

Argument Clinic: A Baloney Detection Kit Pisa, February 2008.

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To doubt everything or to believe everything are two equally convenient solutions; both dispense with the necessity of reflection.

Henri Poincaré (1901)



Introduction

A "pragma-dialectical" approach of dialogues



• In NLP, we distinguish:

- the syntax of well-formed utterances;
- the semantics of meaningfull utterances;
- the pragmatics of linked utterances.
- A <u>dialogue</u> = a coherent sequence of moves from an initial situation to reach the goal of the participants.
- In NLP, dialogue is for:
 - <u>Dialogue Systems</u>, i.e. machine-human in NL;
 - <u>Multi-Agents Systems</u>, i.e. a set of softwares interacting each other with the help of an artificial language;
 - <u>Groupwares</u>, computer systems mediating the interactions amongst humans (built upon MAS and/or DS).

Toward complex dialogues



The logic of an argument for commonsense reasoning

We distinguish:

- formal logic, i.e. proof theory and so automated theorem proving tools;
- informal logic, i.e. informal proof in mathematical litterature;
- the exchange of thesis and counter-propositions;
- the drawing of conclusions;
- the determination of an action.



Outline



- Introduction
- Motivation
- Theoretical reasoning
- Practical reasoning
- Argumentation
- Dialectics
- Conclusions



The facts and their explanations



All men are mortal, Socrates is a man, Socrates is mortal.

Definition (Deduction system)

A deductive system is a pair (L, R) where:

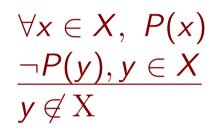
- *L* is a formal language;
- *R* is a set of inference rules of the form (head body)

$$\frac{\alpha_1,\ldots,\alpha_n}{\alpha}$$



No True Scotsman





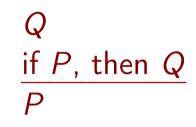
Example

Christian groups claims that faith is permanent for them, and if some of them do not have faith then they are not true Christians.



Affirming the consequent





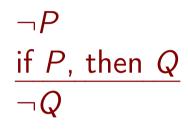
Example

As Arthur Schopenhauer said, All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident. My ideas are being ridiculed and violently opposed. Therefore they are true, and will eventually be accepted as being self-evident.



Denying the antecedent





Example

Alan Turing asserts that a man would be no better than a machine if he had a definite set of rules by which he regulated his life. Since he observes there are no such rules, he concludes that men cannot be machines.



Dichotomy Fallacy or Bifurcation





Example

George W. Bush asserted: "You're either with us or against us".



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Theoretical reasoning Hasty generalization

When an arguer observes a proposition in a group and applies it to a much larger group



 $P(x), x \in X$ $X \subset Y$ $P(y), y \in Y$

Example

Racism, and sexism are classic examples of this fallacy.



When only one of a number of causes for a given effect is selected and the others are neglected



- Cum Hoc Ergo Propter Hoc, i.e. with this therefore because of this.
- Post Hoc Ergo Propter hoc, i.e. confusing chronology with causality.

Example

In the controversial documentary film "Bowling for Columbine", Michael Moore observes that, in the USA, gun ownership and the murder rates are among the highest in the world and concludes owning guns must increase the crime rate.



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The actions which should (or not) be performed



I want to achieve G. The best way to achieve G is to do D. I will do D.

Definition (Decision Framework)

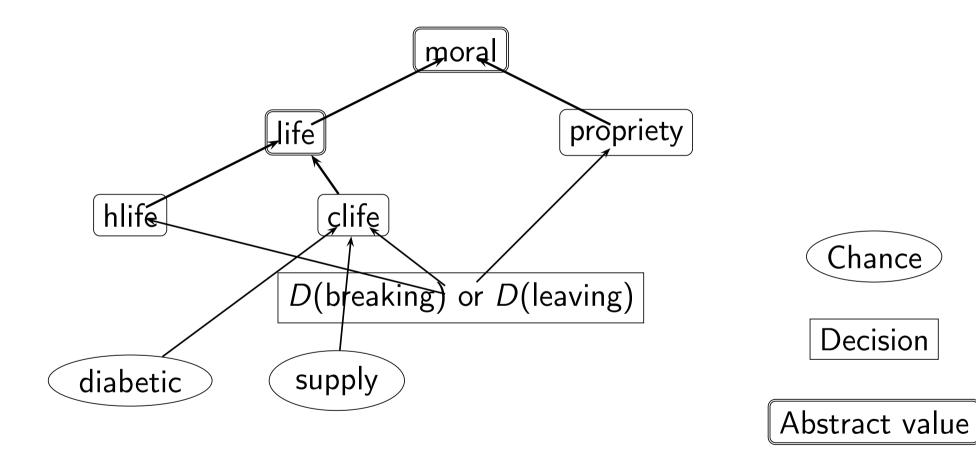
A decision framework is a tuple $D = \langle L, R, I, P \rangle$ where:

- (L, R) is a deduction system;
- *I* is the <u>incompatibility relation</u>, i.e. a binary relation over atomic formulas which is asymmetric;
- P is the priority relation, i.e. a preorder on the rules in R.



