

Abstract Argumentation with Focus on Argument Claims - An Overview



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LPNMR 2022: 16th International Conference on
Logic Programming and Non-monotonic Reasoning
Genova Nervi, 9.9.2022





July 7, 2021

Twittering away our deliberative capacity: Social media and the threat to democracy

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References

Ott, B. L., & Dickinson, G. (2020). The Twitter Presidency: How Donald Trump's Tweets Undermine Democracy

Communication technologies lie at the heart of every society, and their structural biases

VARDI'S INSIGHTS

How the Hippies Destroyed the Internet

By Moshe Y. Vardi

Communications of the ACM, July 2018, Vol. 61 No. 7, Page 9

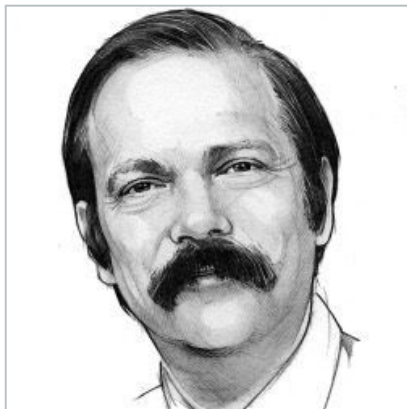
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When we refer to "the Internet" we refer not only to the global system of interconnected computer networks but also to the set of applications that utilize this network, including email, the Web, search engines, social media, and the like. To understand where this Internet comes from, we have to revisit the emergence of online communities in the early and mid-1980s. Consider, for example, the WELL, which began in 1985 as a dial-up bulletin board system, self-described as "a cherished watering hole for articulate and playful thinkers." One of its founders was Stewart Brand, best known as editor of the *Whole Earth Catalog*, an American counterculture magazine and product catalog published periodically

since the late 1960s. "Counterculture" refers to a late-1960s-early-1970s Western

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Vienna, May 2019

"The system is failing" – stated by the founder of the Web, Tim Berners-Lee – emphasizes that while digitalization opens unprecedented opportunities, it also raises serious concerns: the monopolization of the Web, the rise of extremist opinions and behavior orchestrated by social media, the formation of filter bubbles and echo chambers as islands of disjoint truths, the loss of privacy, and the spread of digital surveillance. Digital technologies are disrupting societies and questioning our understanding of what it means to be human. The stakes are high and the challenge of building a just and democratic society with humans at the center of technological progress needs to be addressed with determination as well as scientific ingenuity. Technological innovation demands social innovation, and social innovation requires broad societal engagement.

This manifesto is a call to deliberate and to act on current and future technological development. We encourage our academic communities, as well as industrial leaders, politicians, policy makers, and professional societies all around the globe, to actively participate in policy formation. Our demands are the result of an emerging process that unites scientists and practitioners across fields and topics, brought together by concerns and hopes for the future. We are aware of our joint responsibility for the current situation and the future – both as professionals and citizens.

Today, we experience the co-evolution of technology and humankind. The flood of data, algorithms, and computational power is disrupting the very fabric of society by changing human interactions, societal institutions, economies, and political structures. Science and the humanities are not exempt. This disruption simultaneously creates and threatens jobs, produces and destroys wealth, and improves and damages our ecology. It shifts power structures, thereby blurring the human and the machine.

The quest is for enlightenment and humanism. The capability to automate human cognitive activities is a revolutionary aspect of computer science / informatics. For many tasks, machines surpass already what humans can accomplish in speed, precision, and even analytic deduction. The time is right to bring together humanistic ideals with critical thoughts about technological progress. We therefore link this manifesto to the intellectual tradition of humanism and similar movements striving for an enlightened humanity.

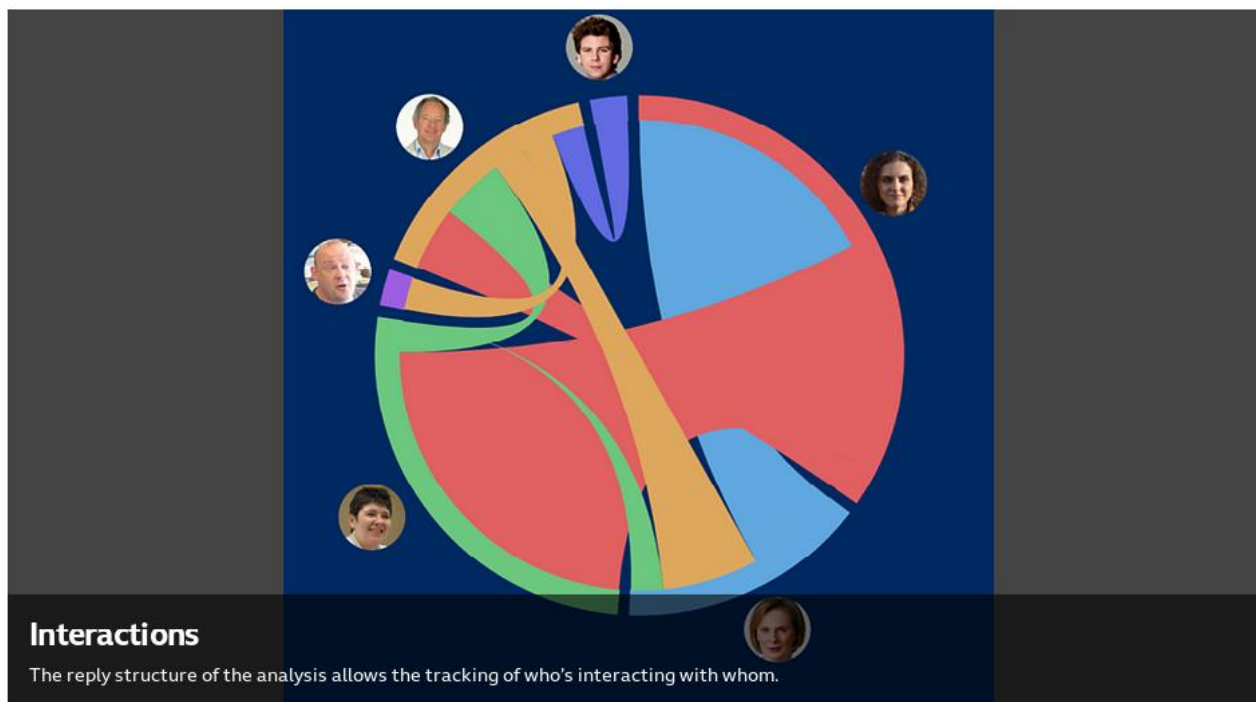
Like all technologies, digital technologies do not emerge from nowhere. They are shaped by implicit and explicit choices and thus incorporate a set of values, norms, economic interests, and assumptions about how the world around us is or should be. Many of these choices remain hidden in software programs implementing algorithms that remain invisible. In line with the renowned Vienna Circle and its contributions to modern thinking, we want to espouse critical rational reasoning and the interdisciplinarity needed to shape the future.

