

Computational Argumentation — Part III

Basics of Argumentation

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Learning goals

▪ Concepts

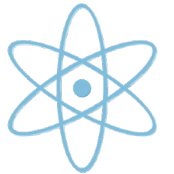
- What is argumentation, why and how do we argue
- Linguistic concepts argumentation builds upon
- Main concepts related to argumentation



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▪ Associated research fields

- Linguistics
- Argumentation theory
- Rhetoric



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▪ Within this course

- Basics needed for understanding what is analyzed and generated in computational argumentation



Outline

- I. Introduction to computational argumentation
- II. Basics of natural language processing
- III. Basics of argumentation**
- IV. Argument mining
- V. Perspective assessment
- VI. Argument quality assessment
- VII. Argument generation
- VIII. Applications of computational argumentation
- IX. Conclusion

- a) Introduction**
- b) Subjective language
- c) Argumentative units and arguments
- d) Argumentation and debate
- e) Logic, rhetoric, and dialectic
- f) Conclusion

Introduction

Need for debate?

iphone vs pixel death penalty energy transformation
rescue boats putin tariff war trump
afd ban affirmative action nuclear energy feminism
refugees armament equal pay vaccine mandate
dembélé vs mbappé abortion gendering
#metoo chatgpt in education straight of hormus
social media age democracy

Controversial issues

▪ Controversy

- A question (problem) without a clearly correct answer (solution)
- A potential conflict of standpoints on a given issue

“Controversy is an essential prerequisite of debate. Where there is no clash of ideas, proposals, interests, or expressed positions on issues, there is no debate.”

(Freeley and Steinberg, 2009)

▪ Examples

Controversial.

Feminism is needed.

Non-controversial.

2 plus 2 equals 4.

Borderline case.

The earth is a sphere.

▪ Issue

- **Topic.** A subject, matter, or theme, such as “*feminism*”.
- **Issue.** A topic at discussion.
- Issues are usually phrased as claims, such as “*Feminism is needed*”.

Argumentation: a compressed definition

“Argumentation is a verbal, social, and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of propositions justifying or refuting the proposition expressed in the standpoint.”

(van Eemeren and Grootendoorst, 2004)

What is argumentation? based on Stede and Schneider (2018)

“Argumentation is a verbal, social, and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of propositions justifying or refuting the proposition expressed in the standpoint.”

(van Eemeren and Grootendoorst, 2004)

- **A verbal activity**

- Inherently linguistic, either in spoken or in written form

Mimics, gestures, and other forms of communicating are secondary.

- **A social activity**

- An interaction with two or more opposing participants, at least implicitly

Notice that you may also argue with yourself.

- **A rational activity**

- The central idea is to exchange reasonable arguments.

Other facets of arguing such as rhetoric may still play a role, though.

Why to argue? based on Stede and Schneider (2018)

“Argumentation is a verbal, social, and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of propositions justifying or refuting the proposition expressed in the standpoint.”

(van Eemeren and Grootendoorst, 2004)

- **A standpoint** (aka stance)
 - Arguments support (or oppose to) a pro or con view on a controversial issue.
Without controversy, there is no disagreement and, hence, no reason to argue.

- **Convincing of acceptability**
 - Arguments aim to make others (at least) accept one’s own view.
They are *not* about finding truth, because truth is not always not known and not always accessible.

- **A reasonable critic**
 - Arguments can be judged within a given social context.
The judges may also be the participants themselves.

How to argue? based on Stede and Schneider (2018)

“Argumentation is a verbal, social, and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of propositions justifying or refuting the proposition expressed in the standpoint.”

(van Eemeren and Grootendoorst, 2004)

- **A constellation of propositions**

- Argumentation creates relations between a set of selected propositions.
Specific arguments are phrased linearizations of these relations.

- **Justifying or refuting the proposition**

- Argumentation aims to clarify why a standpoint is right (or wrong).
It is not just about social power relationships between the involved participants.

Argumentation at different granularity levels

Alice. *Some people say refugees threaten peace, as many of them were criminals. In fact, Spiegel Online just reported results from a study of the federal police about numbers of refugees and crimes: Overall, there is no correlation at all! Rather, the police confirmed that the main reason for committing crime is poverty. So, if you believe the police then you shouldn't believe those people. Syrians are even involved less in crimes than Germans according to the study. So, the more Syrians come to Germany, the more peaceful it gets there, right?*

Bob. *The question is here why I should believe the police!?*

Argumentative discourse unit

Argument

Argumentation (monological)

Debate (dialogical argumentation)

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Subjective language based on Stede and Schneider (2018)

▪ Public and private states

- **Public.** A person's actions can be observed by the outside world.
- **Private.** A person's current mental state cannot (what is thought, felt, ...).

▪ Objective and subjective language

- **Objective.** Statements describing public states. Listeners can judge them as true or false.
- **Subjective.** Statements sharing private states. Listeners may disagree with their content.

There is a llama in the room.

Obama came to office in 2009.

I guess there's a llama here.

Obama was a good president.

▪ Types of subjective statements

- **Sentiment.** Expressions of positive/negative polarity (opinions, emotions, ...)
- **Belief in truth.** Expressions of truth/falsity (claims, speculations, ...)

▪ Notice

- Without linguistic indicators, subjectivity is often not apparent.

Stance and claims

■ Stance

- The overall position held by a person toward some target, such as an object, statement, or issue
- To have/take a stance on a target means to be *pro* or *con* toward it.

Related terms: Viewpoint, view, standpoint, stand, position



Pro toward ban of death penalty

The death penalty must be abolished.

Con toward ban of death penalty

Life-long imprisonment is pricy, though.

