

Comparing the cognitive plausibility of abstract argumentation semantics based on empirical studies

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- An **extension** is a set of arguments from an AF that may be accepted together.
- An **argumentation semantics** is a function that maps each argumentation framework to a set of extensions.
- Multiple argumentation semantics have been proposed in the literature, e.g. **grounded**, **preferred**, **CF2** and **SCF2**.

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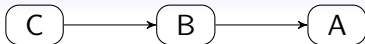
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- Study 2 and Study 3 were based on a prestudy that studied the directionality of attacks between natural language arguments.

Example items by Rahwan et al. (2010)

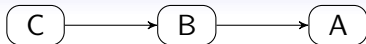


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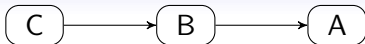


- A.** The battery of Alex's car is not working. Therefore, Alex's car will halt.
- B.** The battery of Alex's car has just been changed today. Therefore, the battery of Alex's car is working.
- C.** The garage was closed today. Therefore, the battery of Alex's car has not been changed today

Example items by Cramer & Guillaume (2018)



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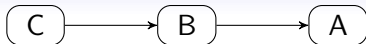


A. According to BBC, President Donald Trump shot an Asiatic lion yesterday. Asiatic lions generally have a mane. So President Donald Trump shot an animal that has a mane.

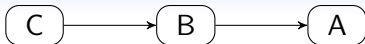
B. The website of the American Society of Animal Species explains that female Asiatic lions generally don't have a mane. So it is not right to say that Asiatic lions generally have a mane.

C. According to an article in America Today, the American Society of Animal Species is a pseudoscientific organization that is funded by a fundamentalist church and hires its staff based on church membership rather than scientific expertise. Therefore the explanations on its website cannot be trusted.

Example items by Cramer & Guillaume (2019)



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- A.** Islander Alice says that there is a treasure buried near the northern tip of the island. So we should dig up the sand near the northern tip of the island.
- B.** Islander Bob says that islander Alice is not trustworthy and that there is a treasure buried behind the bridge. So we should not trust what Alice says, and we should dig up the sand behind the bridge.
- C.** Islander Charlie says that islander Bob is not trustworthy and that there is a treasure buried in front of the well. So we should not trust what Bob says, and we should dig up the sand in front of the well.

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- An argument a is **weakly undecided** iff it is neither strongly accepted nor strongly rejected.

Argumentation semantics

We consider the following semantics:

- Admissibility-based semantics:

Argumentation semantics

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 - Grounded semantics

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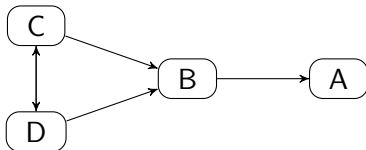
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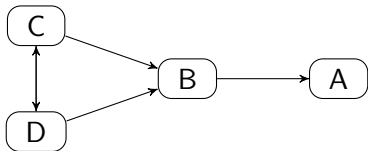
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Example result: Floating reinstatement



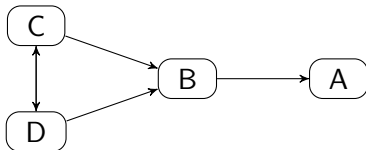
- A is strongly accepted in preferred, semi-stable, CF2, SCF2, stage and stage2.

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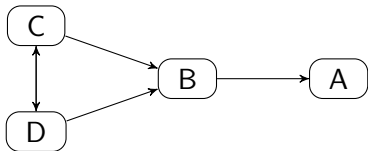
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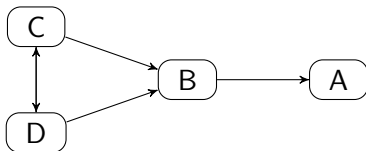
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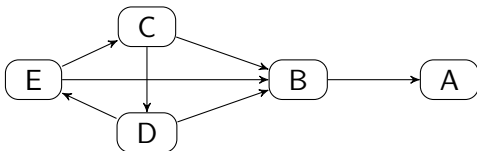
- A is strongly accepted in preferred, semi-stable, CF2, SCF2, stage and stage2.
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- Study 1: Significantly more confidence in A than in B.
- Study 2: Accept A: 83%. Undecided about A: 15%. Reject A: 2%

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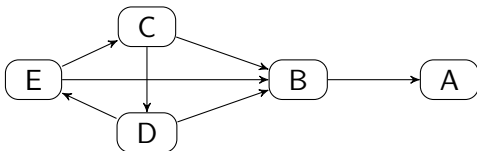
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- Study 3: Accept A: 55%. Undecided about A: 24%. Reject A: 21%

Example result: 3-cycle reinstatement



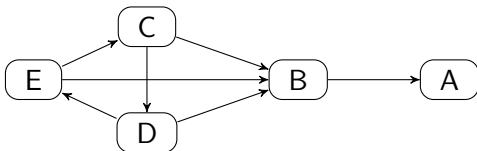
- A is undecided in grounded, preferred and semi-stable semantics.

