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A Gentle Introduction to Argumentation Mining

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Argumentation Mining: The Course

Argumentation Mining (Stede & Schneider, 2019) [1]
+ eight papers

http://wiki.lingvistik.net/index.php/Argumentation_mining_course

Outline

1. Introduction
2. Annotation and Agreement
3. Claims
4. Short Break
5. Supporting and Objecting Statements
6. Argumentation Structure
7. Summary

What is Argumentation?

"Any utterance with the purpose of convincing someone of something."

Stian, 2022

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"Any utterance with the purpose of convincing someone of something."

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Not a very useful definition here...

Models of Argumentation

- 1958: The Toulmin model – shift from logical to practical [2]
- 1988: Rhetorical structure theory – describes relations [3]
- 1996: Walton's argument schemes – classifying inference [4]
- 2003: Pragma-dialectical – as complex discourse activity [5]

Again: What is Argumentation?

"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 Grootendorst (2003)[5]

A Verbal Activity

Speech or text

No gestures, frowns or fistfights

A Social Activity

At least two people

You need someone to argue *with*

A Rational Activity

Be reasonable!

Again, no fistfights

A Standpoint

An issue where divergent views exist

We don’t argue about undisputed facts

Convincing of Acceptability

A successful argument makes the sceptical party more inclined to accept the arguers views

...but not necessarily completely agree

A Constellation of Propositions

A single proposition does not an argument make

not an argument

Justifying the Standpoint

Successful argumentation depends upon a view being justified

...not merely accepted due to e.g. power relations

A Reasonable Critic

Argumentation takes place in a social context

Each context has particular rules of conduct

Some Useful Terms

- Claim / Conclusion = That which is argued for
- Premise / Evidence = That which justifies the claim
- Inference = The relation between claim and premise
- Support
- Attack

Illocutionary Forces in Argumentation

- Asserting (stating an opinion)
- Questioning (pure, assertive and rhetorical questions)
- Challenging (asking why)
- Agreeing (expressing a positive reaction to a previously uttered proposition)
- Conceding (expressing a partial negative reaction, ”Yes, but...”)
- Disagreeing (expressing a negative reaction)
- Restating (when a proposition rephrases another)
- Arguing (defending a standpoint)

Argumentation Mining: Not a Definition

> *"Unlike many of the standard tasks in NLP, argumentation mining is not a single unified process, but a constellation of subtasks, which are of different prominence depending on the goals of the underlying target application."*
>
> Stede & Schneider (2019) [1]

Argumentation Mining in Seven Steps

1. Identify argumentative text (or a portion of a text)
2. Segment the text into *argumentative discourse units* (ADUs)
3. Identify the central claim
4. Identify the role/function of ADUs
5. Identify relations between ADUs
6. Build the overall structural representation
7. Identify the type and the quality of the argumentation

Argumentative Discourse Units

ADUs generally correspond to propositions.

They are commonly used as the minimal unit of text in argumentation mining.

The Argumentative Discourse Unit

"A span of text that plays a single role for the argument being analyzed, and is demarcated by neighboring text spans that play a different role, or none at all."

Stede & Schneider (2019) [1]

The Argumentative Discourse Unit

"A span of text that plays a single role for the argument being analyzed, and is demarcated by neighboring text spans that play a different role, or none at all."

Stede & Schneider (2019) [1]

Can be more or less than a sentence.

Fika

A: Språkbanken has better fika than CLASP, because we bring home baked cakes.	One sentence, two ADUs
B: But the coffee machine at CLASP is good. The one at Språkbanken is pretty bad.	Two sentences, one ADU

Annotating Argumentation

- (Annotated) data is necessary for most argumentation mining
- How to annotate argumentation?
- How do we use these models as annotation guidelines?

Simplify - Adapt - Annotate!