■ Observations on stance

- Often but not necessarily conveys sentiment
- Depends on what a speaker claims to be true
- Can be expressed without any reference to the target

■ Claim

- A claim is a statement that conveys a stance toward a controversial issue, implicitly or explicitly

Reasons and evidence

▪ Reasons vs. evidence

- **Reason.** An answer to *why* a statement is supposed to be true (or false)
- **Evidence.** An answer to *what* is known or *when* something happened

Evidence is often backed up by a reference to sources.

▪ Types of evidence

- **Testimony.** Reference to a proposition made by some expert, authority, ...

Desmond Tutu said, to take a life when a life has been lost is revenge, not justice.

- **Statistics.** A report of results from quantitative research, studies, ...

A UN survey from 1998 gave no support that death penalty deters from crime.

- **Anecdote.** Personal experience, a concrete example, a specific event, ...

I read about a guy who was proven innocent one day after his execution.

- **Other.** Other types distinguished sometimes: analogies, causalities, ...

Causality and communicative effects

- **Causality (“A because B” / “B, so A”)**
 - Using causality in language may have different communicative effects.
 - In argumentation: persuasion or justification

- **Communicative effects of causality**

- **Persuasion.** A claim *A* is supported by a reason *B*.

Using airplanes is bad because they are among the worst air polluters we have.

- **Justification.** *A* is a controversial attitude or action, *B* the reason for it.

I need to use airplanes a lot because my job requires me to be in different parts of the world regularly.

- **Explanation.** *A* is an “undisputed fact”, and *B* is the reason why *A* holds.

Explanations are *not* argumentative in general.

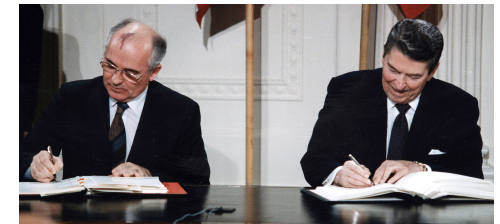
An airplane is able to take off because the shape of the wings produces an upward force when the air flows across them.

Goals of argumentation and debate based on Tindale (2007)

- **Persuasion**
 - Changing or reinforcing the stance of an audience toward an issue
- **Agreement**
 - Resolving a dispute between multiple parties or achieving a settlement in a negotiation
- **Justification**
 - Giving reasons or explanations for an attitude or action that might be controversial
- **Recommendation**
 - Suggesting a decision to make, an action to take, a product to buy, or similar
- **Deliberation**
 - Deepening one's own understanding of an issue



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Arguments

▪ Argument

- A composition of argumentative units, where one takes the role of a *conclusion* and every other the role of a *premise*
- **Conclusion.** A claim that something is true, favorable, or worthy pursuing
- **Premise.** A reason given to support (or object to) the truth of the claim

Conclusion
Premises

Conclusion *The EU should allow rescue boats in the Mediterranean Sea.*

Premise 1 *Many innocent refugees will die if there are no such boats.*

Premise 2 *Nothing justifies to endanger the life of innocent people.*

Observations (detailed below)

- Arguments are inherently relational: Reasons are given for claims.
- The inference from premises to conclusion follows some *scheme*.
- Often, some argumentative units are left implicit.

Conclusions of arguments

- **Types of conclusions** (Eggs, 2002)
 - **Epistemic.** A proposition is true or false.
 - **Ethical (or esthetical).** Something is good or bad (or: beautiful or ugly, ...).
 - **Deontic.** An action should be performed or not.
- **Examples**

Epistemic. *Climate change exists. The temperature increase can be felt in our everyday lives.*

Ethical. *Using airplanes is problematic because they are among the worst air polluters we have.*

Deontic. *We should tear this building down. It is full of asbestos.*

Premises of arguments

- **Types of premises**
 - Different but partly overlapping distinctions of premise types exist.

- **Minor vs. major premises** (Walton et al., 2008)
 - **Minor.** A premise stating specific information related to an issue
 - **Major.** A generalization or rule, linking the other premises to the conclusion

- **Facts, warrants, and backings** (Toulmin, 1958)
 - **Facts (aka data/grounds).** Information specific to a given context
 - **Warrant.** A rule clarifying that the conclusion holds in case the facts hold
 - **Backing.** A justification for the warrant

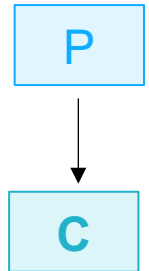
- **Enthymeme**
 - An argument in which one or more premises are left unstated (i.e., implicit)
 - Sometimes informally also: An unstated premise

Major premises, warrants, and backings are often implicit; conclusions may be too, but that is *not* called enthymeme.

Argumentative relations

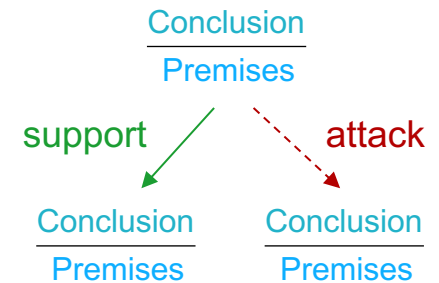
▪ Relations within arguments

- An argument defines a relation where premises support a conclusion.
- A premise may also serve as a counterconsideration to a conclusion.



▪ Relations between arguments

- Different arguments may support or attack each other.
- A counterargument may attack an argument's premise or its conclusion — or the inference between them.



▪ Types of support

- **Simple.** A premise individually supports a conclusion (analog for arguments).
- **Linked.** Multiple premises (arguments) collectively provide support.

