework that integrates the traditional dialectical accounts of argument schemes and fallacies and the rhetorical accounts of the means of persuasion (see Wagemans, 2016).

4. REPRESENTING SECOND-ORDER ARGUMENTS

Now that we have explained our method for representing first-order arguments by means of arg-adtrees and have indicated the differences and commonalities between first-order and second-order arguments, we turn to propose how to represent the addition of 'is true' (⊤) to the premise and/or the conclusion of second-order arguments in their corresponding arg-adtree.

Our proposal is based on the following reflections about the nature of the information that is covered in such an adtree. As we mentioned above, an arg-adtree first of all contains linguistic information about the two statements that make up the represented argument. This 'linguistic' information pertains to the morphosyntactic characteristics of these sentences. Second, an arg-adtree contains 'pragmatic' information, by which label we mean to indicate information pertaining to the use of language, in particular its argumentative use of trying to convince an addressee of the acceptability of the conclusion. As we explained by means of an example in Section 2, the pragmatic information covers various aspects of such argumentative language use: the argumentative function of the statements (conclusion or premise), the order of presentation, and the type of argument they substantiate (which includes information about the argument form, i.e., the specific constellation of subjects and predicates of the statements, as well as about the argument substance, i.e., the specific combination of types of statements).

In order to represent second-order arguments in an arg-adtree, it seems to be necessary to first determine whether the information about the epistemic commitment of the arguer to the truth or acceptability of the statements is of a linguistic or a pragmatic nature. If it is of a linguistic nature, as the addition of 'is true' (⊤) by the analyst suggests, it could be represented as an extra branch in the adtree. If it is of a pragmatic nature, as the notion of epistemic commitment suggests, it could be represented by introducing a symbol for this type of commitment that can be placed under the relevant hook or character in the adtree.

In our view, however, this is a false dilemma, for the simple reason that the analytical strategy of adding 'is true' (⊤) as a predicate to one or both of the statements that make up the argument can be seen as a *linguistic* expression of *pragmatic* information. In fact, one could add this predicate to the two statements that make up a first-order

argument as well. From a pragmatic point of view, someone who puts forward a statement in order to support the acceptability of another statement is committed to the truth or acceptability of both statements as well as their connection (see van Eemeren & Grootendorst, 1992, p. 31). The only reason why this information is left out of the corresponding arg-adtree of a first-order argument such as the one pictured in Figure 1, is that the analyst does not have to add the epistemic commitments in order to identify the type of argument. For second-order arguments, as we explained in the previous section, such an addition is necessary.

Apart from this theoretical justification of why the expression 'is true' can be seen as a linguistic expression of pragmatic information, it is also actually used as such in argumentative discourse. Moreover, in classical rhetorical taxonomies of arguments (*topoi*, *loci*), one finds examples in which the epistemic commitment is expressed in exactly this way. Cicero, for instance, provides the following example of what he subsumes under the heading of the 'external loci' and can be identified as an argument from authority: 'This is true, for Q. Lutatius has said so'.[3]

The above considerations lead us to propose to represent the pragmatic information about the epistemic commitment of the arguer to the truth or acceptability of the statements in second-order arguments in the corresponding arg-adtrees by means of adding 'is true' as an extra branch in the adtree with the symbol '⊤' right under it.

In Figure 2, we pictured the arg-adtree of *He must have gone to the pub* (*q*) [*is true*] (⊤)*, because the interview is cancelled* (*r*) [*is true*] (⊤), which has been identified as a second-order subject argument.

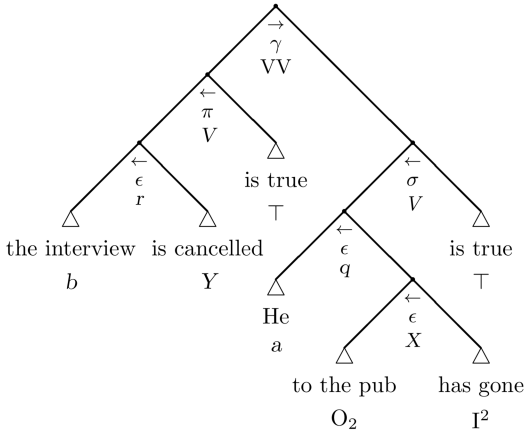

Figure 2 – The arg-adtree of Example 3 – revisited

[3] This example is also discussed in Wagemans (2019b, p. 63). For more information about classical rhetorical taxonomies of arguments, see van Eemeren et al. (2014, pp. 86-94).