We must shape technologies in accordance with human values and needs, instead of allowing technologies to shape humans. Our task is

50 Years of the Abortion Act Argument Analytics

Dig into the debate with tools from the Centre for Argument Technology at the University of Dundee.

10/38



A First Definition

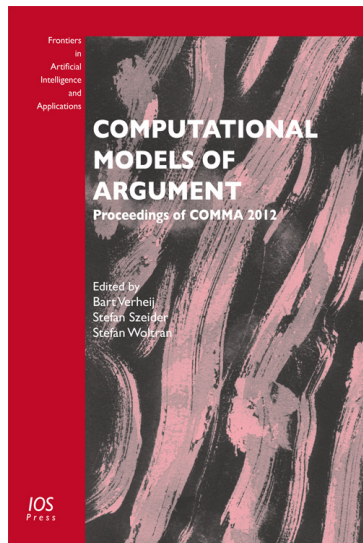
Argumentation is the study of processes “concerned with how assertions are **proposed**, **discussed**, and **resolved** in the context of issues upon which several **diverging opinions** may be held”.

[Bench-Capon & Dunne: Argumentation in AI. Artif. Intell. 171:619-641, 2007]

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- Tasks: Decision Support/Making, Persuasion, Dialogues, Negotiation, Dialectical Reasoning, ..
- Challenges: inconsistency, inherently dynamic, empathy, strategic thinking, ...



nuclear power pros and cons



Anmelden

Feedback geben

https://www.renewableresourcescoalition.org › nuc... ▾ Diese Seite übersetzen

Nuclear Energy Pros & Cons | Renewable Resources Coalition

19.11.2016 - Below you will find the **pros** that led to the revival of **nuclear energy**. Low Greenhouse Gas Emissions. High **Power** Output. Inexpensive **Electricity**. **Nuclear Energy** Doesn't Rely on Fossil Fuels. Economic Impact. Back end Environmental Impact. Past History of **Nuclear** Accidents. High Up-Front and End Stage Cost.

https://www.conserve-energy-future.com › pros-a... ▾ Diese Seite übersetzen

Pros and Cons of Nuclear Energy - Conserve Energy Future

Pros and cons of nuclear energy: As of today, **nuclear energy** is considered as one of the most environmentally friendly source of energy as it produces fewer ...

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Nuclear power pros and cons: What's the impact of the energy ...

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Profiling the top nuclear power pros and cons - NS Energy

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nuclear power



All Discussions People

Pro vs. con view 1990 arguments retrieved in 1.0ms

PRO

Thanks for accepting the LonelyMoutain. I will be...

► Show full argument

Thanks for accepting the LonelyMoutain. I will be presenting my arguments in this round. Good luck! This is the first time I did this topic, and I'm making this debate just to see if the

...
<https://www.debate.org/debates/Nuclear-Power/7/> score ▼

Sorry for the incoherent nature of the opening statement...

► Show full argument

Sorry for the incoherent nature of the opening statement I should have defined it as a look at large scale **nuclear power** station, as my primary example of **nuclear power**. In response to ...

<https://www.debate.org/debates/Nuclear-Power/1/> score ▼

The primary intention of my argument, will be to convince...

► Show full argument

The primary intention of my argument, will be to convince the reader that **nuclear** energy is becoming obsolete. I hope to put **nuclear** energy in the same category as fossil fuels, and perhaps ...

<https://www.debate.org/debates/Nuclear-Power/8/> score ▼

Thank You Mr President for an insightful look into the...

► Show full argument

Thank You Mr President for an insightful look into the "benefits" of **nuclear power**. Now onto my rebuttal! **Nuclear power** is safe? I would have to consider the claim by my opponent that ...

<https://www.debate.org/debates/Nuclear-Power/8/> score ▼

I would like to argue that Nuclear power as a technology...

► Show full argument

I would like to argue that **Nuclear power** as a technology, which have been largely underated due to events such as Chernobyl, is detrimental to the environment more so than the danger radioactive ...

<https://www.debate.org/debates/Nuclear-Power/1/> score ▼

For once, this is not impossible to accept. If you want...

► Show full argument

For once, this is not impossible to accept. If you want to accept, you can right now. I'm

CON

I will agree to my opponents wishes and confine my...

► Show full argument

I will agree to my opponents wishes and confine my arguments to the subject of large scale **nuclear power** facilities, but am still unclear as to his overall resolution. Even taking this ...

<https://www.debate.org/debates/Nuclear-Power/1/> score ▼

Thanks to Smooosh for this debate. I will now present my...

► Show full argument

Thanks to Smooosh for this debate. I will now present my case. I. Intro Pro is implicitly using a cost-benefit analysis framework to analyze the arguments in this debate by appealing to the ...

<https://www.debate.org/debates/Nuclear-Power/8/> score ▼

Thanks, bsh1! I apologize in advance for my delay. I have...

► Show full argument

Thanks, bsh1! I apologize in advance for my delay. I have been extremely busy over this past weekend and I like to put a lot of time and effort into researching and writing my arguments. ...

<https://www.debate.org/debates/Nuclear-Power/5/> score ▼

Unfortunately, my opponent accidentally forfeited his...

► Show full argument

Unfortunately, my opponent accidentally forfeited his final round. Yes, there's still Round 4, but TBR and I agreed before the debate that he'd pass in Round 4, since he started the debate ...

<https://www.debate.org/debates/Nuclear-power/1/> score ▼

Thanks for starting the debate off, TBR. I agree that we...

► Show full argument

Thanks for starting the debate off, TBR. I agree that we face some difficult energy challenges, especially given the problem of climate change and looming carbon constraints. So this is ...

<https://www.debate.org/debates/Nuclear-power/1/> score ▼

Thank you to my opponent spaceman for this debate. I will...