Annotating Argumentation: Challenges

- Argumentation in natural language does not always conform to models of argumentation
- Implicitness & enthymemes
- Domain specificity - argumentation on Twitter compared to essays.
- Component and argumentation boundaries

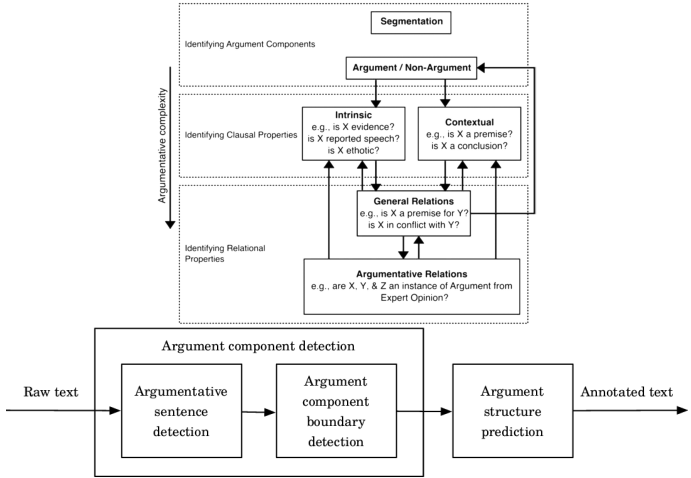
Annotating Argumentation: Challenges

Context is important:
Which animals do you prefer? - I like cats. (neutral)
We should get a cat. - I like cats. (agreeing)
Let's buy a dog! - I like cats. (disagreeing)

Annotating Argumentation: Evaluation

- Aim: Reliable data, good quality
- Inter-annotator agreement
- Do we need alternative ways to evaluate annotations?

The Argumentation Mining Task



The Argumentation Mining Task

1. Classifying text as argumentative or non-argumentative
2. Segmenting text into ADUs
3. Finding claims
4. Identifying supporting and objecting statements
5. Deriving argumentation structure

The Argumentation Mining Task

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Classifying Text as Argumentative or Non-Argumentative

- Document level - similar to genre classification
- Sub-document level - paragraphs, sentences, propositions?
- What is argumentative? What is argumentation?

Segmenting the Text into ADUs

- Are sentences a good unit of argumentation?
- [Although the candidate has good ideas,][you should not vote for her!]
- Annotate free spans, classify sentences

The Argumentation Mining Task

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3. **Finding claims**
4. Identifying supporting and objecting statements
5. Identifying relations between components
6. Deriving argumentation structure

Finding Claims

- Central component of the text or argument
- Definition can vary (or is not given) - but usually answers the question ”What does the writer argue for?”

Språkbanken has better fika than CLASP. Sure, CLASP has a better coffee machine and that’s probably not going to change. But at every Språkbanken fika, someone bakes.

Finding Claims

- Domain and topic influences
- Research has focused mostly on explicit claims
- Classification of predefined items or sequence labelling

Finding Claims: Student Essays

- Stab & Gurevych, (2014) [6]
- Major claim - expresses the authors stance

  *"I believe that **we should attach more importance to cooperation during education.**"*

- A claim is a "controversial statement that is either true or false and should not be accepted by readers without additional support."

  *"**Locker checks should be made mandatory and done frequently** because they assure security in schools, makes students healthy, and will make students obey school policies."*

Finding Claims: Student Essays

- Substantial agreement for claims: 0.77 Major claim, 0.60 Claim (Krippendorff's alpha)
- Four way classification using an SVM: Major claim (0.63), claim (0.54), premise (0.83) and non-argumentative (0.88) (F-score)
- Features: structural, lexical, syntactic and cues

Finding Claims: Wikipedia

- Wikipedia articles annotated for topic-dependent claims (0.39 Cohen's k) Aharoni et al. (2014) [7]
- A claim is "A general, concise statement that directly supports or contests the given topic."
- Three modules using logistic regression - sentences, sub-sentences, ranking claims

Topic: *"The sale of violent video games to minors should be banned"*
Claim: *"Violent video games can increase children's aggression"*

Finding Claims: Social Media

- Arguments in twitter posts. Bosc et al. (2016) [8]
- A tweet containing an opinion is considered an argument.
- 0.74 (Krippendorff's alpha)

"What will #AppleWatch mean for runners? I can't speak for everyone, but I won't be running out to get one. Will you?"

And Now...

