Argumentation Ranking Semantics based on Propagation

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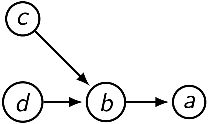
AMANDE

Ranking semantics

Ranking semantics : Rank-order arguments from the most to the least acceptable ones from a Dung's abstract argumentation framework.



$\Rightarrow \quad c \simeq d \succ a \succ b$

Motivations :

- Decision making
- More appropriate for online debate platforms (*cf* Social Argumentation Framework [LM11])

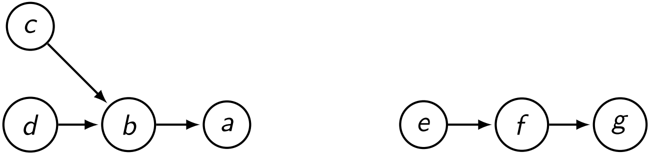
[LM11] J. Leite and J. Martins, *Social abstract argumentation*, (IJCAI'11), 2011

Existing ranking semantics

- (SAF) J. Leite and J. Martins, *Social abstract argumentation*, (IJCAI'11), 2011
- (Cat) P. Besnard and A. Hunter, *A logic-based theory of deductive arguments*, Artificial Intelligence, 2001
- (Cat) F. Pu, J. Luo, Y. Zhang and G. Luo, *Argument ranking with categoriser function*, (KSEM'14), 2014
- (Bbs,Dbs) L. Amgoud and J. Ben-Naim, *Ranking-based semantics for argumentation frameworks* (SUM'13), 2013
- (Tuples) C. Cayrol and M.-Ch. Lagasquie-Schiex, *Graduality in argumentation*, Journal of Artificial Intelligence Research, 2005
- (M&T) P. Matt and F. Toni, *A game-theoretic measure of argument strength for abstract argumentation* (JELIA'08), 2008
- (G&M) D. Grossi and S. Modgil, *On the Graded Acceptability of Arguments* (IJCAI'15), 2015
- ...

Which criteria to rank arguments?

- The number of attackers and defenders

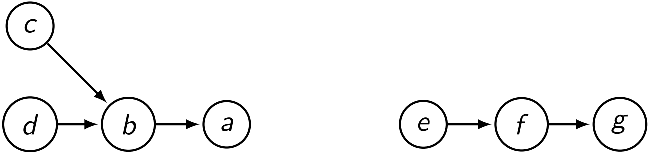


b is more attacked than $f \Rightarrow \boxed{f \succ b}$

a is more defended than $g \Rightarrow \boxed{a \succ g}$

Which criteria to rank arguments ?

- The number of attackers and defenders



b is more attacked than $f \Rightarrow$ $\boxed{f \succ b}$
a is more defended than $g \Rightarrow$ $\boxed{a \succ g}$

- The role and impact of non-attacked arguments

Overview

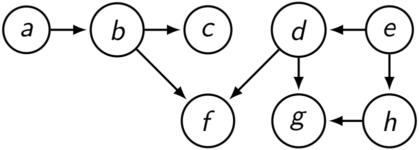
Notations

$\upharpoonleft_n^-(a)$ Represent the **attackers** of the argument a situated at the beginning of a path with a length of n (with $n \in \mathbb{N}+1$)

- $\upharpoonleft_1^-(f) = \{b,d\}$
- $\upharpoonleft_1^-(g) = \{d,h\}$

$\upharpoonleft_n^+(a)$ Represent the **defenders** of the argument a situated at the beginning of a path with a length of n (with $n \in \mathbb{N}$)

- $\upharpoonleft_2^+(f) = \{a,e\}$
- $\upharpoonleft_2^+(g) = \{e\}$



Notations

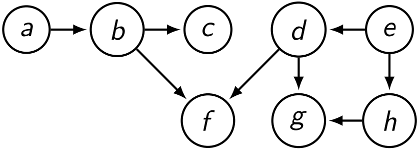
$\oplus$ Allow to choose between the **set** (S) or the **multi-set** (M)