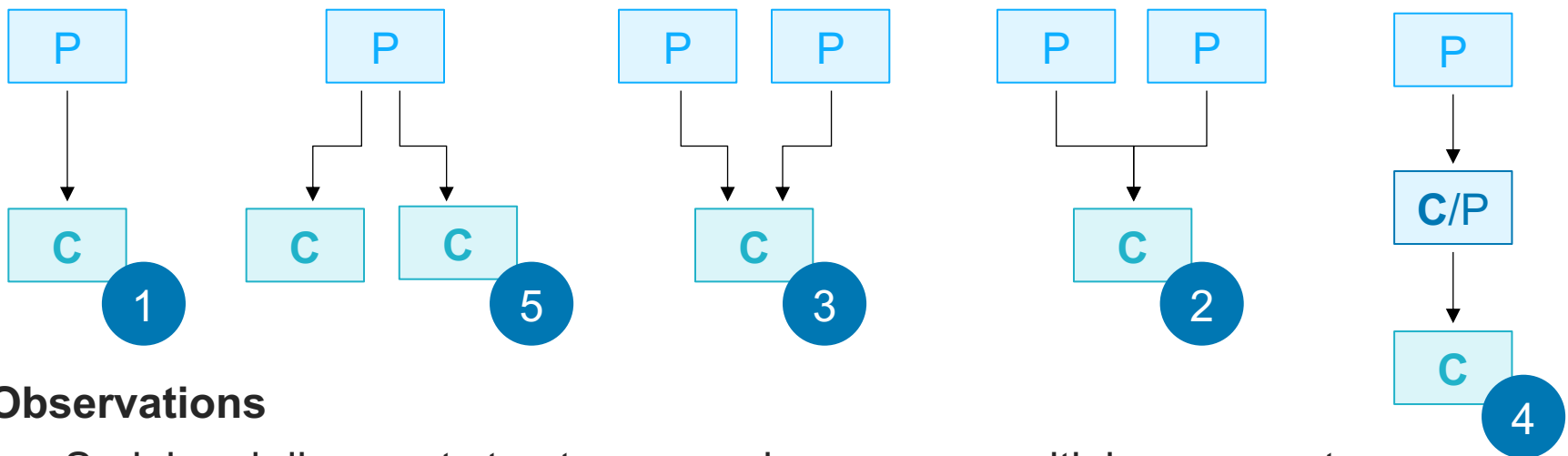
▪ Types of attacks

- **Rebuttal.** A support of the opposite conclusion to an argument's conclusion
- **Undercutter.** An attack of the relevance of a premise to a conclusion

Typically, counterconsiderations are undercut close-by by the same author.

Argument structures

- **Five types of argument structures** (Freeman, 2011)
 1. **Single.** One premise supports a conclusion.
 2. **Linked.** All premises, taken together, support a conclusion.
 3. **Convergent.** Each premise, in isolation, supports a conclusion.
 4. **Serial.** The conclusion of one argument is a premise of another argument.
 5. **Divergent.** A premise supports multiple different conclusions.



- **Observations**
 - Serial and divergent structures may be seen as multiple arguments.
 - The essential distinction is linked vs. convergent.

Argument models

▪ **Argument model**

- Formalized definition of the concepts distinguished for an argument
- Concepts reflect structural and/or semantic aspects.
- Used to operationalize argument processing
- What model to use depends on the given genre or application.

Conclusion
Premises

The concepts define the types of meta-information created by mining (and partly assessment) methods.

▪ **Selected models from argumentation theory**

- **Toulmin model.** Fine-grained unit roles (Toulmin, 1958)
- **Freeman model.** Dialectical exchange of views (Freeman, 2011)
- **Argumentation schemes.** Form of inference within an argument (Walton et al., 2008)

▪ **Selected models from AI/NLP research**

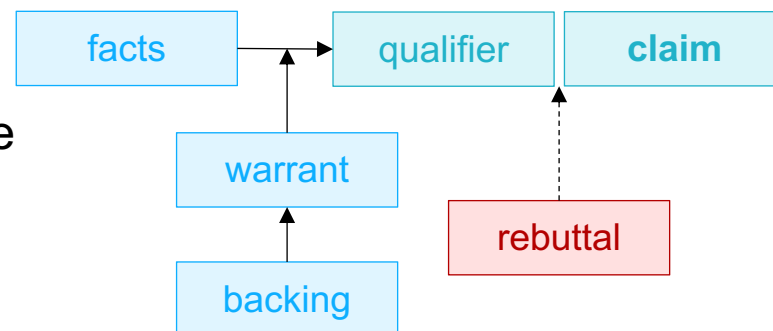
- **Essay-specific.** Hierarchical relations of claims and premises (Stab, 2017)
- **Evaluability-oriented.** Support roles of fine-grained unit types (Park et al., 2018)
- **Abstract argumentation framework.** Attacks between arguments (Dung, 2015)

Toulmin's argument model

▪ Toulmin model (Toulmin, 1958)

- Captures an argument's internal structure with fine-grained unit roles

The relation between the roles is clear by definition.