► Show full argument

Thank you to my opponent spaceman for this debate. I will be debating the Con position of....well, I'm not quite sure. I'm going to use this round to untangle Pro's opening statement as

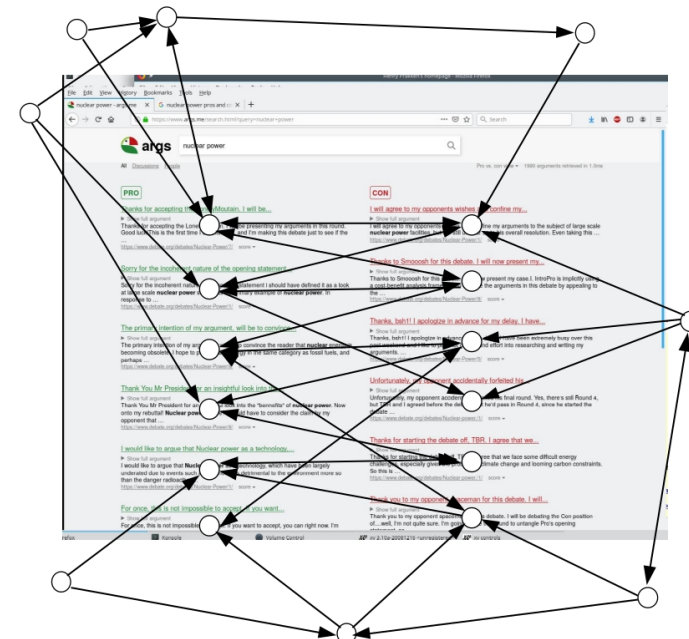
Convincing? Not yet ...

- Further arguments might be needed to obtain a full picture
- Relation between arguments needs to be drawn on solid logical grounds
- Ultimately, this leads to a network of arguments instead of a simple list of pro and cons.

Convincing? Not yet ...

- Further arguments might be needed to obtain a full picture
- Relation between arguments needs to be drawn on solid logical grounds
- Ultimately, this leads to a network of arguments instead of a simple list of pro and cons.
- Desiderata:

- Evaluation: which arguments are jointly acceptable?
- Short response times
- Good visualisation required (avoid bias)



Outline

- Vision: Informed Citizens in a Web of Arguments
- The Gold Standard: Dung's Argumentation Frameworks
- Beyond Dung: Acceptance Problems from a Claim-Centric View
 - Argumentation and LP Revisited
 - Complexity
 - Preferences



Seminal Paper by Phan Minh Dung:

On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artif. Intell.* 77(2):321–358, 1995.



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- “The purpose of this paper is to study the fundamental mechanism, humans use in argumentation, and to explore ways to implement this mechanism on computers.”
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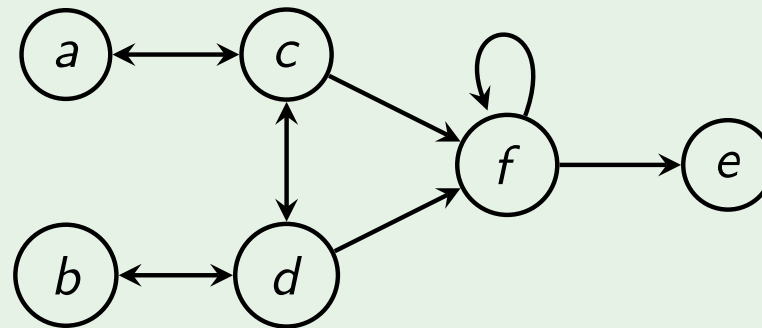
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- “The purpose of this paper is to study the fundamental mechanism, humans use in argumentation, and to explore ways to implement this mechanism on computers.”
- “The idea of argumentational reasoning is that a statement is believable if it can be argued successfully against attacking arguments.”
- “[...] a formal, abstract but simple theory of argumentation is developed to capture the notion of acceptability of arguments.”

Argumentation Frameworks

...thus abstract away from everything but attacks

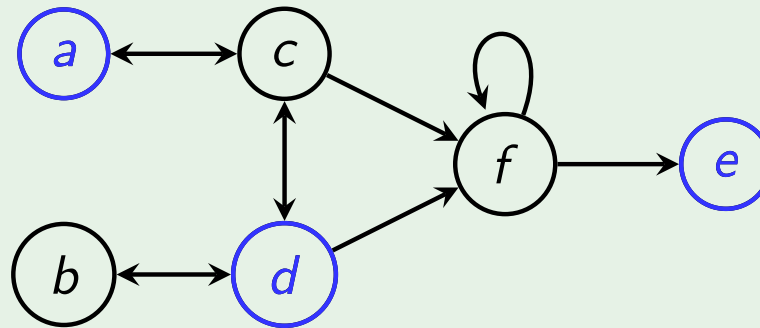
Example



Argumentation Frameworks

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Example

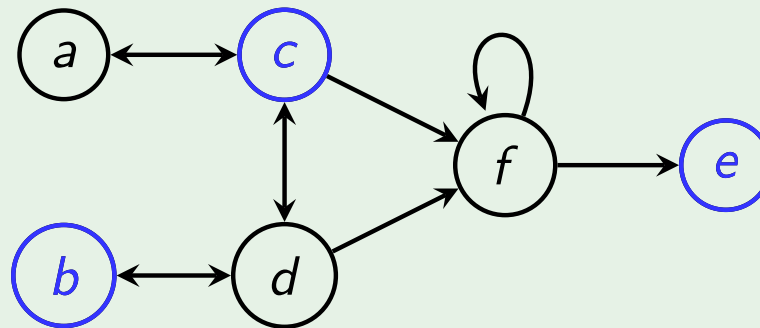


$$stb(F) = \{\{a, d, e\},$$

Argumentation Frameworks

...thus abstract away from everything but attacks

Example

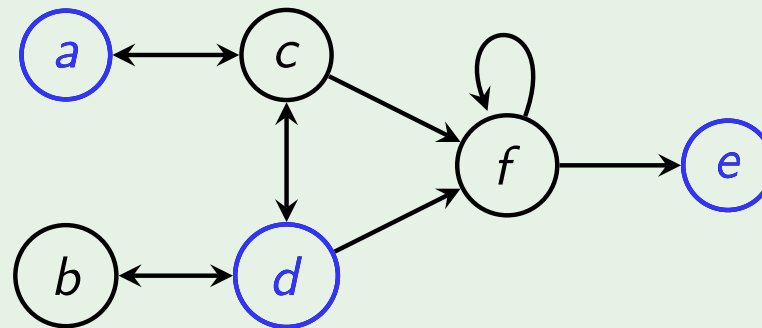


$$stb(F) = \{\{a, d, e\}, \{b, c, e\}\}$$

Argumentation Frameworks

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Example



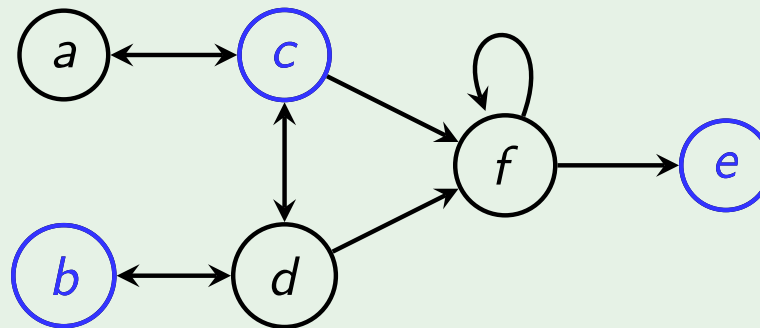
$$stb(F) = \{\{a, d, e\}, \{b, c, e\}\}$$