Influence diagram to structure a moral dilemma









Data strutures and priorities: hierarchies of conflicting rules



- goal rules such as R_{012} : moral \leftarrow life, propriety
- epistemic rules such as F_1 : diabetic \leftarrow
- decision rules such as R_{42} : clife $\leftarrow D(\text{breaking}), \text{supply}, \text{diabetic}$
- the priority over goal rules comes from preferences, e.g. R_{01} : moral \leftarrow life has priority over R_{02} : moral \leftarrow propriety
- the priority over epistemic rules comes from probabilities, e.g. F_1 : diabetic \leftarrow has priority over F_2 : \neg diabetic \leftarrow
- the priority over decision rules come from expected utililies, e.g.
 R₄₁ : clife ← D(leaving) has priority over
 R₄₃ : clife ← D(breaking), diabetic



A walk through the example



Goal theory

 $R_{012} : \text{moral} \leftarrow \text{life, propriety}$ $R_{134} : \text{life} \leftarrow \text{hlife, clife}$ $R_{01} : \text{moral} \leftarrow \text{life}$ $R_{13} : \text{life} \leftarrow \text{hlife}$ $R_{02} : \text{moral} \leftarrow \text{propriety}$ $R_{14} : \text{life} \leftarrow \text{clife}$

Epistemic theory

 $\uparrow \frac{F_1 : \text{diabetic} \leftarrow}{F_3 : \neg \text{diabetic} \leftarrow}$

Decision theory

 $\begin{array}{l} R_{22}: {\sf propriety} \leftarrow D({\sf leaving}) \\ R_{31}: {\sf hlife} \leftarrow D({\sf breaking}) \\ R_{41}: {\sf clife} \leftarrow D({\sf leaving}) \\ R_{42}: {\sf clife} \leftarrow D({\sf breaking}), {\sf supply}, {\sf diabetic} \\ \hline R_{21}: {\sf propriety} \leftarrow D({\sf breaking}) \\ R_{32}: {\sf hlife} \leftarrow D({\sf leaving}) \\ R_{43}: {\sf clife} \leftarrow D({\sf breaking}), {\sf diabetic} \\ \hline R_{44}: g_4 \leftarrow D({\sf breaking}), {\neg} {\sf supply}, {\sf diabetic} \\ \hline \end{array}$

supply ?



When an arguer promotes a decision without taking into account the full consequences



Example

The US interventions in Afghanistan and in Irak has rescued its worst enemy, Iran, from two dangerous rivals: the Ba'athist regime in Iraq and the Taliban in Afghanistan. Moreover, we can add the increasing hostility towards US presence in the area. A country can seldom have done its principal enemy such favours.



Other unintended consequences



• The <u>Sunk Cost Fallacy</u>, i.e. "throwing good money after bad".

Example

The president said the 22nd of August 2005 "We owe them something" referring to the 2,000 Americans who have already died in the war and he added "we must finish the task they gave their lives for".

• The parabola of the <u>Broken Window</u>, i.e. the hidden (or opportunity) costs.

Example

A shopkeeper has a son who carelessly breaks his window. The people tell the shopkeeper that this is actually a good thing for the community, because now, a window-maker will get more business, helping the local economy.



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Example

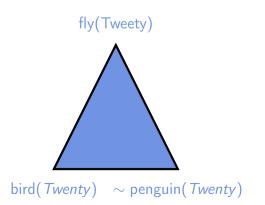
Some researchers consider the failure in experiments involving the application of evolutionary theory to the production or use of computer hardware of software demonstrates that evolution cannot work elsewhere.



