



UNIVERSITY OF AMSTERDAM

Amsterdam Center for Language and Communication

Adpositional Argumentation

How Logic Originates In Natural Argumentative Discourse

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What is Adpositional Argumentation

AdArg = PTA + CxAdGrams

A new formal method that enables the analyst of argumentative discourse to represent linguistic and pragmatic information in a highly detailed and yet flexible way.

Source: Gobbo & Wagemans (*Actes JIAF* 2019)

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2. Constructive Adpositional Grammars (**CxAdGrams**, by Gobbo & Benini)

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Epistemologically, bridges the gap between:

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Source: Gobbo, Benini & Wagemans (*Intelligenza Artificiale* 2019), here

The Periodic Table of Arguments (PTA)

The Periodic Table of Arguments (PTA) is a formal linguistic categorisation of argument types (Wagemans 2016)

Argument types are grouped along four quadrants of canonized forms, such as:

<i>quadrant</i>	<i>conclusion</i>	<i>premise</i>	<i>retrogressive argument</i> <i>(progressive variant)</i>
α	a is X	a is Y	a is X, because a is Y <i>(a is Y, so a is X)</i>
β	a is X	b is X	a is X, because b is X <i>(b is X, so a is X)</i>

Table 1: Overview of first-order argument forms

Source: Gobbo, Benini & Wagemans (*Intelligenza Artificiale* 2019)

Conclusions and premises are expressed by statements

- **F** is statement of Fact
- **V** is statement of Value
- **P** is statement of Policy

Colors indicate the combination of statement types

<i>Values ($\sigma\pi$)</i>	<i>Conventional color</i>
PP	red
VV	yellow
FF	blue
PV, VP	orange
PF, FP	purple
VF, FV	green

Table 2: Conventional colors of the argument types

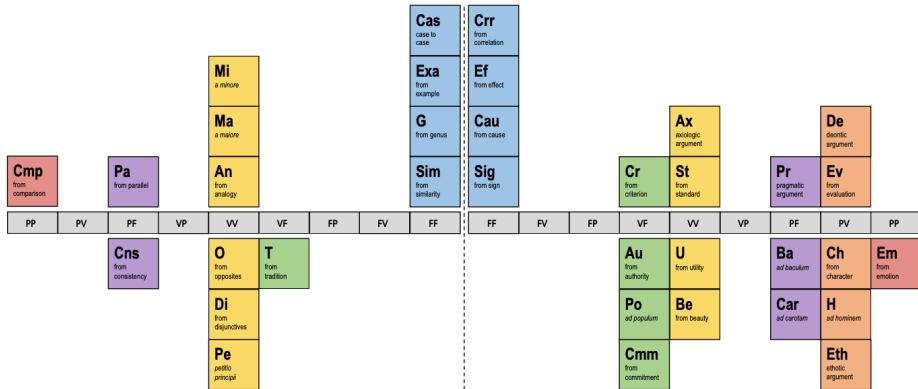
β subject

PERIODIC TABLE OF ARGUMENTS

predicate α

1

1



2

γ subject

VERSION 2.5

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predicate δ

2

δ

For more info please visit <https://periodic-table-of-arguments.org/>

Constructive Adpositional Grammars (CxAdGrams)

- The theoretical framework results from the application of constructive mathematics to the adpositional paradigm in linguistics
- CxAdGrams specifically are based on topos-theory
- It thus permits to use Grothendieck's topologies to formalize natural languages, making information completely explicit.

What does 'adpositional' mean, in this context?

*The adpositional paradigm in linguistics follows the idea that relations between linguistic elements can be described as hierarchical in that **the one element 'governs' the other (which then 'depends' on the former).***

Source: Gobbo & Wagemans (with Benini, AI³, AIXIA 2018)

Abstract adpositional trees

- *gov* is ‘governor’, conventionally on the rightside leaf
- *dep* is ‘dependent’, conventionally on the leftside leaf
- *adp* is ‘adposition’, under the hook, including information prominence (\leftrightarrow)
- *gc* is ‘grammar character’, the function of the whole tree in the syntax
- \triangle indicates a hidden adtree, i.e., recursion is possible