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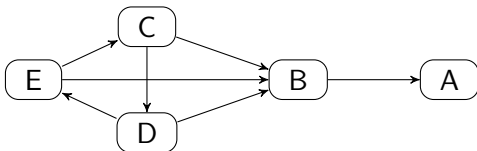
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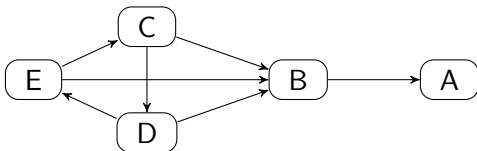
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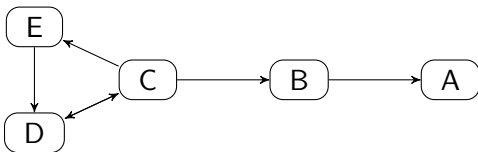
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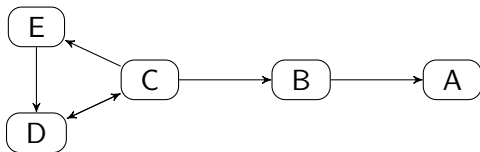
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- Study 3 (non-grounded participants):
Accept A: 67%. Undecided about A: 33%. Reject A: 0%

Example result: 2-3-cycle with output



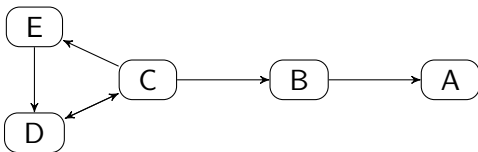
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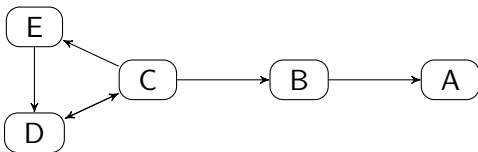
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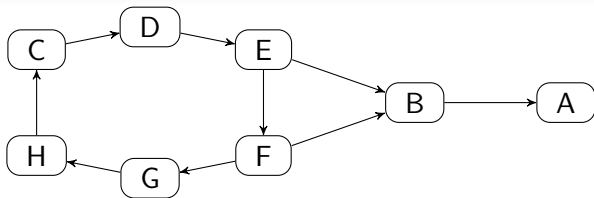
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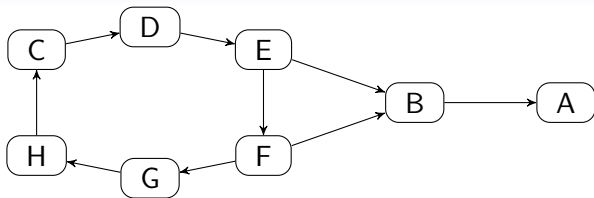
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Example result: 6-cycle with output



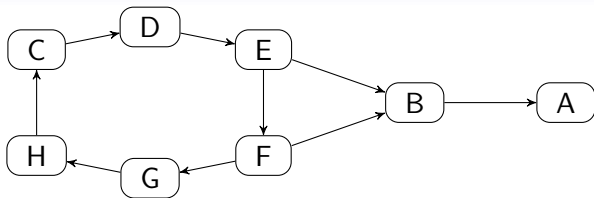
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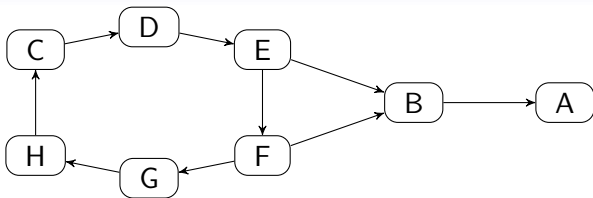
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 - Grounded, CF2 and SCF2 did not significantly differ from each other.
 - Some participants used the general strategy of choosing **undecided** whenever there is some reason for doubt.
 - The judgements of the other ("non-grounded") participants were correctly predicted by preferred semantics in 73.7% of the cases, semi-stable in 65.8%, CF2 in 79.8%, SCF2 in 80.7%, stage in 67.0%, 74.9% of the cases.