Argument as 'proof'



- An abstract entity with an unspecified logic,
 A='Tweety flies because it's a bird';
- A pair (Premises, Conclusion),
 A = ({bird(Tweety), bird(X) → fly(X)}, fly(Tweety));
- A deduction sequence of rules and facts $A = (f_1(\text{Tweety}), r_1(\text{Tweety}));$
- An inference **tree** grounded in premises;

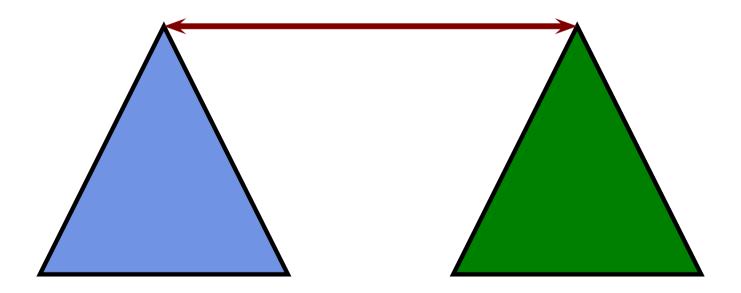




Rebutting, undermining and undercutting attacks



- Tweety flies because it is a bird;
- Tweety doesn't fly because it's a penguin.

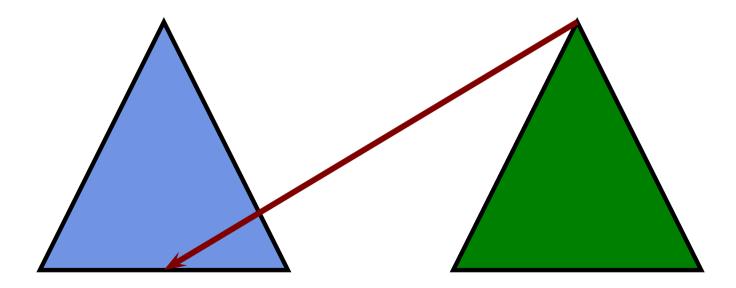




Rebutting, undermining and undercutting attacks



- Tweety flies because it is a bird and it is not provable that Tweety is a penguin;
- Tweety is a penguin.

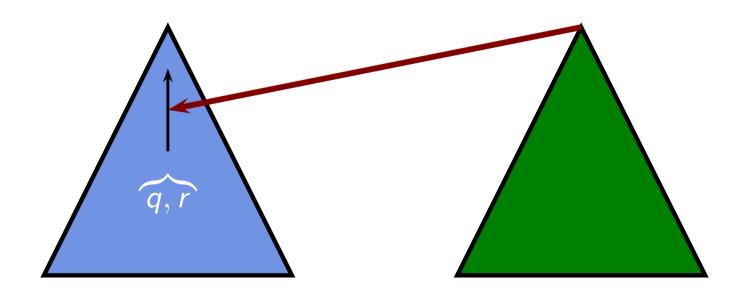




Rebutting, undermining and undercutting attacks



- Tweety flies because all the birds I've seen fly;
- I've seen Tux, it's a bird and it doesn't fly.

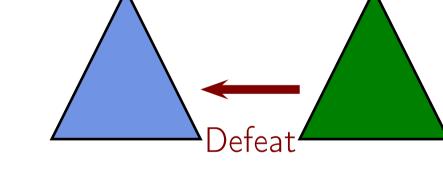




How to evaluate the strengths of arguments?

Some domain-independent principles of commonsense reasoning:

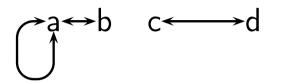
- the last link principle [Prakken & Sartor 97];
- the weakest link principle [Amgoud & Cayrol 02];
- the specificity principle [Simari & Loui 92].
- The likelihood of beliefs.
- The priority amongst goals.
- The expected utililies of actions.







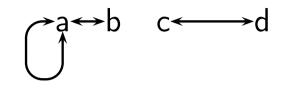
Arguments collectively justified







Arguments collectively justified



- \emptyset is ground;
- $\{b, c\}$ are $\{b, d\}$ preferred;
- $\{b\}$ is the maximal ideal set.

Definition ([Dung, Kowalski & Toni 06])

A set X of arguments is :

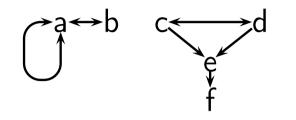
- admissible iff X does not defeat itself and X defeats every argument y such that y attacks X;
- **preferred** iff X is maximally admissible;
- complete iff X is admissible and X contains all arguments x such that X defeats all defeaters against x;
- **grounded** iff X is minimally complete;
- ideal iff X is admissible and it is contained in every preferred sets.