Time for a break!

Welcome Back!

Let's continue!

Ok, so we have found a claim, now what?

A single claim by itself does not make an argument!

Our Example

Språkbanken has better fika than CLASP. Sure, CLASP has a better coffee machine and that's probably not going to change. But at every Språkbanken fika, someone bakes.

The Argumentation Mining Task

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Supporting and Objecting Statements

- Claims are usually supported by additional statements
- We call these statements *premises*, *evidence*, and/or *justification*
- *Counterarguments* present opposing points of view

Finding Supporting Statements

- Each premise must support a claim
- We can assume that evidence is near its claim
- Connectives are good linguistic cues!

How to Find Supporting Statements

- May be explicitly marked by connectives
  - Therefore, however, but, etc.
  - Idea: make a list of expected connectives
- Can also be implicit
  - Think of how you would rate the location of a hotel
  - Idea: assume they are similar to the explicit ones

How to Find Supporting Statements

- Within context

  Given a claim in a text, identify whether other ADUs support that claim

- No immediate context

  Given a claim and an ADU, determine whether the ADU supports the claim

- Finding claims and premises at the same time

Finding Supporting Statements

Språkbanken has better fika than CLASP.$_C$ Sure, CLASP has a better coffee machine and that's probably not going to change. *But at every Språkbanken fika, someone bakes.*$_S$

When There Also Are Opposing Statements

- Counterarguments represent ”the other point of view”
- It is not uncommon to find both premises and counterarguments
- There can be more complex relations like rebuttals

When There Also Are Opposing Statements

We could also classify different kinds of attacks:

- Rebutting (targeting a conclusion)
- Undermining (targeting a premise)
- Undercutting (targeting an inference)

When There Also Are Opposing Statements

Språkbanken has better fika than CLASP.$_C$ *Sure, CLASP has a better coffee machine*$_A$ and that's probably not going to change. *But at every Språkbanken fika, someone bakes.*$_S$

Does Stance Detection Help?

Given two texts A and B do they:

Agree

Disagree

Are unrelated

Does Stance Detection Help?

- It can help when there is an implicit claim
- Can be used to mine arguments online (i.e. social media & forums)
- **However**, it can be seen as an oversimplification of argumentation

The Argumentation Mining Task

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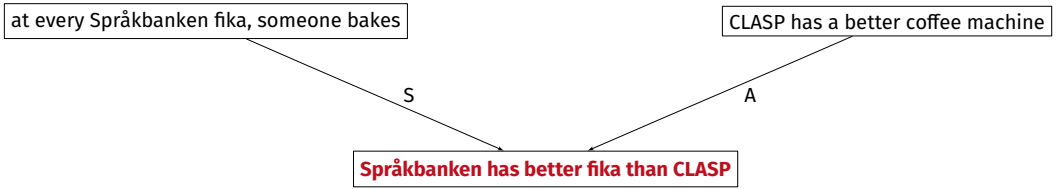
Argumentation Structure: A Simple Example

- **Språkbanken has better fika than CLASP**
- CLASP has a better coffee machine (A)
- at every Språkbanken fika, someone bakes (S)

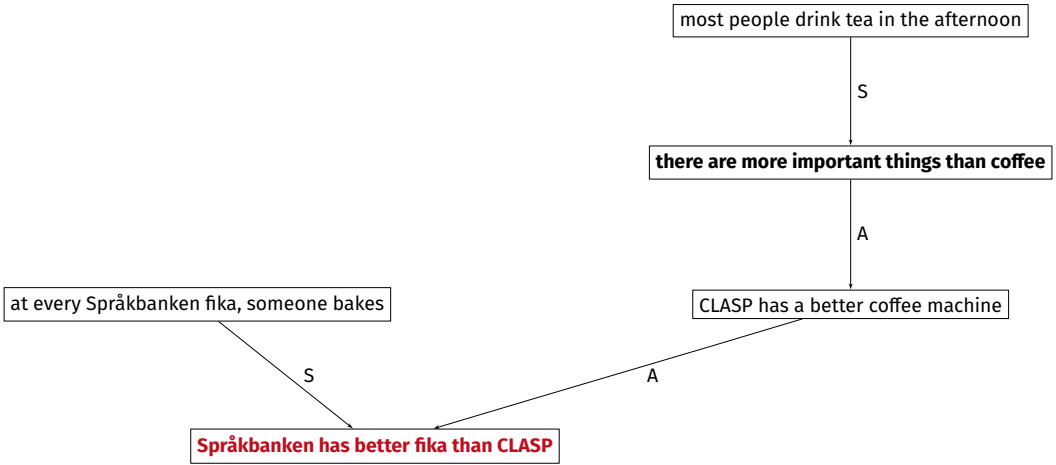
Argumentation Structure: A Simple Example