Definition of SCF2

- SCOOC principle: If an argument a is not in an odd cycle, then an extension not containing any of a 's attackers must contain a .

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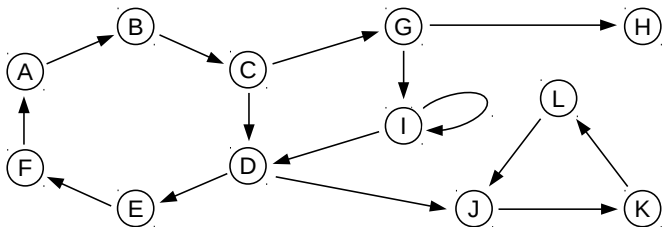
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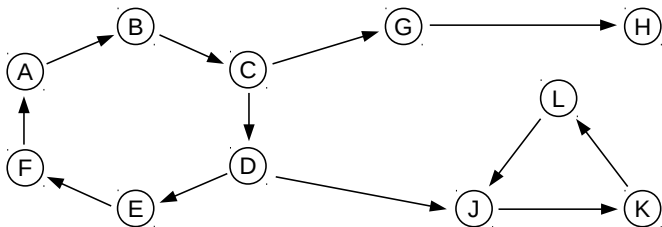
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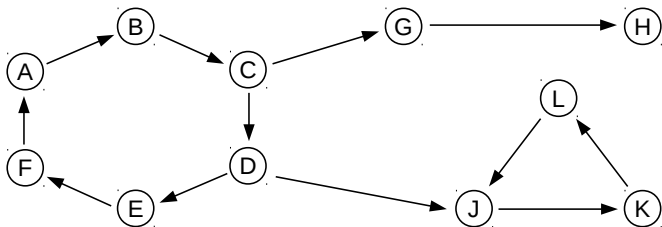
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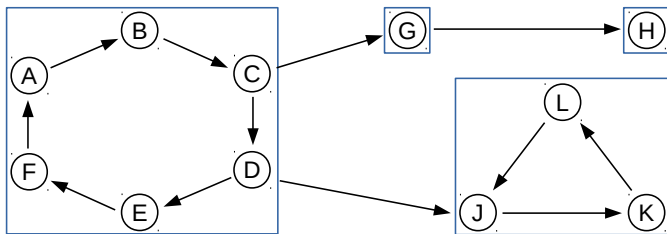
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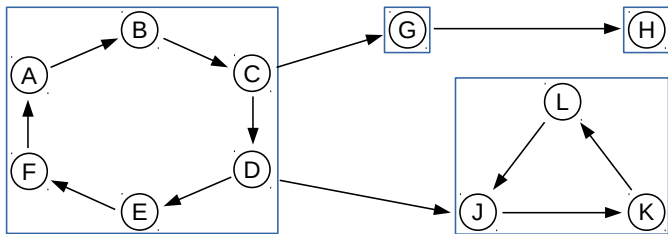
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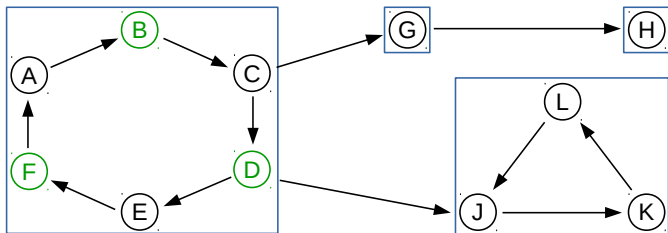
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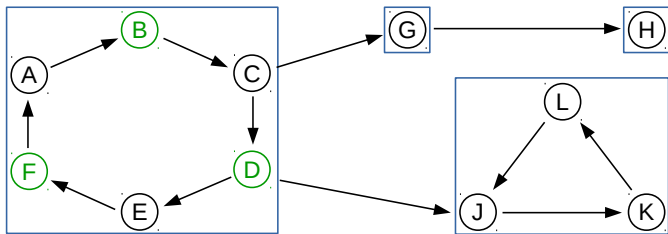
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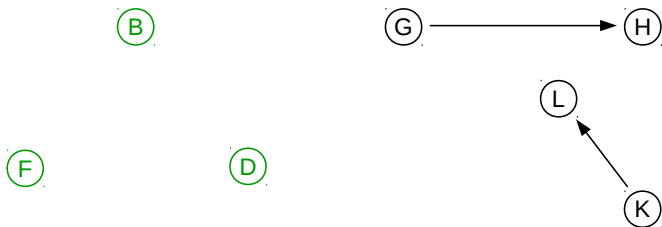
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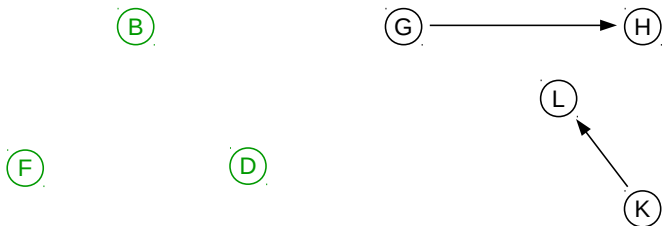
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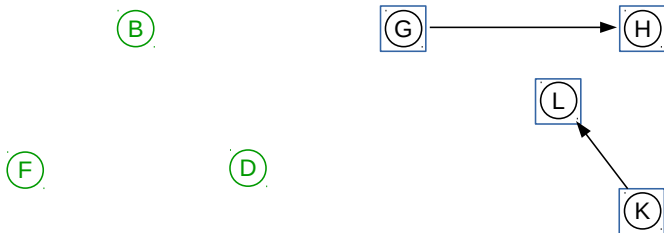
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 - 5 Return to step 2, restricted to not yet chosen arguments.