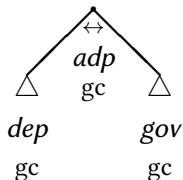
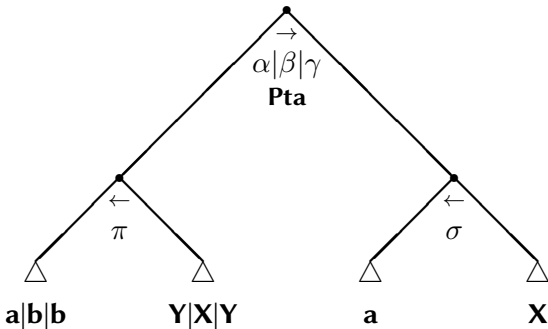


Figure 1: The abstract adtree structure

Argumentative adpositional trees

Basic abstract trees of minimal argument forms: α, β, γ

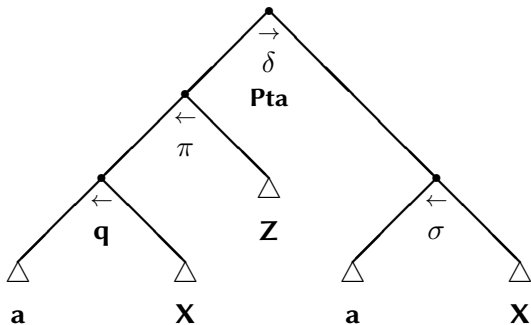
- $(\sigma \rightarrow \pi)$ the form is retrogressive (conclusion because premise)
- **Pta** indicates the argument type (e.g., **Cr** is argument from criterion)



Source: Gobbo, Benini, Wagemans (AI³, AIXIA 2021)

Basic abstract trees of minimal argument forms: δ

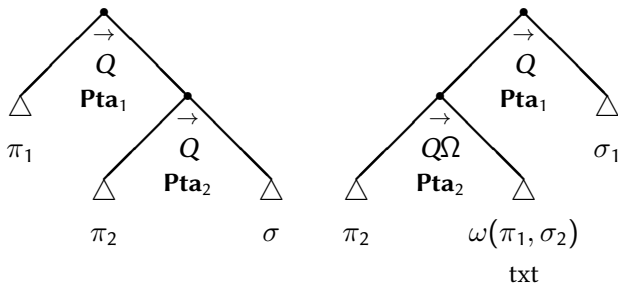
The premise of Delta arguments has a predicate (**Z**) attributed to the conclusion, which appears in the arg-adtrees as quoted (**q**) conclusion



Source: Gobbo, Benini, Wagemans (AI³, AIXIA 2021)

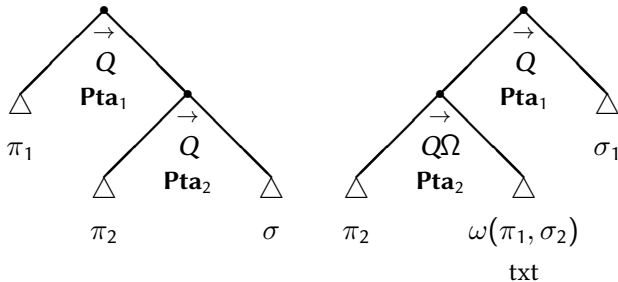
Convergent (left) and serial (right) arguments

- Q is Quadrant ($\alpha, \beta, \gamma, \delta$)
- Ω signals the serial argument, where txt holds a double function
- ω graphically represents the two halves of a chain ring $\omega(\pi_1, \sigma_2)$



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$\omega(\pi_1, \sigma_2)$ is an implication whose nature (classical, intuitionistic, relevant, linear, ...) is not specified.

To annotate a natural language text we need the voice (φ)

ρ_y is a report by φ_y whereas ξ_y introduces arguments (...) put by φ_x

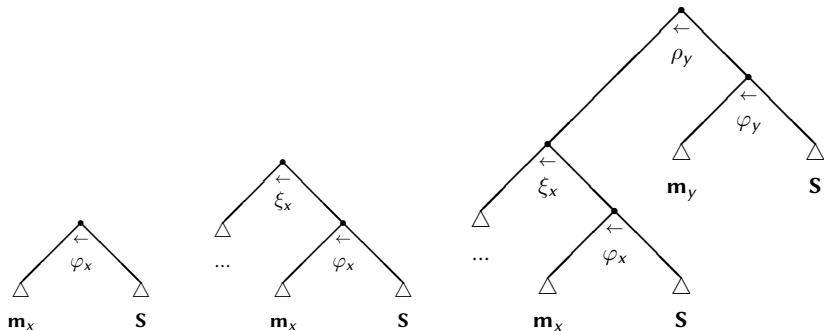


Figure 2: Adtrees showing voice (left), viewpoint (middle), and reported speech (right)

