

Natural Language Processing



Argumentation Mining

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Overview



- What is Argumentation Mining?
- Argumentation/Discourse Theory
- Available data
- Detection and segmentation problem

Argumentation Mining



Aim:

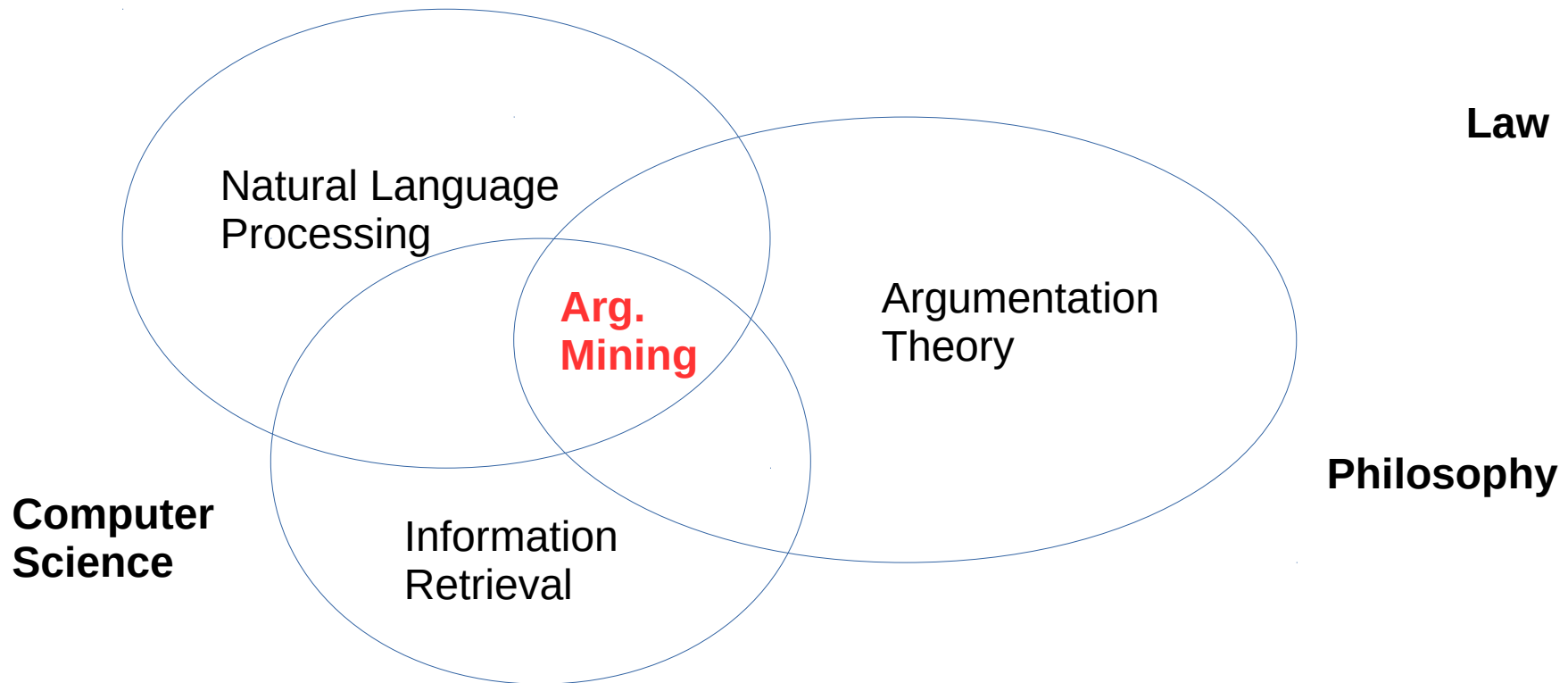
Automatically detect...

- Arguments
- Relation between arguments
- Internal structure of arguments

Classification



Linguistics



Applications



- Common law (case law)
- Reasoning in AI
- Question Answering

History



- Argumentative Zoning (statistical classifiers with simple features)
- Regex
- Text mining

Argumentation



What is argumentation?

- Process where arguments are constructed/handled/evaluated
- Relations between premises and claims

Argumentation Theory



Premise:

- piece of evidence supporting a claim

Claim:

- proposition (true or false)

Chains of reasoning:

- claims are premises for other claims

Argumentation Theory



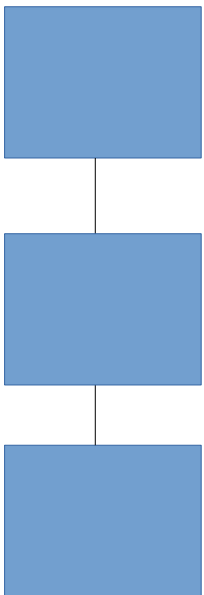
What is an argument?