$\uparrow_n^{-,\oplus}(a)$ Represent the **attackers** of the argument a situated at the beginning of a path with a length of n (with $n \in \mathbb{N}+1$)

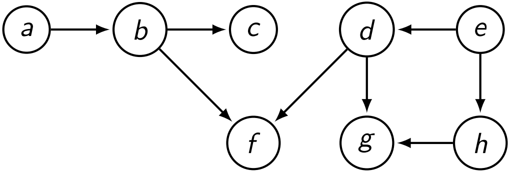
- $\uparrow_1^{-,S}(f) = \uparrow_1^{-,M}(f) = \{\text{b,d}\}$

$\uparrow_n^{+,\oplus}(a)$ Represent the **defenders** of the argument a situated at the beginning of a path with a length of n (with $n \in \mathbb{N}$)

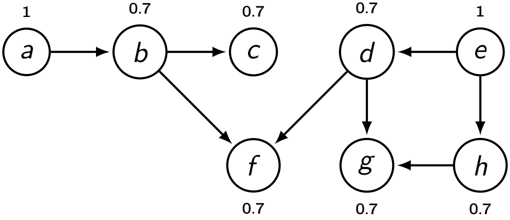
- $\uparrow_2^{+,S}(f) = \uparrow_2^{+,M}(f) = \{\text{a,e}\}$
- $\uparrow_2^{+,S}(g) = \{\text{e}\}$
- $\uparrow_2^{+,M}(g) = \{\text{e,e}\}$



Propagation principle

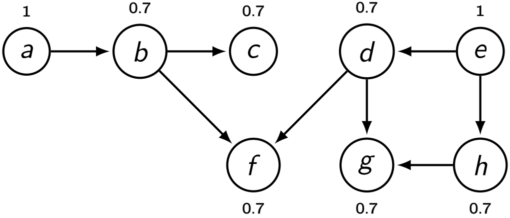


Propagation principle



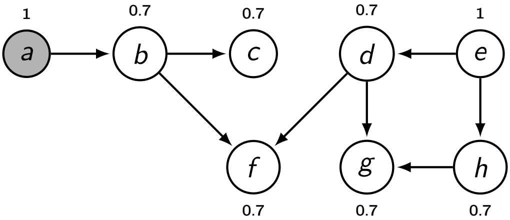
Step 1 : Assign a positive initial weight to each argument. The weight of non-attacked arguments is set to be higher or equal than the weight of attacked arguments.

Propagation principle



Step 2 : We propagate the initial weights into the graph in changing their polarities in order to comply with the attack relation meaning (attack or defense).

Propagation principle



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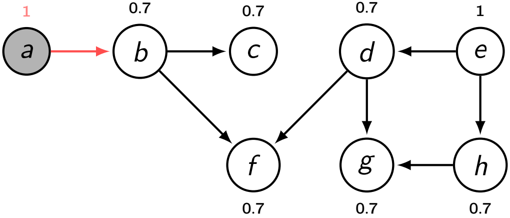

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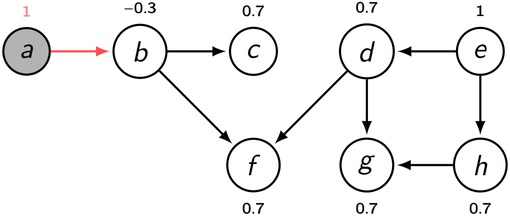
Propagation principle



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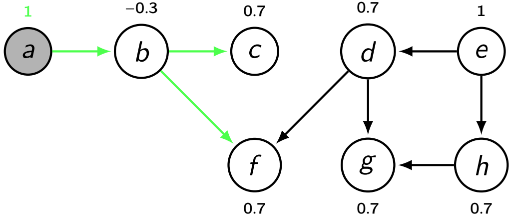
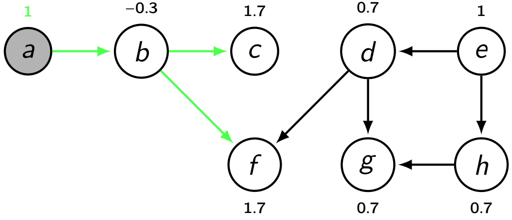
Propagation principle



Step 2 : We propagate the initial weights into the graph in changing their polarities in order to comply with the attack relation meaning (attack or defense).