▪ Unit types

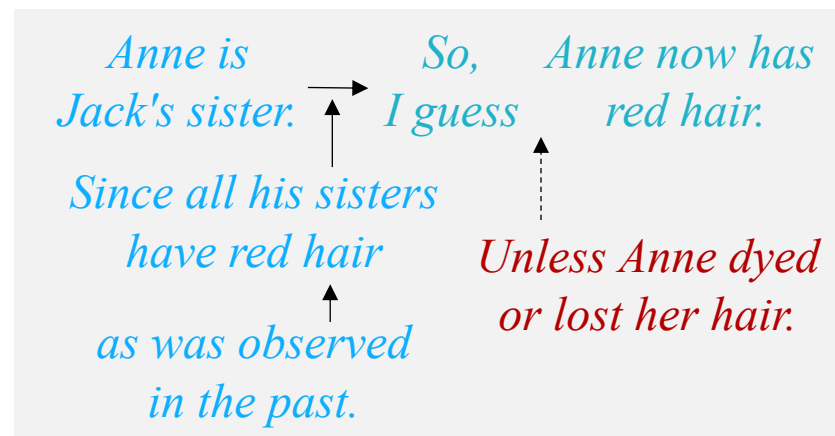
- **Claim.** A conclusion conveying a stance on an issue
- **Facts (aka data/grounds).** Evidence given to support the claim
- **Warrant.** Defeasible rule for why the claim can be inferred from the facts
- **Rebuttal.** Circumstances under which the claim does not hold
- **Qualifier.** Constraint or uncertainty
- **Backing.** Justification of the warrant

Qualifier, rebuttal, and backing are optional.

▪ Discussion

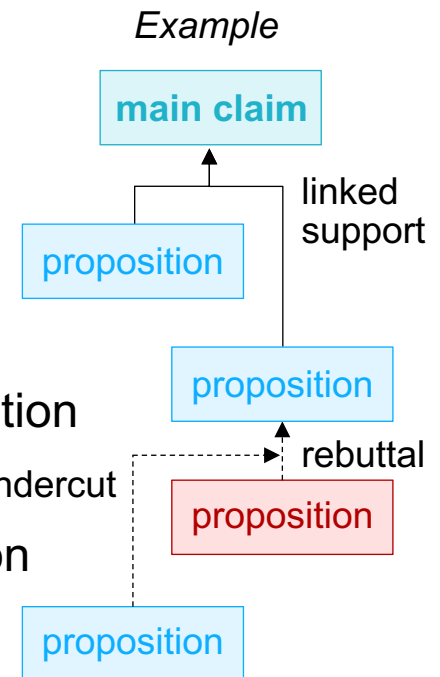
- Clarifies how arguments work, but few real-life arguments match model

E.g.: Warrants are often implicit. Units may mix roles, ...



Freeman's argument model based on Peldszus and Stede (2013)

- **Freeman model** (Freeman, 2011)
 - Captures the (hypothetical) dialectic exchange in an argument between a proponent defending a claim and an opponent attacking it
- **Unit types**
 - **Main claim.** The proposition the proponent argues for
 - **Proposition.** Any other unit of the proponent or opponent
- **Relation types**
 - **(Linked) Support.** Inference from proposition(s) to proposition
 - **Rebuttal.** Attack of the acceptability of a proposition
 - **Undercutter.** Attack of the inference based on a proposition
- **Discussion**
 - More robust in practice, at least for well-formed arguments (Peldszus and Stede, 2015)



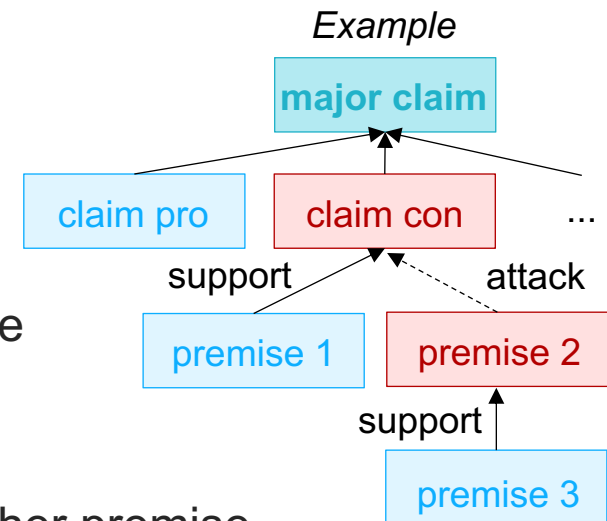
Essay-specific argument model

- **Essay-specific model** (Stab, 2017)

- Captures the hierarchical structure of monological argumentative text

- **Unit types**

- **Major claim.** The thesis of the text
- **Claim.** The conclusion of an argument; has a stance toward the thesis
- **Premise.** The premise of a claim or other premise



- **Relation types**

- **Support.** The support of a claim/premise by another premise
- **Attack.** Analogous for attacks

Relations are modeled only *within* paragraphs by Stab (2017).

- **Discussion**

- Tuned toward the characteristics and conventions of persuasive essays

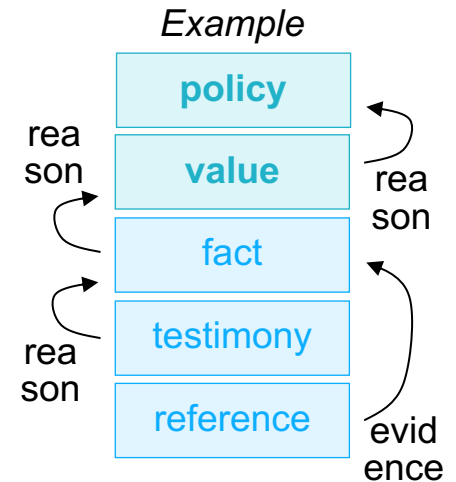
Evaluability-oriented argument model

- **Evaluability-oriented model** (Park et al., 2018)

- Captures whether all argument units are supported by an explicit premise of an appropriate unit type

- **Unit types**

- **Policy.** Proposal of a specific course of action
- **Value.** Value judgment without policy suggestions
- **Fact.** Verifiable independent of views or interpretations
- **Testimony.** Depending on private state or experience
- **Reference.** Reference to a source of evidence



- **Relations**

- **Reason.** P gives rationale for C
- **Evidence.** P proves or disproves C

	needs	Policy	Value	Fact	Test.
Reason		x	x	x	(x)
Evidence				x	(x)

- **Discussion**

- Enables analyses of reasoning in settings where arguments are explicit

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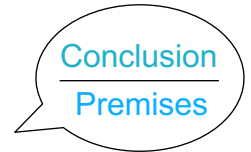
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Argumentation

▪ Argumentation

- The usage of arguments to achieve persuasion (or similar) with respect to a stance on a controversial issue
- Usually refers to the *process* of arguing, rather than its *product* (e.g., a text)



▪ Elements of argumentation

- 1+ arguments (given by argumentative units and their relations)
- 0+ statements that serve rhetorical and dialectical functions, or give context and background information

▪ Thesis (aka main/central/major claim)

- Overall conclusion of an argumentative text or speech
- All arguments (ideally) directly or indirectly support/attack the thesis.