- Set of premises
- Support or disprove a claim

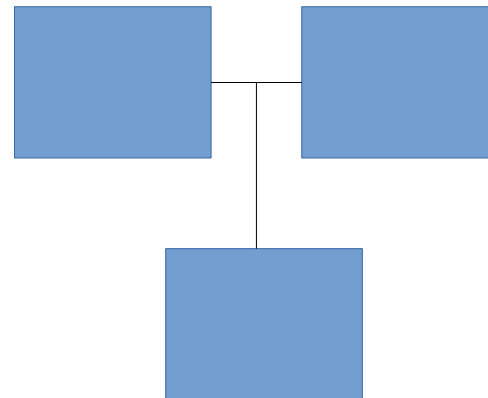
Types of Argumentation



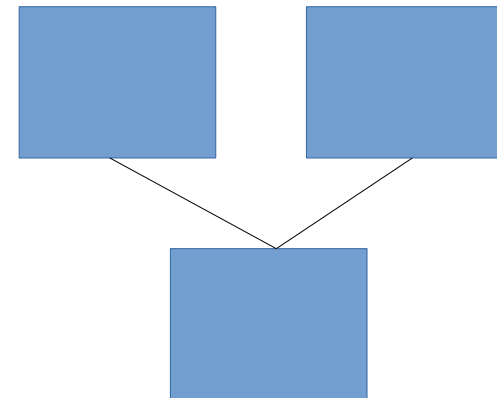
Subordinatively
Compound



Coordinatively
Compound



Multiple Argumentation



Problems



- What is the abstract structure of an argument?
- What are the elementary units?
- What are the relations?
- How to automatically detect the above?

Discourse Theory



Rhetorical Structure Theory:

- Coherent text consists of unit
- Every unit has a rhetorical function
(relation between nucleus and satellite)
- Evidence for the functions can be found in the text

Discourse Theory



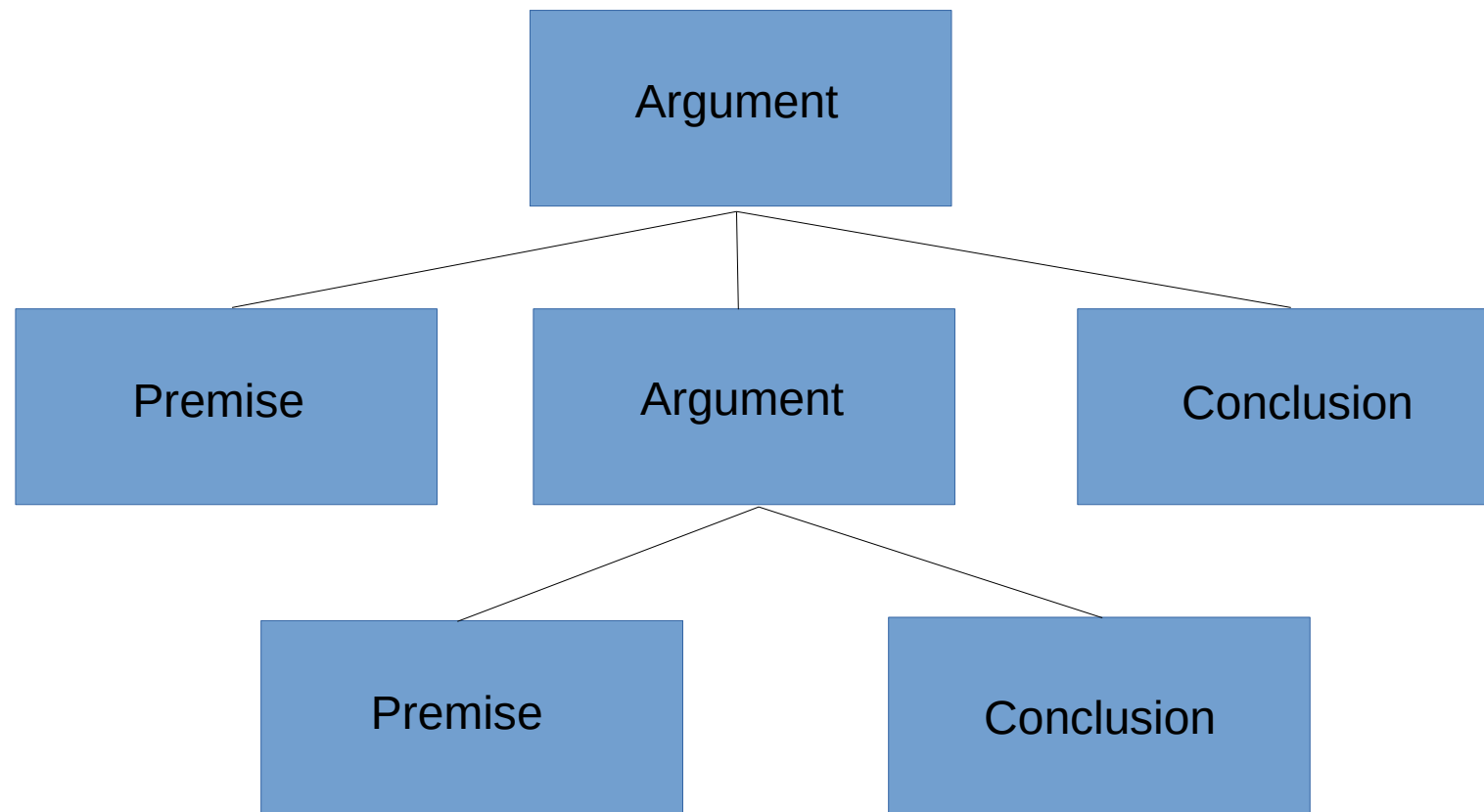
Stereotypical patterns of reasoning:

- argumentation schemes
- text can be represented as tree

Argumentation Structure



Argumentation tree:



Problems



- ~~What is the abstract structure of an argument?~~
- ~~What are the elementary units?~~
- ~~What are the relations?~~
- How to automatically detect the above?