Propagation principle



Step 2 : We propagate the initial weights into the graph in changing their polarities in order to comply with the attack relation meaning (attack or defense).

Propagation vector

The valuation P of $a \in A$ at step i :

$$P_i^{\epsilon,\oplus}(a) = \begin{cases} v_\epsilon(a) & \textit{if } \mathrm{i} = 0 \\ P_{i-1}^{\epsilon,\oplus}(a) + (-1)^i \sum_{b \in \uparrow_i^{-,\oplus}(a)} v_\epsilon(b) & \textit{otherwise} \end{cases}$$

where $v : A \to \mathbb{R}^+$ is a valuation function giving an initial weight to each argument, with $\epsilon \in [0,1]$ such that $\forall b \in A$:

$$v_\epsilon(b) = \begin{cases} 1 & \textit{if } \uparrow_1^{-,\oplus}(b) = \emptyset \\ \epsilon & \textit{otherwise} \end{cases}$$

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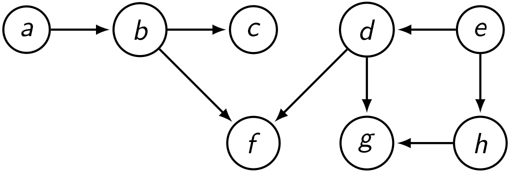
$$v_\epsilon(b) = \begin{cases} 1 & \textit{if } \uparrow_1^{-,\oplus}(b) = \emptyset \\ \epsilon & \textit{otherwise} \end{cases}$$

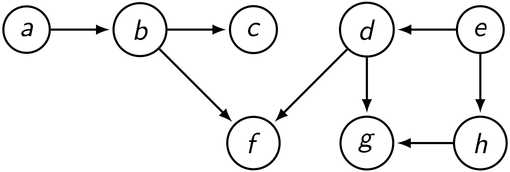
The **propagation vector** of a : $P^{\epsilon,\oplus}(a) = \langle P_0^{\epsilon,\oplus}(a), P_1^{\epsilon,\oplus}(a), \dots \rangle$

Example ($\epsilon = 0.7$)



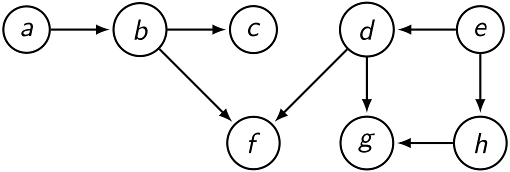
$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	s	M	s	M	s	M	s	M	s	M
0	1		0.7		0.7		0.7		0.7	

Example ($\epsilon = 0.7$)



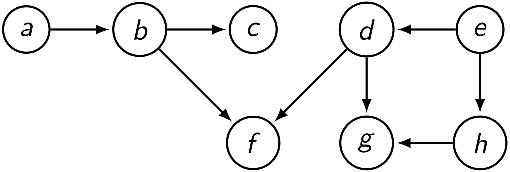
$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	s	M	s	M	s	M	s	M	s	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	

Example ($\epsilon = 0.7$)



$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

Example ($\epsilon = 0.7$)



$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

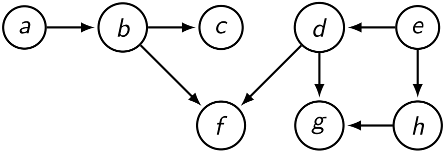
$$P^{0.7,S}(c) = P^{0.7,M}(c) = \langle\ 0.7\ ,\ 0\ ,\ 1\ \rangle$$

Our ranking semantics

Three ranking semantics based on the notion of propagation :

- Propa_{ϵ}
- $\text{Propa}_{1+\epsilon}$
- $\text{Propa}_{1\rightarrow\epsilon}$

Use of the **lexicographical order** to compare the propagation vector of each argument.