$$pref(F) = \{\{a, d, e\},$$

Argumentation Frameworks

...thus abstract away from everything but attacks

Example



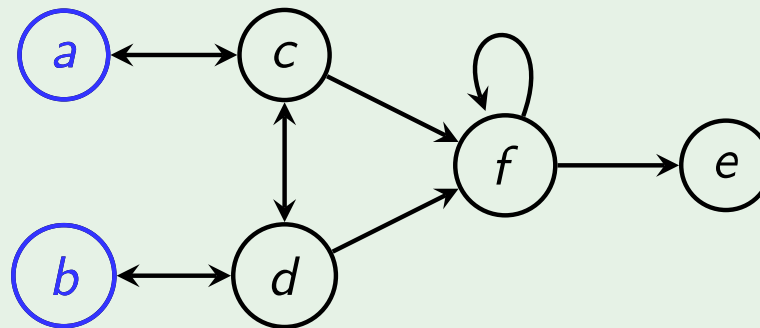
$$stb(F) = \{\{a, d, e\}, \{b, c, e\}\}$$

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Argumentation Frameworks

...thus abstract away from everything but attacks

Example



$$\begin{aligned} stb(F) &= \{\{a, d, e\}, \{b, c, e\}\} \\ pref(F) &= \{\{a, d, e\}, \{b, c, e\}, \{a, b\}\} \end{aligned}$$

Complexity Results – Dung AFs

Basic Decision Problems:

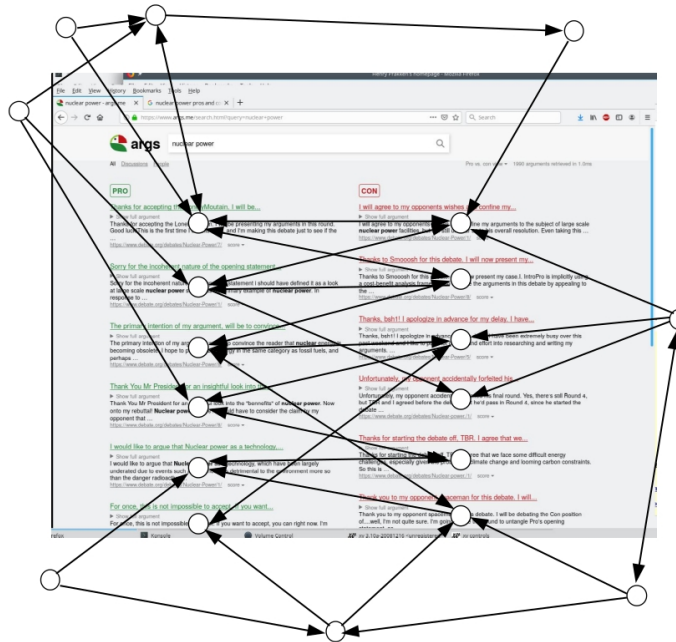
- $Cred_{\sigma}$: is an argument contained in some σ -extension?
- $Skept_{\sigma}$: is an argument contained in all σ -extensions?
- Ver_{σ} : is a set of arguments a σ -extension?

Complexity Results – Dung AFs

Basic Decision Problems:

- $Cred_\sigma$: is an argument contained in some σ -extension?
- $Skept_\sigma$: is an argument contained in all σ -extensions?
- Ver_σ : is a set of arguments a σ -extension?

σ	$Cred_\sigma$	$Skept_\sigma$	Ver_σ
<i>cf</i>	in P	trivial	in P
<i>naive</i>	in P	in P	in P
<i>grd</i>	P-c	P-c	P-c
<i>stb</i>	NP-c	coNP-c	in P
<i>adm</i>	NP-c	trivial	in P
<i>comp</i>	NP-c	P-c	in P
<i>pref</i>	NP-c	Π_2^P -c	coNP-c
<i>sem</i>	Σ_2^P -c	Π_2^P -c	coNP-c
<i>stage</i>	Σ_2^P -c	Π_2^P -c	coNP-c



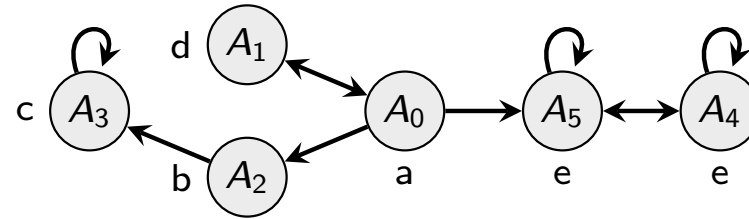
We observe a certain gap:

- Due to the abstraction, reasoning is solely based on argument names, rather than on their claims
- in fact, several arguments might have the same claim
- thus, checking whether a claim is supported by every possible extension is a different problem compared to checking whether an argument is contained in every possible extension
- we propose a shift from an argument-centric view to a claim-centric view

On the Relation of Logic Programming and Argumentation

$r_0: a \leftarrow \text{not } d$
 $r_1: d \leftarrow \text{not } a$
 $r_2: b \leftarrow \text{not } a$
 $r_3: c \leftarrow \text{not } c, \text{not } b$
 $r_4: e \leftarrow \text{not } e$
 $r_5: e \leftarrow \text{not } a, \text{not } e$

Logic Program P



Resulting AF F (with claims)

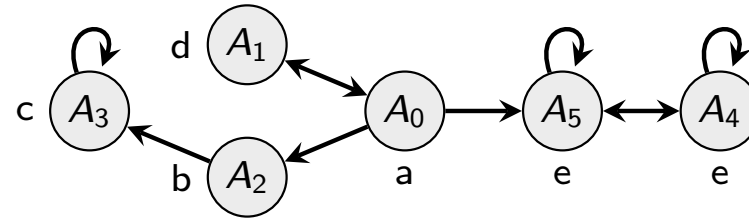
Translation from Logic Programs (LPs) to AFs (Caminada et al., 2015)

- Rule r_i corresponds to argument A_i , head of r_i gives claim of A_i
- A_i with claim c attacks A_j if **not** c appears in body of rule r_j