When Flat Labels Are Not Enough

- **Språkbanken has better fika than CLASP**
- at every Språkbanken fika, someone bakes (S)
- CLASP has a better coffee machine (A)
- **there are more important things than coffee** (S)
- most people drink tea in the afternoon (S)

When Flat Labels Are Not Enough



Common Argument Structures: Single

at every Språkbanken fika, someone bakes

Språkbanken has better fika than CLASP

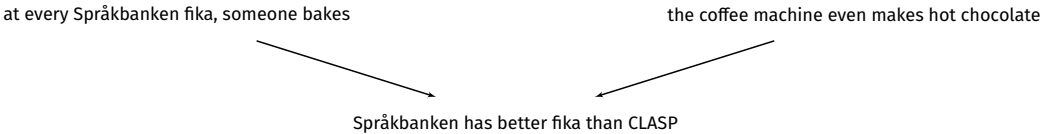
Common Argument Structures: Serial

at every Språkbanken fika, someone bakes

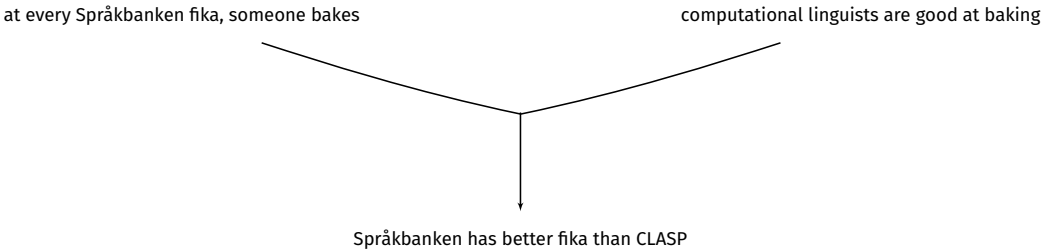
cake is always fresh from the oven there

Språkbanken has better fika than CLASP

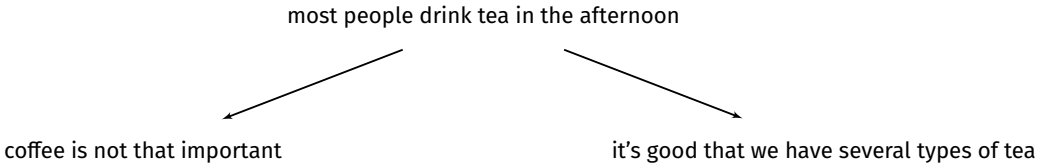
Common Argument Structures: Convergent



Common Argument Structures: Linked



Common Argument Structures: Divergent



Inferring Argument Structure: Two Classes of Approaches

- **pairwise labelling**: identification of relations between pairs of ADUs; seen as multi-class classification
- **identification of complete argument structures**

Inferring Argument Structure: Two Classes of Approaches

- **pairwise labelling**: identification of relations between pairs of ADUs; seen as multi-class classification
- **identification of complete argument structures**

Pairwise Labelling

- **rule-based approaches**: relying on punctuation and cue words, usually domain-specific
- reuse of **RTE** tools[1] (intuition: entailment $\sim$ support)
- classification based on **linguistic features** (connectives, lemma n-grams, dependency relations...) [11]
- ...