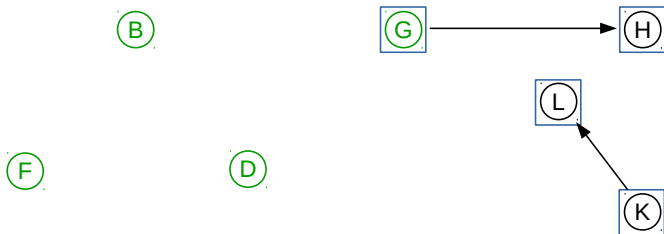
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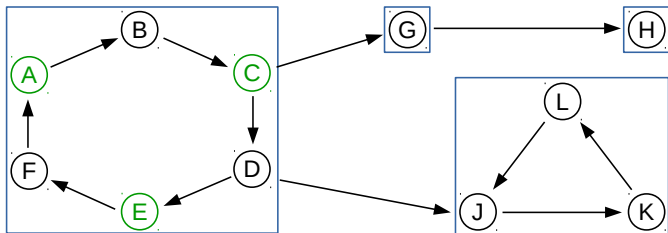
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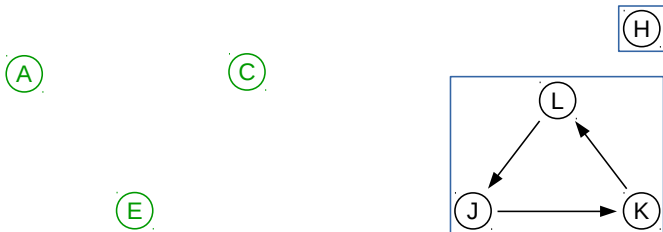
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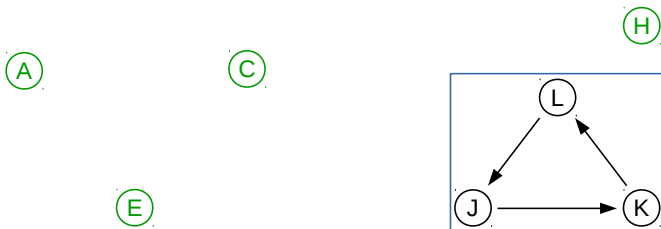
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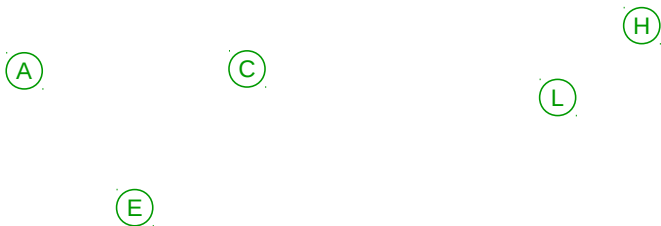
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- So far no cognitive studies have tackled the issue of multiple extensions.

References

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