$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

a, b, c, d, e, f, g, h

Propa$_\epsilon$

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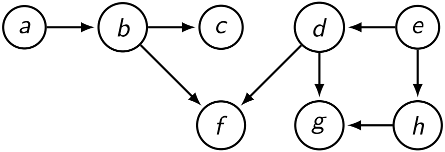

$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g		
	S	M	S	M	S	M	S	M	S	M	a, b, c, d, e, f, g, h
0	1		0.7		0.7		0.7		0.7		$a, e \succ b, c, d, f, g, h$
1	1		-0.3		0		-0.7		-0.7		
2	1		-0.3		1		1.3		0.3	1.3	

Propa$_\epsilon$

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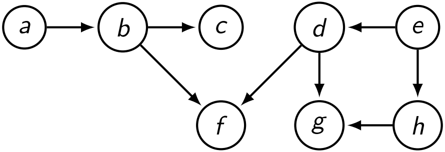
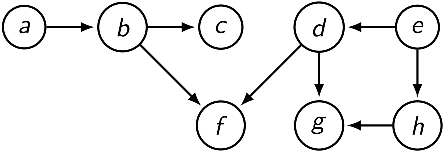


$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g		
	S	M	S	M	S	M	S	M	S	M	a,b,c,d,e,f,g,h
0	1		0.7		0.7		0.7		0.7		$a,e \succ b,c,d,f,g,h$
1	1		-0.3		0		-0.7		-0.7		$a,e \succ c \succ b,d,h \succ f,g$
2	1		-0.3		1		1.3		0.3	1.3	

Propa$_\epsilon$

Use of the **lexicographical order** to compare the propagation vector of each argument.



$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g		
	S	M	S	M	S	M	S	M	S	M	a,b,c,d,e,f,g,h
0	1		0.7		0.7		0.7		0.7		$a,e \succ b,c,d,f,g,h$
1	1		-0.3		0		-0.7		-0.7		$a,e \succ c \succ b,d,h \succ f,g$
2	1		-0.3		1		1.3		0.3	1.3	$a,e \succ c \succ b,d,h \succ f \succ g$

Propa$_\epsilon$

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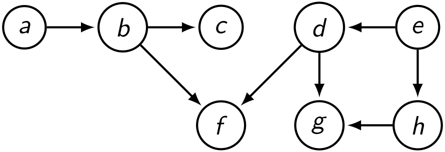
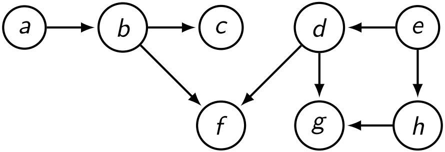


$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g		
	S	M	S	M	S	M	S	M	S	M	a, b, c, d, e, f, g, h
0	1		0.7		0.7		0.7		0.7		$a, e \succ b, c, d, f, g, h$
1	1		-0.3		0		-0.7		-0.7		$a, e \succ c \succ b, d, h \succ f, g$
2	1		-0.3		1		1.3		0.3	1.3	$a, e \succ c \succ b, d, h \succ f \succ g$

$$\text{Propa}_\epsilon^{0.7,S}(AF) = a, e \succ c \succ b, d, h \succ f \succ g$$

We compare with the lexicographical order in **alternating** the case $\epsilon = 0$ (only take into account the non-attacked arguments) and the case $\epsilon \neq 0$.



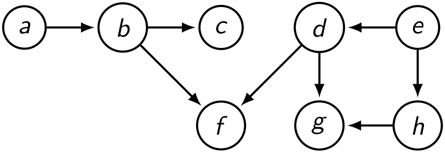
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, b, c, d, e, f, g, h$$

Propa$_{1+\epsilon}$

We compare with the lexicographical order in **alternating** the case $\epsilon = 0$ (only take into account the non-attacked arguments) and the case $\epsilon \neq 0$.



