Argument Aggregation

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Seminar Inteligent Groupware 2007
Universiteit Utrecht

June 28, 2007
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Argument Aggregation

**Topic Description:**

- Arguments acquired from users can be combined in different ways varying from *pro et contra, pro aut contra* (Arne Næss) to *mutual defeat among arguments* (Loui, 1987, and later).

Give an overview of possible ways to aggregate arguments, based on the literature.

**Papers:**

- Peter McBurney and Simon Parsons: *Truth or consequences: using argumentation to reason about risk* (1999)

**Other papers/references (my own research):**

- *Still researching, Several references still to explore...*
Definition:

The act of forming reasons, making inductions, drawing conclusions, and applying them to the case in discussion; the operation of inferring propositions, not known or admitted as true, from facts or principles known, admitted, or proved to be true.

(http://www.BrainyQuote.com)
Defeat among arguments: a system of defeasible inference (Loui) (1)

Paper Guideline:

- Presents a system of nonmonotonic reasoning with defeasible rules.
- Logic different from Poole’s - differences and comparison.
- Contributions in content and form
  - (content) the kinds of defeat that are considered
  - (form) the way which defeat is treated in the rules of inference
Defeat among arguments: a system of defeasible inference (Loui) (2)

Inference Rules and Formalism used

- They Explicitly mention defeat and kinds of defeat
- On one attempt to copy the defeat mechanisms in Kyburg’s and Polloc’s theories of direct inference the result was a way of evaluating defeasible arguments.
- based on prefered premises, amount of evidence, amount of specificity
Defeat among arguments: a system of defeasible inference (Loui) (3)

Example:

- G1 uses *as much evidence* as G2 iff Sources(G1) is consistent and for every $P \in \text{Sources}(G2)$, Sources(G1) $\vdash P$.
- G1 uses *more evidence* than G2 iff Sources(G1) uses as much evidence as G2 and it's not the case that G2 uses as much evidence as G1.
- G1 uses *as specific* as G2 iff there is a node $n_1$ in G1 and a node $n_2$ in G2 such that Label($n_1$) and Label($n_2$) are inconsistent and Support($n_1$) $\vdash$ Support($n_2$).
- ...

...
Defeat among arguments: a system of defeasible inference (Loui) (4)

Example Graph:

Fig. 2. $G_1$ uses more evidence than $G_2$.

Fig. 3. $G_1$ is more specific than $G_2$.  

"B"   "D"   "E"   "F"   "G"
"E"   "F"   "G"   "E"   "F"

"B"   "D"   "E"   "F"   "G"
"E"   "F"   "G"   "E"   "F"
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (1)

Paper Guideline:

- Carcinogenicity
  - Modes of Inference
  - Example of Statistical Inference
- Argumentation Frameworks
  - Monodic and Dialectical argumentation
  - A Framework for dialogue
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (2)

Carcinogenicity example of Modes of inference:

*The Chemical X is carcinogenic to humans at dose d based on a bioassay of species a if:*

- There is a relationship between administered dose and delivered dose in the bioassay, AND
- The sample of animals used for the experiment was selected in a representative manner from the population of animals, AND

”By Articulating these often-unstated assumptions as formal modes of inference, we clarify exactly what inferences are being made”
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (3)

Some points about Statistical inference:

- Reasoning about a population on the basis of evidence from a sample of that population.
- unsoundness? Preservation of truth:
  - True antecedents are not guaranteed to generate true consequents
  - Estimation of the probability that the inference from sample to population is incorrect.
  - upper bound on the extent of unsoundness.