▪ Monological vs. dialogical argumentation

- **Monological.** A composition of arguments on a given issue
- **Dialogical (debate).** A series of argumentative turns on the same issue

Monological vs. dialogical argumentation

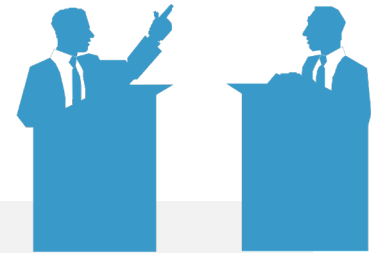


Monological argumentation

Italy, Malta, Germany, and France agreed a plan at the end of September to share responsibility for hosting asylum seekers and migrants rescued in the central Mediterranean. [...]

However, the plan does not address the underlying issues with EU migration policy that have led to the increased death rate – namely the Europe-wide criminalisation of humanitarian support for asylum seekers and refugees and the EU's policy of border externalisation. [...]

Dialogical argumentation



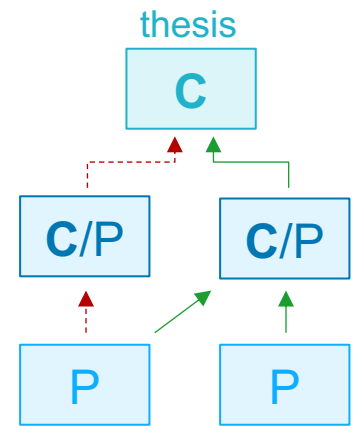
Alice. *The EU should allow rescue boats in the Mediterranean Sea, to save the innocent refugees.*

Bob. *So naïve... having such boats makes even more people die trying. I'm against.*

Alice. *Well, I actually read that rescue boats haven't led to any increase yet.*

Monological argumentation

- **Monological overall structure** (aka discourse-level structure)
 - An argumentative text or speech simultaneously has a *hierarchical* and a *sequential* overall structure.
- **Hierarchical structure**
 - The logical structure induced by all argumentative relations
 - A thesis is supported or attacked by conclusions whose premises may be conclusions of other arguments, etc.
 - Can be modeled as a directed acyclic graph where nodes are ADUs and edges are relations
- **Sequential structure**
 - The structure induced by the ordering of units in a text or speech
 - Can be modeled as a sequential flow of *rhetorical moves*, such as the stance of each ADU toward the thesis
 - Often has a rhetorical function primarily



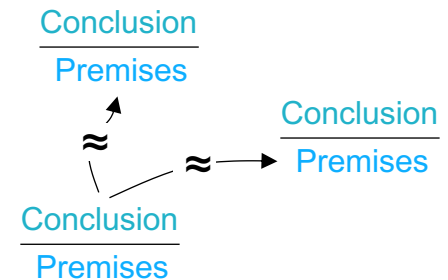
Dialogical argumentation

▪ Dialogical overall structure

- The participants' arguments induce a *hierarchical* structure.
- Their series of turns defines a *sequential* structure, possibly with clear stages
- **Fragmented**. Arguments may be split into disconnected turns.
- **Not plannable**. Participants need to react on the opponents' turns.

▪ Hierarchical structure

- The structure given by the relations between arguments, by the reuse of ADUs, or similar
- Can be modeled as a graph where nodes are arguments



▪ Example sequential structure (for Oxford-style debates)

1. **Introduction**. Each party lays out its main arguments, one after the other.
2. **Discussion**. Parties respond to questions by an audience and to each other.
3. **Conclusion**. Each party subsequently gives final remarks.

Participants in argumentation (recap)

▪ Author (or speaker)

- Argumentation is connected to the person who argues.
- The same argument is perceived differently depending on the author.

“ The EU should allow rescue boats. Many innocent refugees will die if there are no such boats. ”



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▪ Reader (or audience)

- Argumentation often targets a particular audience.
- Different arguments and ways of arguing work for different readers.