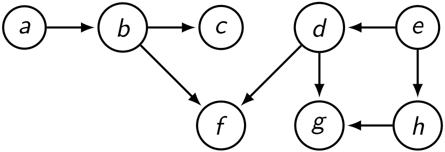
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a,e \succ b,c,d,f,g,h$$

Propa$_{1+\epsilon}$

We compare with the lexicographical order in **alternating** the case $\epsilon = 0$ (only take into account the non-attacked arguments) and the case $\epsilon \neq 0$.



$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ b, c, d, f, g, h$$

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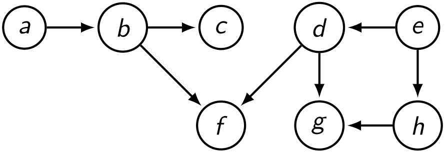


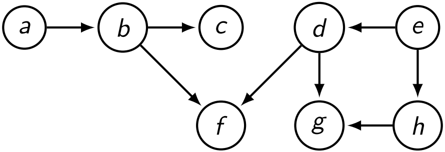
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ c, f, g \succ b, d, h$$

Propa$_{1+\epsilon}$

We compare with the lexicographical order in **alternating** the case $\epsilon = 0$ (only take into account the non-attacked arguments) and the case $\epsilon \neq 0$.



$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ c \succ f, g \succ b, d, h$$

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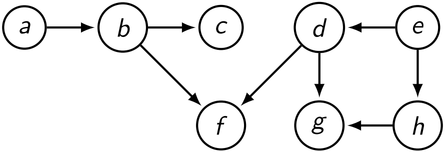
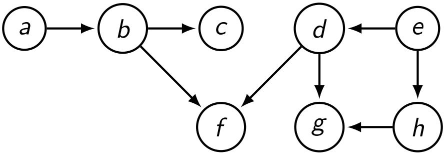


$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ c \succ f \succ g \succ b, d, h$$

We compare with the lexicographical order in **alternating** the case $\epsilon = 0$ (only take into account the non-attacked arguments) and the case $\epsilon \neq 0$.



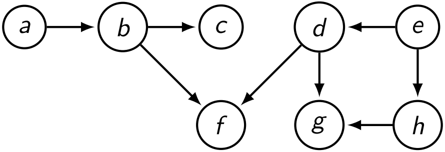
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$\text{Propa}_{1+\epsilon}^{0.7,S}(AF) = a, e \succ c \succ f \succ g \succ b, d, h$$

Propa$_{1\rightarrow\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa$_\epsilon$).

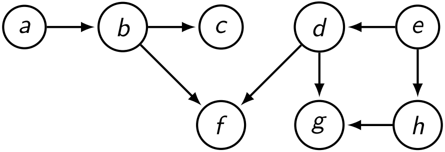


$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, b, c, d, e, f, g, h$$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa$_\epsilon$).



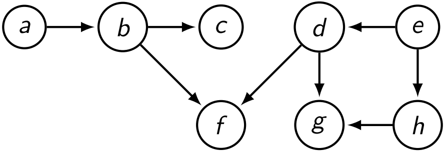
$P_i^{0,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ b, c, d, f, g, h$$

$\text{Propa}_{1\to\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa_ϵ).



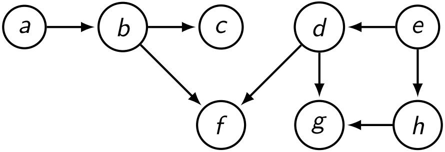
$P_i^{0,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a, e		b, d, h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ c, f, g \succ b, d, h$$

$\text{Propa}_{1\rightarrow\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa_ϵ).