On the Relation of Logic Programming and Argumentation

$r_0: a \leftarrow \text{not } d$
 $r_1: d \leftarrow \text{not } a$
 $r_2: b \leftarrow \text{not } a$
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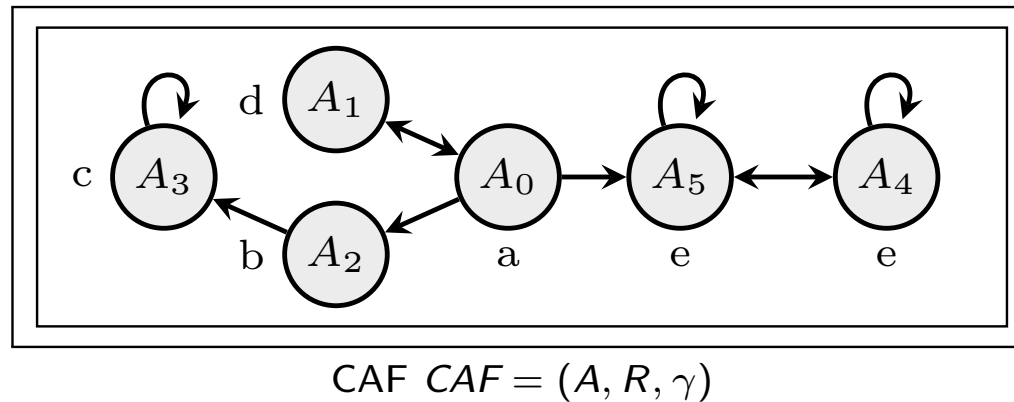
- Rule r_i corresponds to argument A_i , head of r_i gives claim of A_i
- A_i with claim c attacks A_j if **not** c appears in body of rule r_j

- Many LP semantics expressible as AF semantics (e.g., stable semantics)
- However, not every LP semantics is expressible as AF semantics as already observed by Caminada et al. (e.g., L-stable model semantics)

Argumentation Frameworks with Claims

Definition

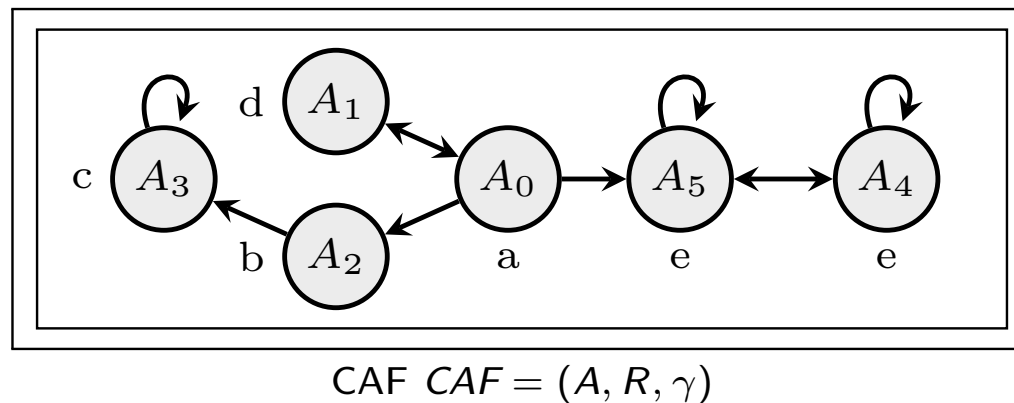
A **Claim-augmented Argumentation Framework (CAF)** is a triple (A, R, γ) where (A, R) is an AF and $\gamma : A \rightarrow C$ maps arguments to claims.



Argumentation Frameworks with Claims

Definition

A **Claim-augmented Argumentation Framework (CAF)** is a triple (A, R, γ) where (A, R) is an AF and $\gamma : A \rightarrow C$ maps arguments to claims.



Definition

A CAF (A, R, γ) is called **well-formed** if, for any a, b with $\gamma(a) = \gamma(b)$, $\{c \mid (a, c) \in R\} = \{c \mid (b, c) \in R\}$.

Semantics Straight-Forward?

Definition

For a semantics σ , we define the inherited variant as follows:

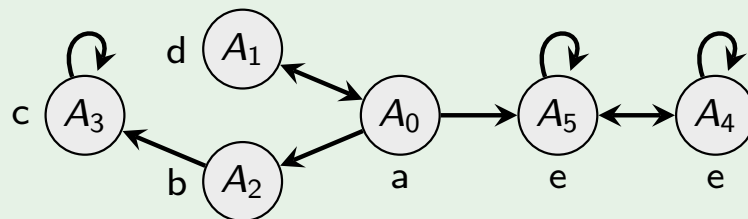
$$\sigma_c((A, R, \gamma)) = \{\gamma(S) \mid S \in \sigma((A, R))\}.$$

(Given a set $S \subseteq A$ of arguments and $\gamma : A \rightarrow C$, let $\gamma(S) = \{\gamma(a) \mid a \in S\}$.)

Semantics Straight-Forward?

Example (Semi-stable semantics)

For AF (A, R) , $S \subseteq A$, S^+ denotes the set of arguments attacked by S . S is **semi-stable** if S is conflict-free & defends itself (admissible) and there is no admissible set T with $S \cup S^+ \subset T \cup T^+$ (subset-maximal range)

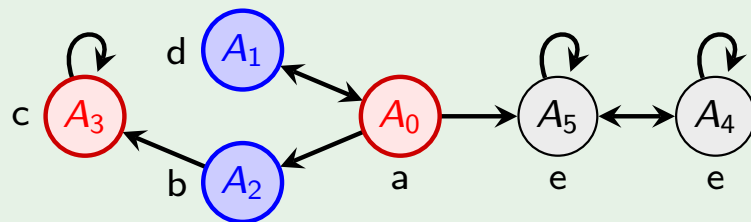


Semi-stable extensions of (A, R) :
 $sem((A, R)) = \{\{A_1, A_2\},$

Semantics Straight-Forward?

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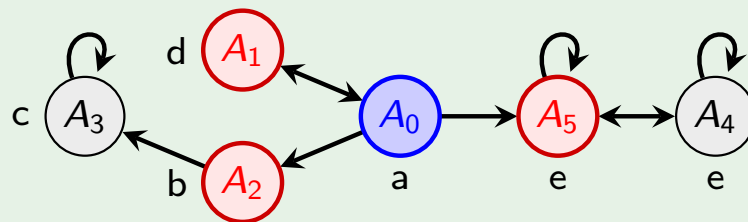


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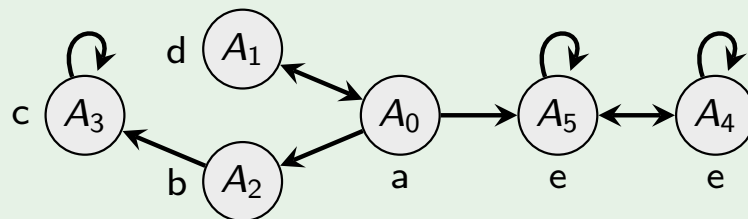


Semi-stable extensions of (A, R) :
 $sem((A, R)) = \{\{A_1, A_2\}, \{A_0\}\}$

Semantics Straight-Forward?