Adapted from: Gobbo, Benini, Wagemans (More than Relata Refero, *Languages* 2021)

Annotating an Argumentative Text

The case of Copernicus and Aristarchos: first two paragraphs

In his article “Plagiarism: A rich tradition in science,” editor John Lowell argues, referring to an article by dr. P. Smith, that Copernicus was also guilty of plagiarism: it appears that he “forgot” to mention that Aristarchos of Samos (310-230 BC) had already arrived at a heliocentric theory. It is, however, doubtful that Copernicus knew of this.

Kant spoke of heliocentricity as a Copernican revolution: it is directly contrary to “common sense” (after all, we can see that the sun rises in the east and sets in the west), and more importantly, to a centuries-old geocentric, Christian-scientific tradition. Copernicus needed all the support he could muster for his theory, and cited a great many classical writers to that end.

Source: Gobbo, Benini, Wagemans (More than Relata Refero, *Languages* 2021)

First paragraph of Copernicus and Aristarchos

[0] [the author writes]

1.1.a.I In his article “Plagiarism: A rich tradition in science,”

1.1.a.II editor John Lowell

1.1.a.III argues,

1.1.b.I referring

1.1.b.II to an article

1.1.b.III by dr. P. Smith,

1.1.c that Copernicus was also guilty of plagiarism:

1.1.d.I it appears that he “forgot” to mention

1.1.d.II that Aristarchos of Samos (310–230 BC) had already arrived at a heliocentric theory.

1.2.a It is, however, doubtful

1.2.b.I that Copernicus knew of

1.2.b.II this [anaphora of 1.1.d.II].

Source: Gobbo, Benini, Wagemans (More than Relata Refero, *Languages* 2021)

Second paragraph of Copernicus and Aristarchos

2.1.a.I Kant

2.1.a.II spoke of

2.1.a.III heliocentricity as a Copernican revolution:

2.1.b it is directly contrary to “common sense”

2.1.c (after all, we can see that the sun rises in the east and sets in the west)

2.1.d and more importantly, to a centuries old geocentric, Christian scientific tradition.

2.2.a Copernicus needed all the support he could muster for his theory,

2.2.b.I and [Copernicus] cited a great many classical writers

2.2.b.II to that end.

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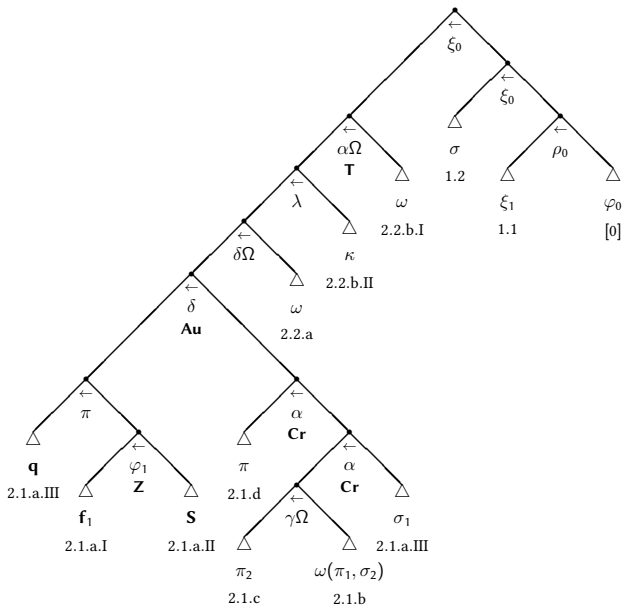


Figure 3: Arg-adtree of § 1-2 of Copernicus and Aristarchos

Conclusion

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- the annotated text reveals argumentation structures and patterns
- annotation is *pre-logical*: it shows exactly where the logic comes in
- it makes evident the points of attack of the way of reasoning


Thank You for Your Kind Attention! Any Questions?


 FOR MORE RESEARCH ON ADARG 

[https://lancar.org/research-projects/
constructive-adpositional-argumentation-cxadarg/](https://lancar.org/research-projects/constructive-adpositional-argumentation-cxadarg/)

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