In this case, the analyst adds the expression 'is true' as a predicate to both the conclusion and the premise of the argument. Also, in a similar way as this has been done for other pragmatic information such as that about the argumentative function of the statements as a conclusion or a premise, the symbol '⊤' is placed under the expression.

In Figure 3, we pictured the arg-adtree of *We only use 10% of our brain* (*q*) [*is true*] (⊤), *because that* (*q*) *was said by Einstein* (*Z*), which has been identified as a second-order predicate argument.

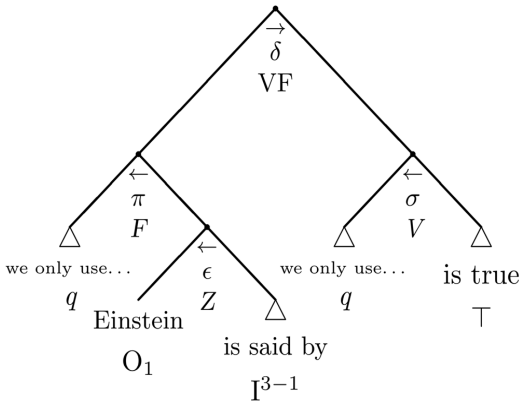

Figure 3 – The arg-adtree of Example 4 – revisited

In this case, the analyst adds the expression 'is true' as a predicate only to the conclusion of the argument. Like in the adtree of the previous example, the symbol '⊤' is placed under the expression.

5. CONCLUSION

In this paper, we have proposed a method for representing so-called 'second-order' arguments within the framework of *Adpositional Argumentation* (AdArg). Our proposal is based on the starting points of our method for representing 'first-order' arguments in combination with an analysis of the difference between second-order and first-order arguments. The main conclusion of our research is that the additional pragmatic information about the epistemic commitment of the arguer regarding the truth or acceptability of the statements that make up the argument, which has to be added by the analyst in order to identify the type of argument, can be represented by means of its linguistic expression 'is true' (⊤). We have illustrated this proposal by providing the arg-adtrees of two examples of second-order arguments.

The considerations that underly our proposal give rise to several new challenges in our project of representing linguistic and pragmatic information about argumentative discourse in arg-adtrees. One question that needs to be addressed is how to add the epistemic commitment of the arguer to arg-adtrees representing first-order arguments. For the fact that adding the linguistic expression of this pragmatic information is not necessary for identifying the type of argument, does not imply that it should not be added at all. In a similar vein, it should be explored how to add other linguistic expressions of pragmatic information to arg-adtrees. An example is 'My conclusion is that […]', which expression is sometimes used by arguers to indicate the argumentative function of the statement followed by it.

Another issue to be addressed in further research is whether it would be possible to add the negation of the epistemic commitment to arg-adtrees, for instance in the form of the predicate 'is not true' or 'is false' (⊥). If this can be done, our approach would cover not only those situations in which a conclusion is *supported* by a premise, but also those in which a conclusion is *refuted* on the basis of a premise. Apart from that, we think that such an extension would enable researchers to study the interrelations between *Adpositional Argumentation* (AdArg) and approaches working with formal argumentation frameworks – for example, those included in Modgil, Budzynska and Lawrence (2018). By conveniently hiding details of the information contained in arg-adtrees, they can be represented as nodes in a network, thereby resulting in something very similar to Dung graphs.

Finally, there is the question of how to represent different linguistic expressions of similar pragmatic information. Apart from inserting 'is true' after the statement, for instance, second-order arguments can also be reconstructed by inserting 'You should accept' before the statement. In the first case, what is added to the original text expresses an epistemic commitment of the arguer. In the second case, however, what is added expresses an epistemic directive towards the addressee. By studying the linguistic and pragmatic characteristics of these and other expressions in more detail, we hope to further develop our approach of *Adpositional Argumentation* (AdArg) as a high-precision method for representing argumentative discourse.

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