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Semi-stable extensions of (A, R) :
 $sem((A, R)) = \{\{A_1, A_2\}, \{A_0\}\}$

- inherited semi-stable extensions: $sem_c(CAF) = \{\{b, d\}, \{a\}\}$

Claim-Level Semantics for CAFs (I)

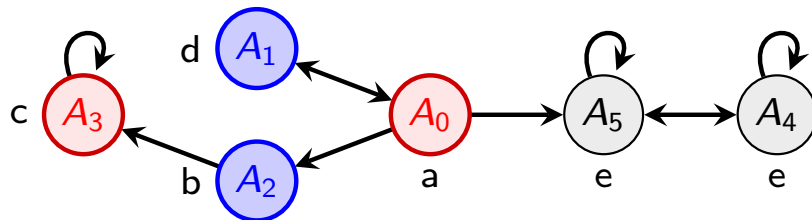
- **Idea:** Maximization on claim-level instead of argument-level
 - simple for, e.g., preferred semantics.
- **Problem:** Semi-stable requires maximization of **range**
 \hookrightarrow We introduce **claim-defeat** in order to maximize range of claim-sets

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- **Idea:** Maximization on claim-level instead of argument-level
 - simple for, e.g., preferred semantics.
- **Problem:** Semi-stable requires maximization of **range**
 - ↪ We introduce **claim-defeat** in order to maximize range of claim-sets

Definition (Defeat of claims)

Let $CAF = (A, R, \gamma)$. $E \subseteq A$ **defeats** $c \in \gamma(A)$ if E attacks every $a \in A$ with $\gamma(a) = c$. $dis_{CAF}(E)$ denotes the set of all defeated claims of E .

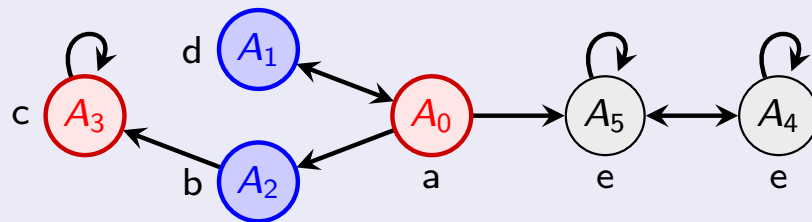


- defeated claims of $\{b, d\}$: a, c
- range of $\{b, d\}$: $\{a, b, c, d\}$

Claim-Level Semantics for CAFs (II)

Definition (cl-semi-stable semantics)

Let $CAF = (A, R, \gamma)$. $S \subseteq \gamma(A)$ is a **cl-semi-stable claim-set** if there is an admissible set of arguments $E \subseteq A$ with $\gamma(E) = S$ such that there is no admissible set of arguments $G \subseteq A$ with $S \cup dis_{CAF}(E) \subset \gamma(G) \cup dis_{CAF}(G)$.

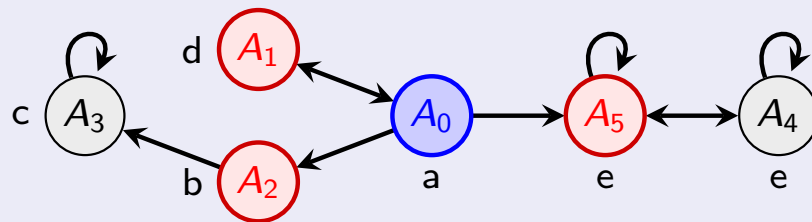


- range of $\{b, d\}$: $\{a, b, c, d\}$

Claim-Level Semantics for CAFs (II)

Definition (cl-semi-stable semantics)

Let $CAF = (A, R, \gamma)$. $S \subseteq \gamma(A)$ is a **cl-semi-stable claim-set** if there is an admissible set of arguments $E \subseteq A$ with $\gamma(E) = S$ such that there is no admissible set of arguments $G \subseteq A$ with $S \cup dis_{CAF}(E) \subset \gamma(G) \cup dis_{CAF}(G)$.

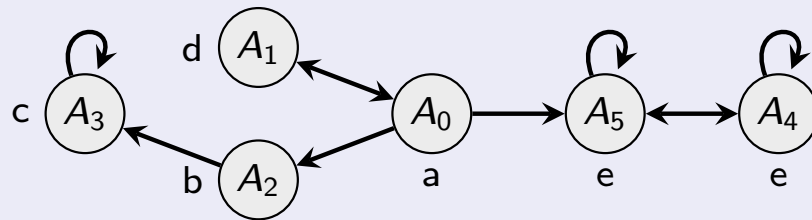


- range of $\{b, d\}$: $\{a, b, c, d\}$
- range of $\{a\}$: $\{a, b, d\}$

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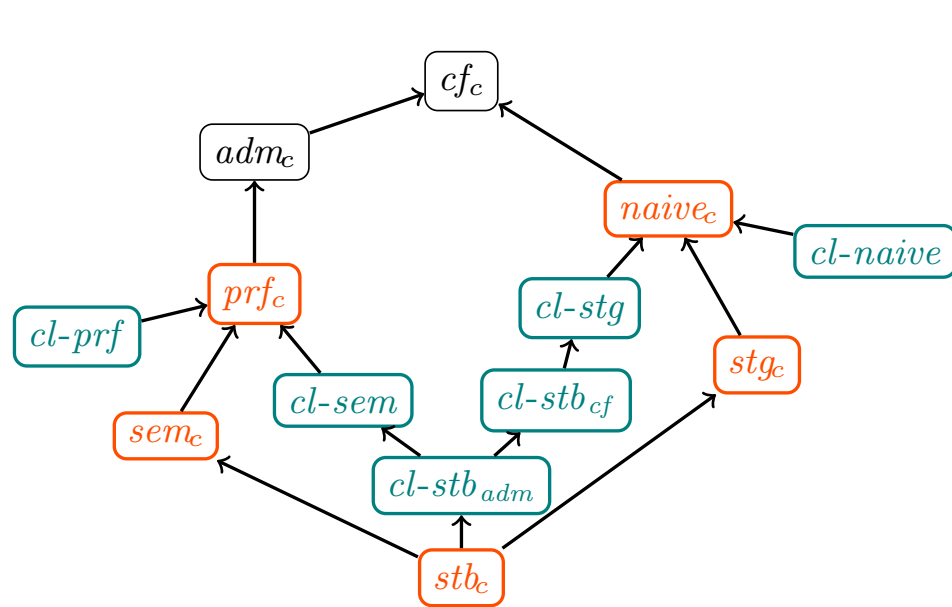
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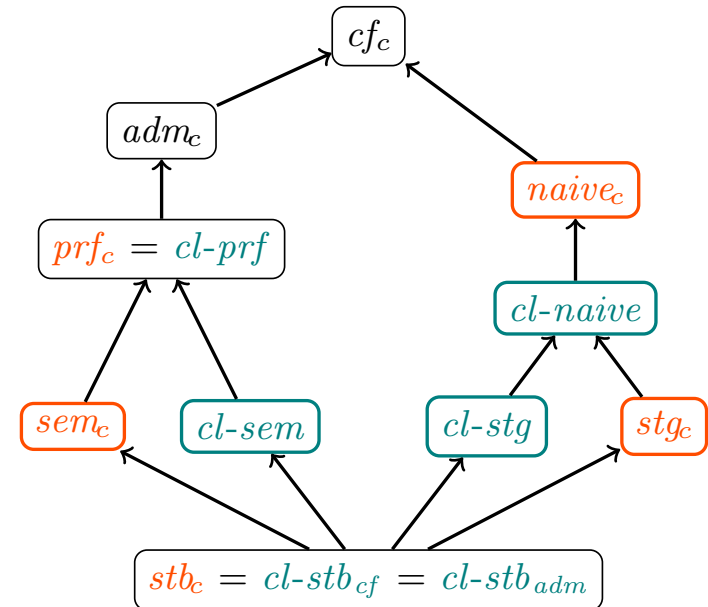
- range of $\{b, d\}$: $\{a, b, c, d\}$
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- Range of $\{a\}$ is not subset-maximal
 \hookrightarrow Unique cl-semi-stable claim-set of CAF is $\{b, d\}$.