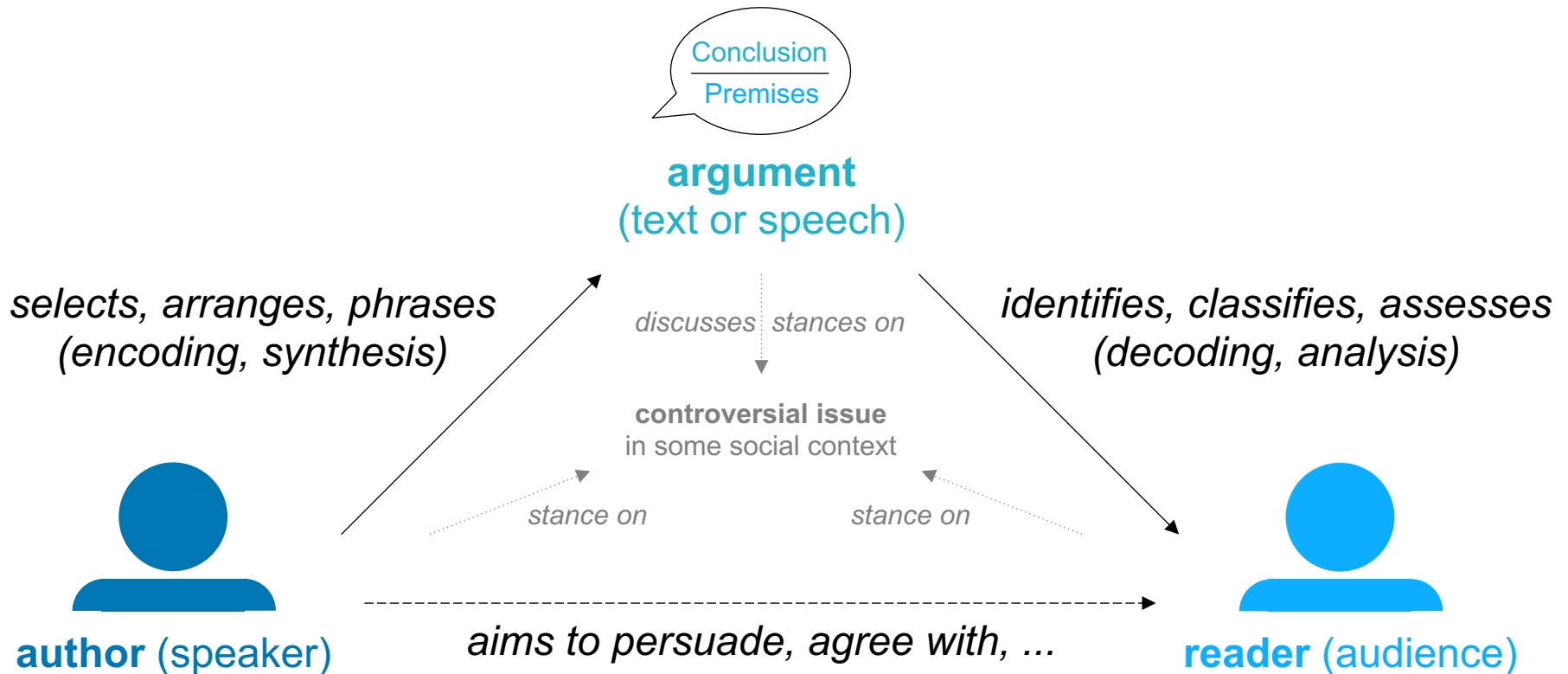
“ According to a study in Nature from 2023, rescue boats do not increase the number of refugees who try. ”

<https://www.nature.com/articles/s41598-023-38119-4>



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General argumentation setting



▪ Notice

- In dialogical argumentation, the roles of participants alternate.
- The audience may also be a third, not actively involved party.

Example: In Oxford-style debates, the goal is to change the view of an audience that listens to both sides.

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Logic

- **Formal argumentation** (Blair, 2012)

- The study of the *soundness* of arguments, requiring deductively valid inferences of conclusions

$$\frac{A \quad A \rightarrow B}{B}$$

- **Natural language argumentation**

- In real life, truth is often unclear or unknown.
- While valid natural language arguments exist, most are *defeasible*.
- Logically good arguments are called *cogent*.

- **Cogency** (Blair, 2012)

- A cogent argument has individually *acceptable* premises that are *relevant* to its conclusion and, together, *sufficient* to draw the conclusion.

Conclusion. *The EU should allow rescue boats in the Mediterranean Sea.*

Premise 1. *Many innocent refugees will die if there are no such boats.*

Premise 2. *Nothing justifies to endanger the life of innocent people.*

Acceptable? Relevant? Sufficient? Acceptable? Relevant?

Types of argumentative reasoning

▪ Defeasible reasoning

- Argumentation follows a non-monotonic reasoning logic: conclusions may have to be revised when new information is given.
- Defeasible arguments are usually *abductive*.

▪ Three types of reasoning

- **Deductive.** A conclusion is logically inferred from the given premises.
- **Inductive.** A conclusion is generalized from multiple concrete instances.
- **Abductive.** A conclusion is seen as plausible under a given set of premises.

Inductive.

My grandpa died. My grandma died. Elvis died. It seems that everyone dies.

Deductive.

*All humans are mortal.
Elvis is a human.
Therefore, Elvis must be mortal.*

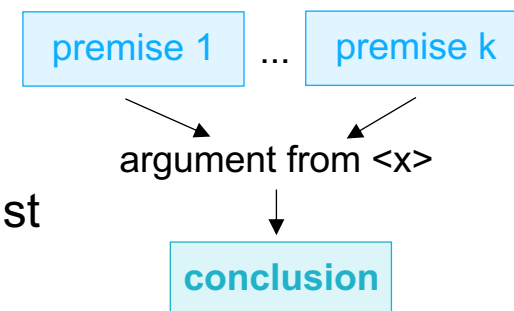
Abductive.

*Elvis can only be dead.
It just seems impossible that none of his fans ever saw him again.*

Argumentation schemes based on Walton et al. (2008)

Argumentation scheme

- Form of inference from premises to conclusion
- 60+ deductive, inductive, and abductive schemes exist
- Each comes with a set of *critical questions*.