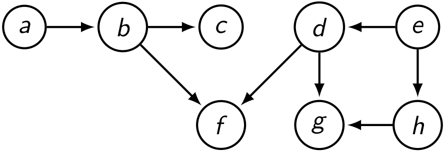
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ f \succ c, g \succ b, d, h$$

$\text{Propa}_{1\to\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa_ϵ).



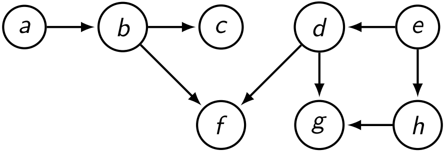
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ f \succ c, g \succ b, d, h$$

$\text{Propa}_{1\to\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa_ϵ).



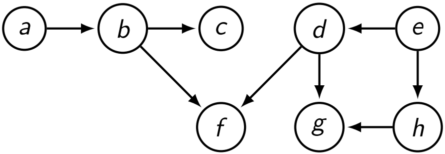
$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$a, e \succ f \succ c \succ g \succ b, d, h$$

$\text{Propa}_{1\to\epsilon}$

Give a higher priority to the non-attacked arguments, by propagating **first** their weights in the graph (case $\epsilon = 0$). Then, if some argument are still incomparable, we restart with the case $\epsilon \neq 0$ (*cf* Propa_ϵ).



$P_i^{0,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0		0		0		0	
1	1		-1		0		0		0	
2	1		-1		1		2		1	2

$P_i^{0.7,\oplus}$	a,e		b,d,h		c		f		g	
	S	M	S	M	S	M	S	M	S	M
0	1		0.7		0.7		0.7		0.7	
1	1		-0.3		0		-0.7		-0.7	
2	1		-0.3		1		1.3		0.3	1.3

$$\text{Propa}_{1\to\epsilon}^{0.7,S}(AF) = a,e \succ f \succ c \succ g \succ b,d,h$$

Overview

Results and Comparison

Properties	Grounded	SAF	Cat	Dbs	Bbs	Tuples*	M&T	Propa_{ϵ}	$\text{Propa}_{1+\epsilon}$	$\text{Propa}_{1\to\epsilon}$
Abs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VP	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP	×	✓	✓	✓	✓	×	×	✓	✓	✓
CT	×	✓	✓	✓	✓	×	×	✓	✓	×
SCT	×	✓	✓	✓	✓	×	×	✓	✓	×
CP	×	×	×	✓	✓	×	×	×	×	×
QP	✓	×	×	×	×	×	×	×	×	×
DDP	×	×	×	×	✓	×	×	×	✓	✓
SC	×	×	×	×	×	–	✓	×	×	×
⊕DB	×	×	×	×	×	×	×	×	×	×
+DB	×	×	×	×	×	✓	×	×	×	✓
↑AB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
↑DB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
+AB	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
AE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AvsFD	✓	×	×	×	×	✓	✓	×	✓	✓

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Results and Comparison

Properties	Grounded	SAF	Cat	Dbs	Bbs	Tuples*	M&T	Propa_ϵ	$\text{Propa}_{1+\epsilon}$	$\text{Propa}_{1\rightarrow\epsilon}$
Abs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VP	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP	×	✓	✓	✓	✓	×	×	✓	✓	✓
CT	×	✓	✓	✓	✓	×	×	✓	✓	×
SCT	×	✓	✓	✓	✓	×	×	✓	✓	×
CP	×	×	×	✓	✓	×	×	×	×	×
QP	✓	×	×	×	×	×	×	×	×	×
DDP	×	×	×	×	✓	×	×	×	✓	✓
SC	×	×	×	×	×	–	✓	×	×	×
⊕DB	×	×	×	×	×	×	×	×	×	×
+DB	×	×	×	×	×	✓	×	×	×	✓
↑AB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
↑DB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
+AB	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
AE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AvsFD	✓	×	×	×	×	✓	✓	×	✓	✓

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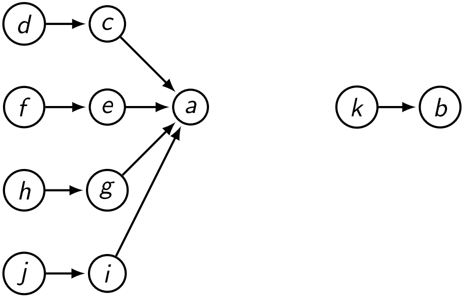
Attack vs Full Defense

A fully defended argument (without any attack branch) should be strictly more acceptable than an argument attacked once by a non-attacked argument.