Corpora



Araucaria:

- Structured English data (19 newspapers, 4 parliamentary records, 5 court reports, 6 magazines and 14 online discussion boards)
- Balanced number of arguments
- Sentence classified by text type

Corpora (Araucaria)



| Text type | Argument | Non-argument |
|-----------------------|--|--|
| Discussion fora | “On this occasion, however, I shall not vote for any individual or party but will spoil my paper.” | “I have been voting since 1964 and at one time worked for my chosen party.” |
| Legal judgments | “He is aware of the risks involved, and he should bear the risks.” | “Let there be any misunderstanding one point should be clarified at the outset.” |
| Newspapers | “Labor no longer needs the Liberals in the Upper House.” | “The independents were a valuable sounding board for Labor’s reform plans.” |
| Parliamentary records | “I have accordingly disallowed the notice of question of privilege.” | “Copies of the comments of the Ministers have already been made available to Dr. Raghuvansh Prasad Singh.” |
| Weekly magazines | “But for anyone who visits Rajasthan’s Baran district, the apathy of the district administration and the failure of the Public Distribution System (pds) is clear to see.” | “This time in Rajasthan.” |

Corpora



ECHR (European Court of Human Rights):

- Collection of legal texts
- Standard argumentation structure
- More realistic distribution of premises/conclusions/non-argumentative units

Corpora (ECHR)



{ [*SUPPORT*: The Court recalls that the rule of exhaustion of domestic remedies referred to in Article x of the Convention art. x obliges those seeking to bring their case against the State before an international judicial or arbitral organ to use first the remedies provided by the national legal system.

CONCLUSION: Consequently, States are dispensed from answering before an international body for their acts before they have had an opportunity to put matters right through their own legal systems.]

[*SUPPORT*: The Court considers that, even if it were accepted that the applicant made no complaint to the public prosecutor of ill-treatment in police custody, the injuries he had sustained must have been clearly visible during their meeting.

AGAINST: However, the prosecutor chose to make no enquiry as to the nature, extent and cause of these injuries, despite the fact that in Turkish law he was under a duty to investigate see paragraph above.

SUPPORT: It must be recalled that this omission on the part of the prosecutor took place after Mr Aksoy had been detained in police custody for at least fourteen days without access to legal or medical assistance or support.

SUPPORT: During this time he had sustained severe injuries requiring hospital treatment see paragraph above.

CONCLUSION: These circumstances alone would have given him cause to feel vulnerable, powerless and apprehensive of the representatives of the State.]

CONCLUSION: The Court therefore concludes that there existed special circumstances which absolved the applicant from his obligation to exhaust domestic remedies. }

Argumentation Detection



Binary Classifier:

- Argumentative vs. Non-argumentative
- Naïve Bayes, Maximum Entropy Model or SVM
- BUT: segmentation problem

Segmentation Problem



Approaches:

- Limitation by sections
- Elementary discourse units (e.g. clauses)
- Grouping by semantic distance:
 - Ontology based (e.g. WordNet)
 - Corpus based (statistical word correlation)

Proposition Classification



Second Classifier:

- Supportive/contrastive premises vs. conclusions
- Statistical classifier (e.g. SVM)
- Classifies on clausal level

Structure Detection



Argumentative parsing:

- Rule-based (CFG)
- RST parsing (shift-reduce parser)
- Statistical (HMM, MEM, Neural Networks, Decision trees...)

Evaluation



Conclusion Detection:

| Classifiers | Precision | Recall | F-Measure |
|-------------|-----------|--------|-----------|
| MEM + SVM | 77.49 | 60.88 | 74.07 |
| CFG | 61.00 | 75.00 | 67.27 |

Premises Detection:

| Classifiers | Precision | Recall | F-Measure |
|-------------|-----------|--------|-----------|
| MEM + SVM | 70.19 | 66.16 | 68.12 |
| CFG | 59.00 | 71.00 | 64.03 |

* Experiments from (Mochales and Moens, 2009)

Conclusion



- Relatively new area of research
- Lack of data
- RST as basic idea for schemes (structure detection problem)
- Segmentation problem
 - a lot of open questions/work

References



- Mochales, R. And Moens, M. (2009): **Argumentation Mining: The Detection, Classification and Structure of Arguments in Text.** In: Proceedings of the *ICAIL, 2009.* pages 98-109
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