[1] EDITS [9], Excitement [10]

The Problem with Pairwise Labelling

- Språkbanken has better fika than CLASP - every fika, someone bakes
- there are more important things than coffee - every fika, someone bakes
- Språkbanken has better fika than CLASP - CLASP has a better coffee machine
- there are more important things than coffee - CLASP has a better coffee machine
- Språkbanken has better fika than CLASP - at every Språkbanken fika, someone bakes
- there are more important things than coffee - at every Språkbanken fika, someone bakes
- Språkbanken has better fika than CLASP - most people drink tea in the afternoon
- there are more important things than coffee - most people drink tea in the afternoon

Inferring Argument Structure: Two Classes of Approaches

Two classes of approaches:

- **pairwise labelling**: identification of relations between ADUs seen as a multi-class classification task
- **identification of complete argument structures**

Identifying Complete Argument Structures

- **segment-wise classification** (IOB tagging; non-recursive) [12, 13]
- **rule-based discourse parsing** (grammar-driven, produces tree structures $\rightarrow$ serial support) [14, 15]
- **template slot filling** (making explicit use of argument schemes)
- ...

Recap

1. Classifying text as argumentative or non-argumentative
2. Segmenting text into ADUs
3. Finding claims
4. Identifying supporting and objecting statements
5. Deriving argumentation structure

Our Example Text

Språkbanken has better fika than CLASP: every fika, someone bakes. Sure, CLASP has a better coffee machine and that's probably not going to change. On the other hand, there are more important things than coffee. In fact, most people drink tea in the afternoon.

1. Classifying Text as Argumentative or Non-Argumentative

Språkbanken has better fika than CLASP: every fika, someone bakes. Sure, CLASP has a better coffee machine ~~and that's probably not going to change~~. On the other hand, there are more important things than coffee. In fact, most people drink tea in the afternoon.

2. Segmenting Text into ADUs

- Språkbanken has better fika than CLASP
- every fika, someone bakes
- CLASP has a better coffee machine
- there are more important things than coffee
- most people drink tea in the afternoon

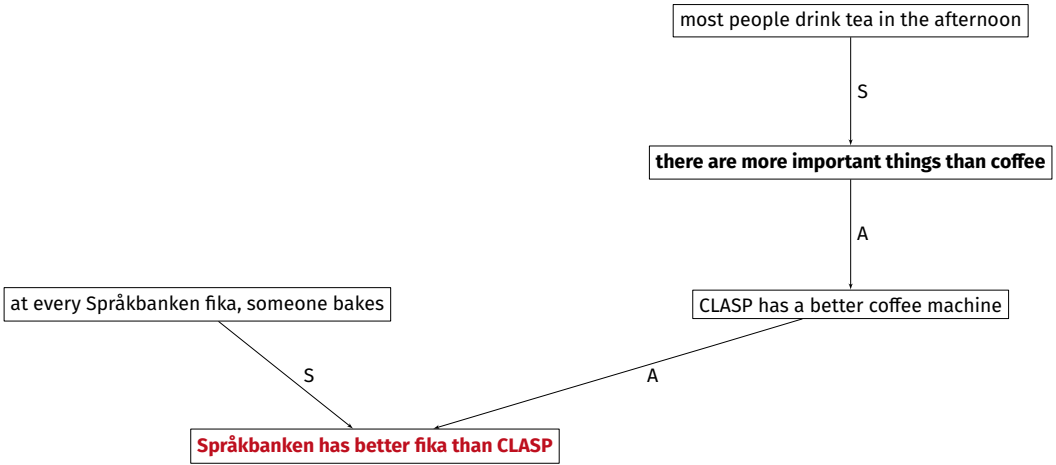
3. Finding Claims

- **Språkbanken has better fika than CLASP**
- every fika, someone bakes
- CLASP has a better coffee machine
- **there are more important things than coffee**
- most people drink tea in the afternoon

4. Identifying Supporting and Objecting Statements

- **Språkbanken has better fika than CLASP**
- every fika, someone bakes (S)
- CLASP has a better coffee machine (A)
- **there are more important things than coffee** (S)
- most people drink tea in the afternoon (S)

5. Deriving Argumentation Structure



And Now...

Question time!

Citations I

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