Relations between Semantics



Relations between semantics for CAFs



Relations for well-formed CAFs

An arrow from σ to τ indicates $\sigma(CAF) \subseteq \tau(CAF)$ for every CAF CAF .

Wolfgang Dvorák, Anna Rapberger, Stefan Woltran: Argumentation Semantics under a Claim-centric View: Properties, Expressiveness and Relation to SETAFs. KR 2020: 341-350

Complexity Results – General CAFs

Decision Problems Reformulated:

- $Cred_{\sigma}$: is a claim contained in some σ -extension?
- $Skept_{\sigma}$: is a claim contained in all σ -extensions?
- Ver_{σ} : is a set of claims a σ -extension?

Complexity Results, Inherited Semantics

σ	$Cred_\sigma$	$Skept_\sigma$	Ver_σ
<i>cf</i>	in P	trivial	NP-c
<i>naive</i>	in P	coNP-c	NP-c
<i>grd</i>	P-c	P-c	P-c
<i>stb</i>	NP-c	coNP-c	NP-c
<i>adm</i>	NP-c	trivial	NP-c
<i>comp</i>	NP-c	P-c	NP-c
<i>pref</i>	NP-c	Π_2^P -c	Σ_2^P -c
<i>sem</i>	Σ_2^P -c	Π_2^P -c	Σ_2^P -c
<i>stage</i>	Σ_2^P -c	Π_2^P -c	Σ_2^P -c

Results that deviate from the corresponding results for AFs are highlighted in bold-face.

Complexity Results - Exemplary Proof

Theorem

Ver_{stb} is NP-complete.

Complexity Results - Exemplary Proof

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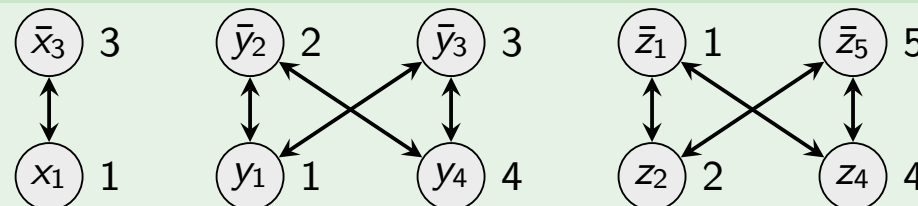
Proof Sketch (Hardness). We reduce from 3-SAT. Let φ be given as set $Cl = \{cl_1, \dots, cl_m\}$ of clauses over atoms X . We construct a CAF $CAF = (A, R, \gamma)$ with the arguments given by the two sets $V = \{x_i \mid x \in X, x \in cl_i\}$ and $\bar{V} = \{\bar{x}_i \mid x \in X, \neg x \in cl_i\}$:

$$A = V \cup \bar{V} \quad R = \{(x_i, \bar{x}_j), (\bar{x}_j, x_i) \mid x_i \in V, \bar{x}_j \in \bar{V}\}$$

$$\gamma(x_i) = i \text{ for } x_i \in V \text{ and } \gamma(\bar{x}_i) = i \text{ for } \bar{x}_i \in \bar{V}.$$

It holds that φ is satisfiable iff $\{1, \dots, m\}$ is stable.

Example: $\varphi = \{\{x, y, \neg z\}, \{\neg y, z\}, \{\neg x, \neg y\}, \{y, z\}, \{\neg z\}\}.$



Complexity Results, Claim-based Semantics

σ	$Cred_\sigma$	$Skept_\sigma$	Ver_σ
$cl-stb_{adm}$	NP-c	coNP-c	NP-c
$cl-stb_{cf}$	NP-c	coNP-c	NP-c
$cl-prf$	NP-c	Π_2^P -c	<u>DP-c</u>
$cl-naive$	in P	<u>Π_2^P-c</u>	<u>DP-c</u>
$cl-sem$	Σ_2^P -c	Π_2^P -c	Σ_2^P-c
$cl-stg$	Σ_2^P -c	Π_2^P -c	Σ_2^P-c

Results that deviate from the corresponding AF results are in bold-face; results that deviate from those w.r.t. inherited semantics are underlined.

Complexity Results – Well-formed CAFs

For the important class of well-formed CAFs, complexity drops back on AF level for most cases.

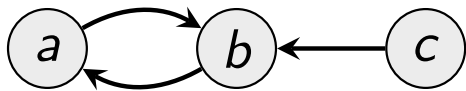
Exceptions:

- Skeptical acceptance for naive semantics remains **coNP**-complete (for both variants)
- Some deviations for restricted graph classes

Wolfgang Dvorák, Alexander Greßler, Anna Rapberger, Stefan Woltran:
The Complexity Landscape of Claim-Augmented Argumentation
Frameworks. AAI 2021: 6296-6303.

Preferences in Argumentation Frameworks

- A Preference-based AF¹ is a triple (A, R, \succ) .
 - If $x \succ y$ then x is stronger than y .
 - Critical attack: $x \succ y$ but $(y, x) \in R$.