Arguments collectively justified





- $\{b, c, f\}$ are $\{b, d, f\}$ preferred;
- $\{b\}$ is the maximal ideal set and $\{b\} \subset \{b, f\} \subset \{b, c, f\} \cap \{b, c, f\}$

Definition ([Dung, Kowalski & Toni 06])

- A set X of arguments is :
 - admissible iff X does not defeat itself and X defeats every argument y such that y attacks X;
 - **preferred** iff X is maximally admissible;
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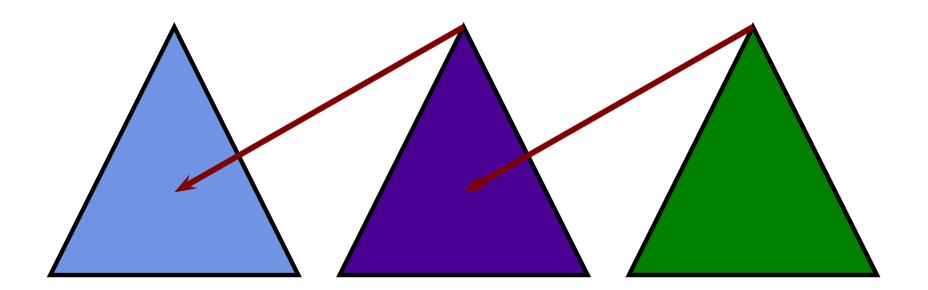


Dialectics

From the defeat relation to the status of arguments



• Defeat relation focus on two arguments not on a dispute, e.g.









(Declarative) Model-theoretic Semantic Completeness Soundness

(Procedural) Dialectical Proof Procedure



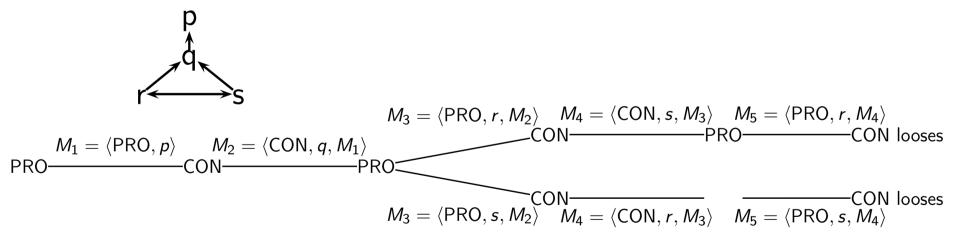
Dialectical enquiry



Definition

A Two-Party Immediate Respond Dispute (TPI) is defined s.a.:

- both parties are allowed to repeat PRO;
- PRO is not allowed to repeat CON;
- CON is allowed to repeat CON in a different dispute line.



Theorem

Soundness and completeness of TPI for the credulous semantics.



When a participant argues that a proposition is incorrect, not in its own right, but because of where it originated



Argumentum ad hominem (resp. Argumentum ad verecundium)

- A claims P
- A is untrustworthy. (resp. trustworthy)
- P is false (resp. true).
- argumentum ad populum,
- argumentum ad antiquitatem,
- argumentum ad novitatem.

Example

Voltaire argued that Rousseau was not competent to write about the education of children since he withdrawn his children.



Dialectics Argumentum ad Ignorantiam

When a an arguer draws a positive conclusion from a lack of contradictory evidence



A claims P It cannot be shown that P is not true. P is true.

Example

Senator Joe McCarthy said: "I do not have much information on case ... except the general statement of the agency that there is nothing in the files to disprove his Communist connections."



When the procedural rules are not respected



- <u>Argumentum ad Nauseam</u>, i.e. "A lie told often enough becomes the truth" as said by Lenin.
- Petitio principii

P implies *QQ* implies *PP*.

• The strawman

Example

"No legalization ! Any society with unrestricted access to drugs loses its work ethic." The opponent was to legalize marijuana and misrepresented as "unrestricted access to drugs".





- A formal deductif system for the justifications of beliefs is
 - a language,
 - a set of rules,
- A formal decision framework of the motivations of actions is
 - a set of goals, decisions, actions, and beliefs,
 - an incompatibility relation,
 - a priority relation.
- An <u>argumentation framework</u> for the calculus of oppositions is
 - a set of arguments (abstract entities, pfremises -conclusion, rules, tree),
 - attacking each other,
 - more or less prior,
 - therefore defeating each other.
- A dialectical framework for the exchange of arguments is
 - a set of procedural rules.





• Our work

- Decision support systems, e.g. http://margo.sourceforge.net.
- Multi-Agents Systems with interacting, decision-making agents which negotiate, e.g. GOLEM.
- Service Oriented Architecture such as GRID computing, e.g. the ARGUGRID plateform.

But also

- Legal Disputes.
- Business Negotiation.
- Scientific Inquiry.



Thanks for your attention





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Conclusions

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