Selected schemes

- Argument from example
- Argument from consequence
- **Argument from position to know**

Conclusion *A is true.*

Major pr. *Source E should know about proposition A in a domain S.*

Minor pr. *E asserts that A is true (in S).*

Example

1. *Should E know about A?* **yes**

2. *Did E assert A to be true?* **(yes)**

3. *Is E a reliable source?* **no!**

Conc *Cigarettes are not addictive.*

Major *James W. Johnston (CEO of RJ Reynolds Tobacco Company) is a tobacco expert.*

Minor *Johnston testified before Congress that tobacco is not an addictive substance.*

Fallacies

- **Fallacy** (Tindale, 2007)
 - An argument with some (often hidden) flaw in its reasoning, i.e., with a failed or a deceptive scheme.
- **Example types of fallacies** (see: https://en.wikipedia.org/wiki/List_of_fallacies)
 - **Red herring.** Introducing an unrelated issue in the reasoning
 - **Ad-hominem.** Attacking the opponent instead of attacking their arguments
 - **Appeal to ignorance.** Taking lack of evidence as proof for the opposite
- **Fallacies are hard to detect**
 - Structure identical to other arguments
 - Understanding and context needed



"The Secret of Monkey Island" (Lucasarts, 1991)

*My girlfriend **won't** give me a gift for my birthday. I have received no indication to the contrary from her.*

*My flight today **won't** be delayed. I have received no indication to the contrary from the airline.*

Rhetoric

■ Rhetoric

- The study of the merits of strategies for communicating a stance (Stede and Schneider, 2018)
- The ability to know how to persuade (Aristotle, ca. 350 B.C.E. / translated 2007)



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“Is a strong argument an effective argument which gains the adherence of the audience, or is it a valid argument, which ought to gain it?”

(Perelman and Olbrechts-Tyteca, 1969)

■ Persuasion

- The use of rhetorical techniques to influence someone’s beliefs, attitudes, intentions, or similar
- Persuasive argumentation aims to be *effective*.

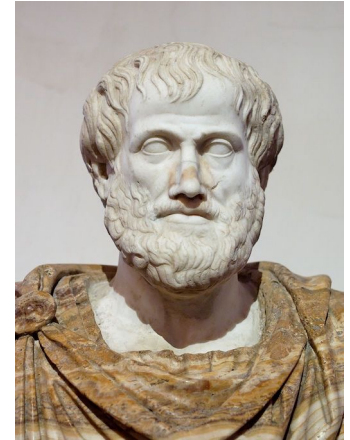
■ (Persuasive) Effectiveness

- Argumentation is effective if it persuades the audience of (or corroborates their agreement with) the stance of the author.

Means of persuasion, style, and arrangement

“In making a speech, one must study three points: the means of producing persuasion, the style or language to be used, and the proper arrangement of the various parts.”

(Aristotle, ca. 350 B.C.E. / translated 2007)



▪ Three means of persuasion

- **Logos.** The use of logically good arguments
- **Ethos.** The demonstration of good character, authority, and credibility
- **Pathos.** The appeal to certain emotions in the listener/reader

There is also *kairos*: Stating something at the right place and time

▪ Style and arrangement

- **Clear style.** Using correct, unambiguous language without unnecessary complexity and deviation from the issue
- **Appropriate style.** A choice of words that fits to the issue and audience
- **Proper arrangement.** The “right” sequential order of presenting arguments

Frames and framing

- **Frame** (Entman, 1993)

- A frame highlights an aspect under which an issue may be considered.
- Both topic-specific and generic sets of frames have been proposed.



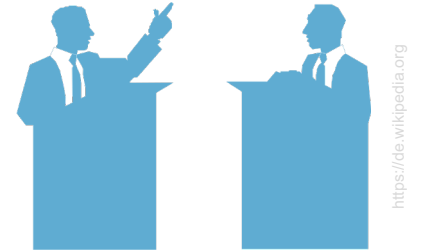
- **Framing**

- The selection of specific aspects of an issue to make them more *salient*, i.e., more noticeable, meaningful, and/or memorable.
- The same issue framed in a different way may be perceived entirely different.
- Selecting the right frames is decisive to achieve persuasion.

Dialectic

▪ Dialectic

- Dialectic considers discussions between two parties that aim at agreement.
- In a dialectical debate, parties should argue *reasonably*.



▪ Reasonableness (van Eemeren, 2015)

- **Problem validity.** Arguments contribute to arriving at a conclusion.
- **Intersubjective validity.** Arguments and the way they are stated are acceptable for all participants.

▪ Pragma-dialectics (van Eemeren and Grootendoorst, 2004)

- A theory to evaluate dialectical debates in an idealized process, covering concepts such as the following:
- **Rules of a critical discussion.** 10 rules to obtain reasonableness in the debate
- **Strategic maneuvering.** Parties follow both dialectical and rhetorical goals.

Discussion rules & strategic maneuvering (van Eemeren et al., 2002)

▪ Selected rules of a critical discussion

1. **Freedom.** Parties must not prevent each other from advancing stances or from casting doubt on stances.
2. **Burden of proof.** A party that advances a stance is obliged to defend it, if asked by the other party to do so.
- ...
10. **Usage.** A party must not use unclear or confusing formulations, and must interpret the other party's formulations as accurately as possible.



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▪ Strategic maneuvering

- Even when agreement is the goal, participants want to effectively persuade others of their stance.
- They need to *maneuver* between dialectic and rhetoric.