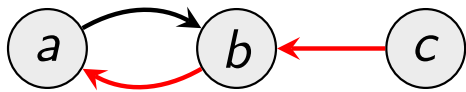


Example PAF with $a \succ b$ and $b \succ c$

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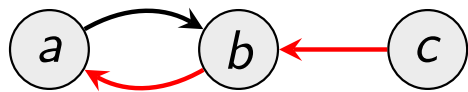


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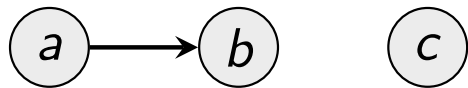
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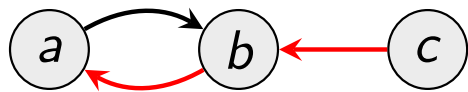


Reduction 1 (deletion)

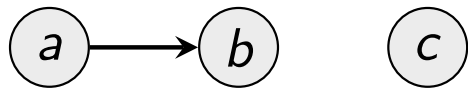
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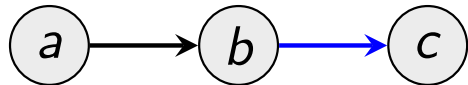
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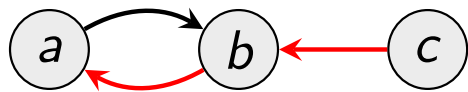


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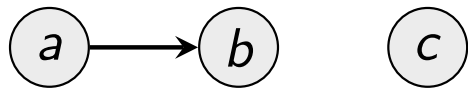
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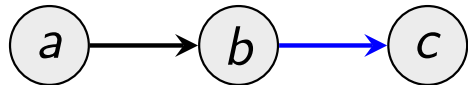
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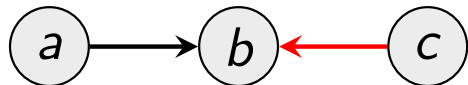
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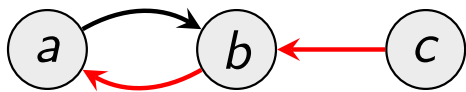


Reduction 3 (conservative deletion)

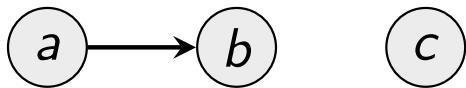
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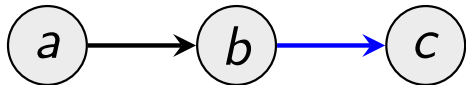
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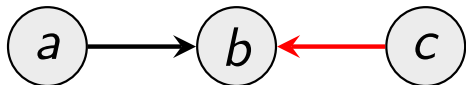
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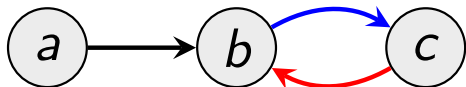
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Reduction 4 (defense)

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	<i>naive</i>	<i>stb</i>	<i>pref</i>	<i>sem</i>	<i>stage</i>
<i>CAF</i>	x	x	x	x	x
<i>wfCAF</i>	x	✓	✓	✓	✓

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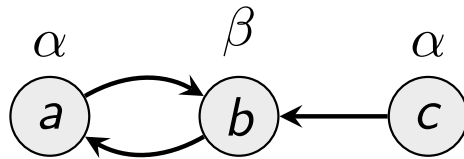
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- **Complexity** of verification ... given a CAF F and a set of claims C , is C a σ -extension of F ?

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<i>cf/adm/naive/stb/comp</i>	NP-c	in P
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Preference-based CAFs

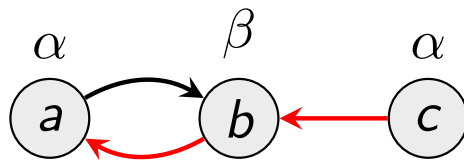
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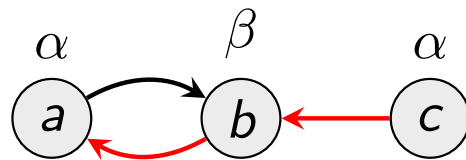
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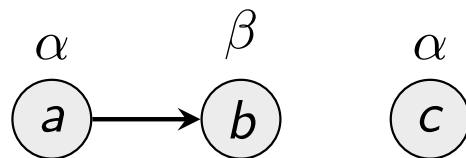
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Example PCAF P with $a \succ b$ and $b \succ c$

- Let $\mathcal{R}_i(P)$ be the result of applying Reduction i to a PCAF P .



$\mathcal{R}_1(P)$ for above example PCAF

Preference-based CAFs

- Four new CAF classes ($i \in \{1, 2, 3, 4\}$):

$$\mathcal{R}_i\text{-}\mathbf{CAF} = \{\mathcal{R}_i(P) \mid P \text{ is a PCAF}\}$$

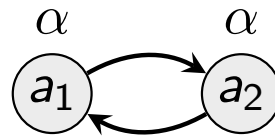
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- Is every CAF in $\mathcal{R}_i\text{-}\mathbf{CAF}$? No!
- The following CAF is in none of the four classes:



- For all $i \in \{1, 2, 3, 4\}$: $\mathbf{wfCAF} \subset \mathcal{R}_i\text{-}\mathbf{CAF} \subset \mathbf{CAF}$.

Proposition

For all $i \in \{1, 2, 4\}$ and all $j \in \{1, 2, 3, 4\}$ such that $i \neq j$ it holds that $\mathcal{R}_i\text{-}\mathbf{CAF} \not\subseteq \mathcal{R}_j\text{-}\mathbf{CAF}$ and $\mathcal{R}_3\text{-}\mathbf{CAF} \subset \mathcal{R}_i\text{-}\mathbf{CAF}$.

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- Recall: a semantics σ preserves I-maximality if for σ -extensions S, T we have that $S \subseteq T$ implies $S = T$.

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$\mathcal{R}_{1,2,4}$	×	×	×	×	×
\mathcal{R}_3	×	✓	✓	✓	×

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$\mathcal{R}_{1,2,4}$	×	×	×	×	×
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- Reduction 3 is the most conservative of the reductions:
 - conflicts are never completely deleted;
 - no new attacks are introduced.

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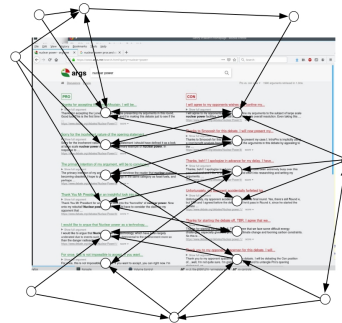
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So far, results only for inherited CAF semantics ...

Michael Bernreiter, Wolfgang Dvorák, Anna Rapberger, Stefan Woltran: The Effect of Preferences in Abstract Argumentation Under a Claim-Centric View. NMR'22.

Summary

- Formulated a vision towards a Web of Arguments



- Proposal for a core formalism to evaluate a network of arguments under a claim-centric view (CAFs)
 - Different definition of semantics
 - Complexity issues (verification becomes harder for general CAFs)
 - Effect of preferences