$a \succ b$

Results and Comparison

Properties	Grounded	SAF	Cat	Dbs	Bbs	Tuples*	M&T	Propa_ϵ	$\text{Propa}_{1+\epsilon}$	$\text{Propa}_{1\to\epsilon}$
Abs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VP	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP	×	✓	✓	✓	✓	×	×	✓	✓	✓
CT	×	✓	✓	✓	✓	×	×	✓	✓	×
SCT	×	✓	✓	✓	✓	×	×	✓	✓	×
CP	×	×	×	✓	✓	×	×	×	×	×
QP	✓	×	×	×	×	×	×	×	×	×
DDP	×	×	×	×	✓	×	×	×	✓	✓
SC	×	×	×	×	×	–	✓	×	×	×
⊕DB	×	×	×	×	×	×	×	×	×	×
+DB	×	×	×	×	×	✓	×	×	×	✓
↑AB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
↑DB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
+AB	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
AE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AvsFD	✓	×	×	×	×	✓	✓	×	✓	✓

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Results and Comparison

Properties	Grounded	SAF	Cat	Dbs	Bbs	Tuples*	M&T	Propa_{ϵ}	$\text{Propa}_{1+\epsilon}$	$\text{Propa}_{1\to\epsilon}$
Abs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VP	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP	×	✓	✓	✓	✓	×	×	✓	✓	✓
CT	×	✓	✓	✓	✓	×	×	✓	✓	×
SCT	×	✓	✓	✓	✓	×	×	✓	✓	×
CP	×	×	×	✓	✓	×	×	×	×	×
QP	✓	×	×	×	×	×	×	×	×	×
DDP	×	×	×	×	✓	×	×	×	✓	✓
SC	×	×	×	×	×	–	✓	×	×	×
⊕DB	×	×	×	×	×	×	×	×	×	×
+DB	×	×	×	×	×	✓	×	×	×	✓
↑AB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
↑DB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
+AB	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
AE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AvsFD	✓	×	×	×	×	✓	✓	×	✓	✓

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Results and Comparison

Properties	Grounded	SAF	Cat	Dbs	Bbs	Tuples*	M&T	Propa_{ϵ}	$\text{Propa}_{1+\epsilon}$	$\text{Propa}_{1\rightarrow\epsilon}$
Abs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VP	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP	×	✓	✓	✓	✓	×	×	✓	✓	✓
CT	×	✓	✓	✓	✓	×	×	✓	✓	×
SCT	×	✓	✓	✓	✓	×	×	✓	✓	×
CP	×	×	×	✓	✓	×	×	×	×	×
QP	✓	×	×	×	×	×	×	×	×	×
DDP	×	×	×	×	✓	×	×	×	✓	✓
SC	×	×	×	×	×	–	✓	×	×	×
⊕DB	×	×	×	×	×	×	×	×	×	×
+DB	×	×	×	×	×	✓	×	×	×	✓
↑AB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
↑DB	×	✓	✓	✓	✓	✓	×	✓	✓	✓
+AB	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
AE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AvsFD	✓	×	×	×	×	✓	✓	×	✓	✓

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Conclusion and Future works

Conclusion

- New ranking semantics based on :
  - The influence of attacked and non-attacked arguments
  - The use of the set or multi-set for the attackers/defenders
- Semantics with good properties

Future works

- Define these semantics with votes on the argument and on the attacks (see Social Argumentation Framework)
- Study the possible adaptation of the properties for SAF