Estimate the soundness of each type of inference ⇒ Detailed examination of all the experimental and theoretical evidence and then using this to develop a framework for theory development relevant to the mode of inference.
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (4)

Argumentation Frameworks

Monodic (Single Voice)
- Different arguments and counter-arguments
- Using the Logic of Argumentation - enabling the combination of arguments for and against a proposition
- Belief-indicators
- Weighing evidence

Dialectical argumentation
- A Branch of philosophy dealing with the conduct of debate and discourse.
- Key difference with monodic argumentation: presence in the latter of an audience.
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (5)

A Framework for dialogue - Extract of Paper:

We define an “agora” (from the Greek for “meeting place”) as a space in which the dialogue will occur, and we use this term also for the dialogue itself. Thus a “φ-agora” is a debate about the claim φ. A φ-agora consists of the following elements:24

- A database \( \land \) of well-formed formulae of a symbolic propositional language, with the usual connectives, in which atomic propositions are denoted \( \phi_i \).

- A set of different modes of inference, each denoted \( R_j \).

- A set of debate participants, each denoted \( P_k \).

- A set of rules for asserting, supporting, questioning, denying, rebutting, undercutting, assumption-denying, mode-of-inference-denying of a claim. (i.e. which argument moves are valid, when; which responses are valid, when.)

- A set of rules for summarising, combining and manipulating arguments.

- A presentation and advice module (so this can be presented to the user).
Truth or consequences: using argumentation to reason about risk (McBurney, Parsons) (6)

Following Aristotle, J. Habermas proposed a three-level structure for his dialectical argumentation framework that tied with the work on argumentation of the paper:

- Logical Level
- Dialectical Level
- Rhetorical Level

Several argumentation theorists proposed structures for dialectical argumentation which permit combination and resolutions of different arguments

- Rupert-Crawshay-Williams
- Arne Næss’ rules of ”precizating” statements
- ...

⇒ Probable references for the paper...
Stephen Edelston Toulmin (born March 25, 1922) is a British philosopher, author, and educator. Influenced by the Austrian philosopher Ludwig Wittgenstein, Toulmin devoted his works to the analysis of moral reasoning. Throughout his writings, he seeks to develop practical arguments which can be used effectively in evaluating the ethics behind moral issues. His works were later found useful in the field of rhetoric for analyzing rhetorical arguments. The Toulmin Model of Argumentation, a diagram containing six interrelated components used for analyzing arguments, was considered his most influential work, particularly in the field of rhetoric and communication, and in computer science.
The Toulmin Model of Argumentation (2)

Toulmin believes that a good argument can succeed in providing good justification to a claim, which will stand up to criticism and earn a favourable verdict. In The Uses of Argument (1958), Toulmin proposed a layout containing six interrelated components for analyzing arguments:

- **Claim**: conclusions whose merit must be established.
- **Data**: the facts we appeal to as a foundation for the claim.
- **Warrant**: the statement authorizing our movement from the data to the claim.
- **Backing**: credentials designed to certify the statement expressed in the warrant; backing must be introduced when the warrant itself is not convincing enough to the readers or the listeners.
- **Rebuttal**: statements recognizing the restrictions to which the claim may legitimately be applied.
- **Qualifier**: words or phrases expressing the speaker’s degree of force or certainty concerning the claim. Such words or phrases include "possible," "probably," "impossible," "certainly," "presumably," "as far as the evidence goes," or "necessarily."
Possible Structure of Paper

- A Bit of Argumentation Theory and its Roots (Modus Ponens, Logic, Mathematics)
- Overview of Papers and Topics Discussed in papers of reference
  - Toulmin Model of Argument
  - Formalisms of Argumentation / Frameworks
- Aggregation Rules Overview, discussion, explanation, examples
- Real Case examples (Carcinogenicity example, etc...)
- Conclusions
Questions?
Critics?  Suggestions?
Guideline Papers:

- Ronald Loui: *Defeat among arguments: a system of defeasible inference* (1987);
- Peter McBurney and Simon Parsons: *Truth or consequences: using argumentation to reason about risk* (1999)
- Several other papers still to filter...

Other references:

- [http://www.wikipedia.org](http://www.wikipedia.org)
- Google Scholar
- Citeseer
- ...