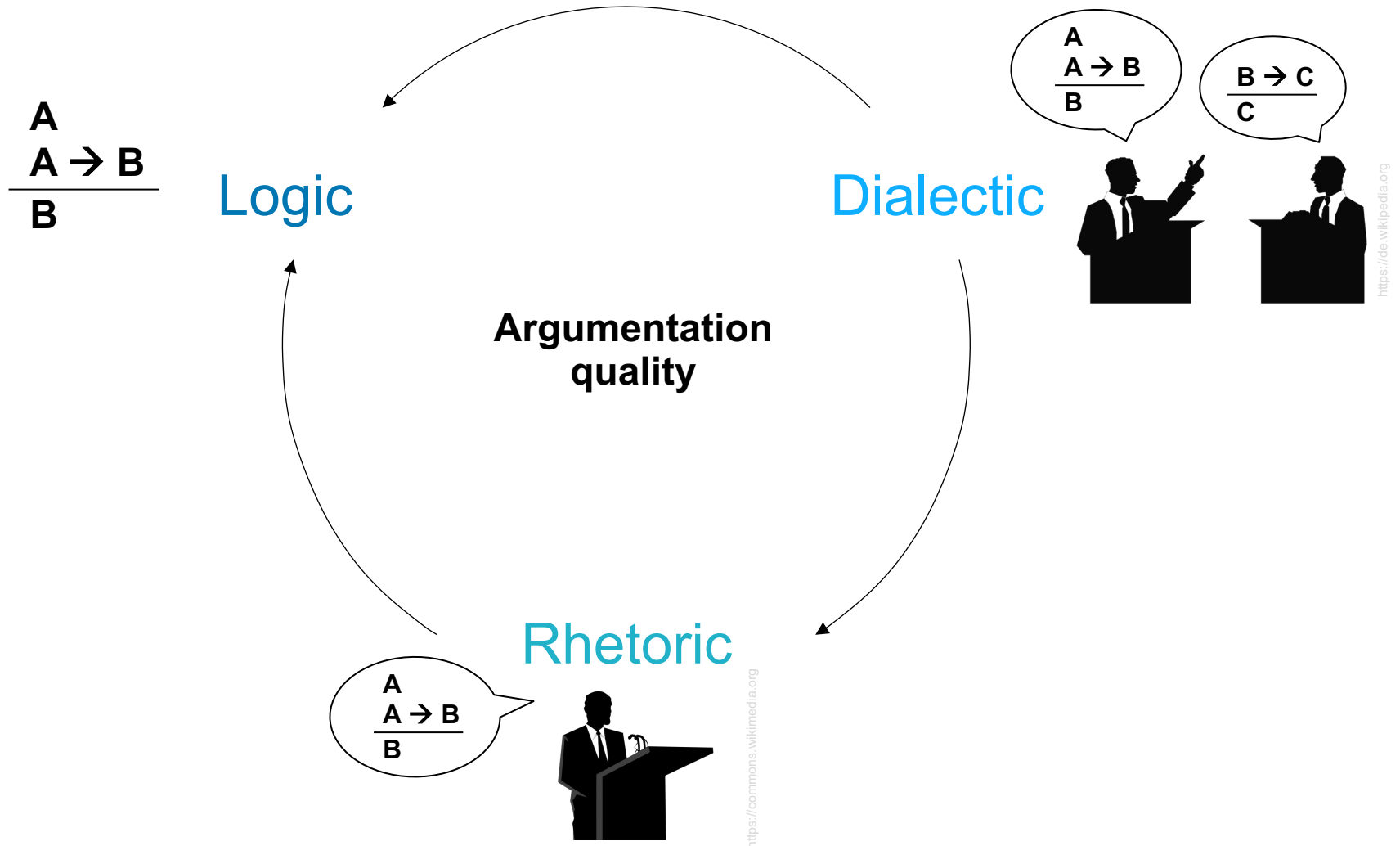
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Topic potential.
Select the most effective available content

Audience demand.
Adapt to the audience's frame of reference

Presentational devices.
Exploit effective and reasonable style

Argument quality (recap)



Next section: Conclusion

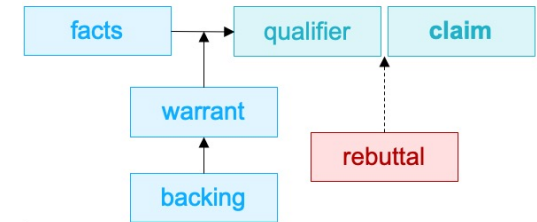
- I. Introduction to computational argumentation
- II. Basics of natural language processing
- III. Basics of argumentation**
- IV. Argument mining
- V. Perspective assessment
- VI. Argument quality assessment
- VII. Argument generation
- VIII. Applications of computational argumentation
- IX. Conclusion

- a) Introduction
- b) Subjective language
- c) Argumentative units and arguments
- d) Argumentation and debate
- e) Logic, rhetoric, and dialectic
- f) Conclusion**

Conclusion

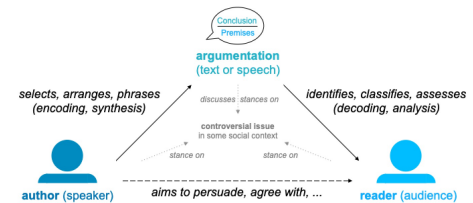
■ Argument

- A claim supported by one or more reasons
- Conveys a stance toward a controversial issue
- Different argument models exist in theory and NLP.



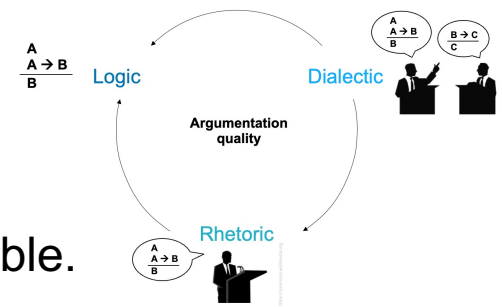
■ Argumentation and debate

- Compose premises and conclusions in arguments
- Comprise sequential and hierarchical structure
- Always affected by the specific participants



■ Logic, rhetoric, and dialectic

- Most arguments follow defeasible inference schemes.
- Strategies are based on the means of persuasion.
- Good arguments are cogent, effective, and/or reasonable.



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