On the Instantiation of Abstract Argumentation Frameworks

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Outline

What is Abstract Argumentation?

Structured Argumentation: Logic Programming

Abstract Argumentation

- NMR formalism proposed by Dung in 1995.
  - Core reference in modern argumentation theory.
  - Given a set of arguments, decide which subsets are admissible.
  - Captures a variety of semantics in NMR formalisms: inductive logic, default logic, logic programming,...

Abstract Argumentation - Example

- Dung defined Argumentation Frameworks (AFs)...
  - An AF is a graph (*Args*, *Att*): nodes are arguments; edges are conflicts.

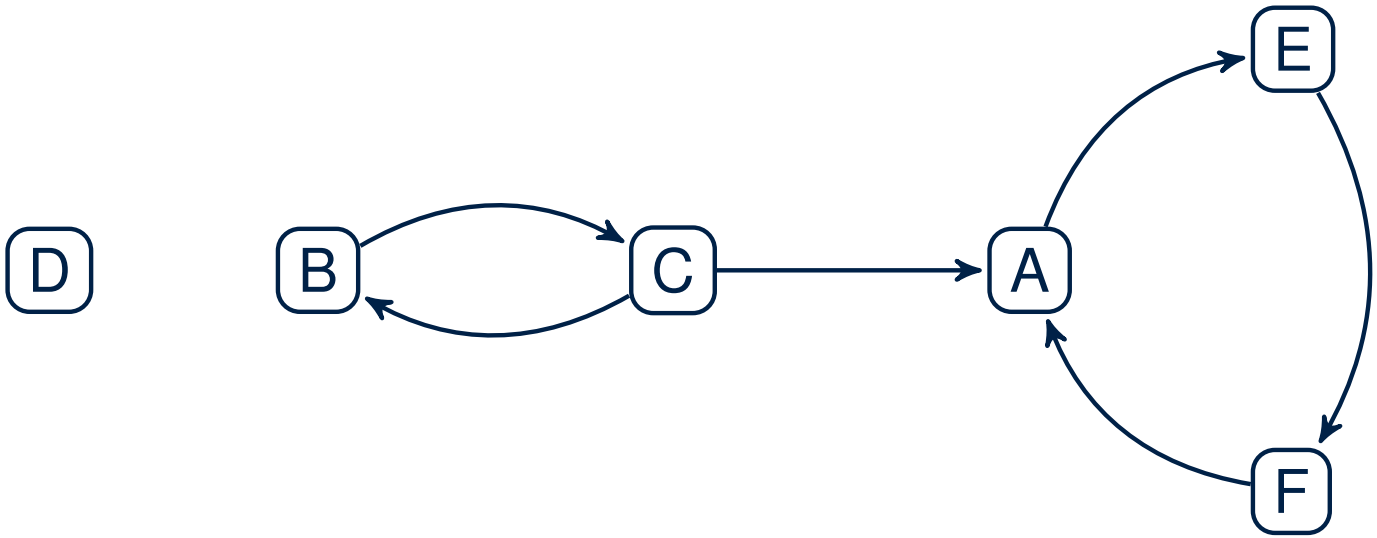
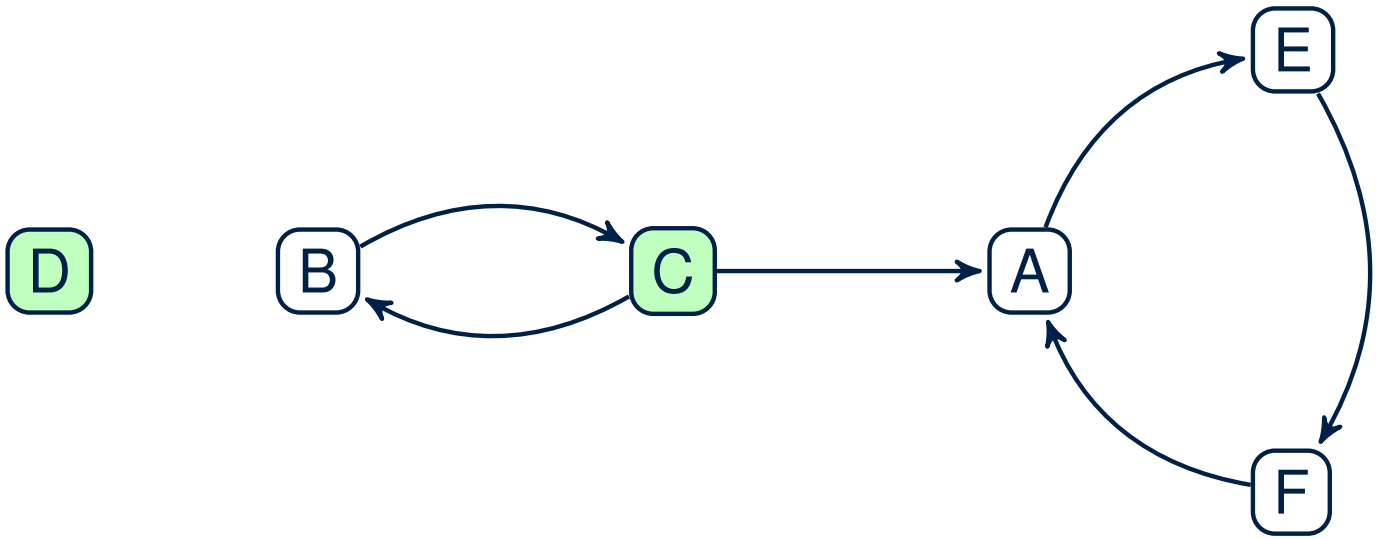


Figure: An AF - What arguments can we accept?

Abstract Argumentation - Example

- ... and *admissibility* semantics. A set *S* of arguments:
  - is **conflict-free** if no two arguments attack one another;



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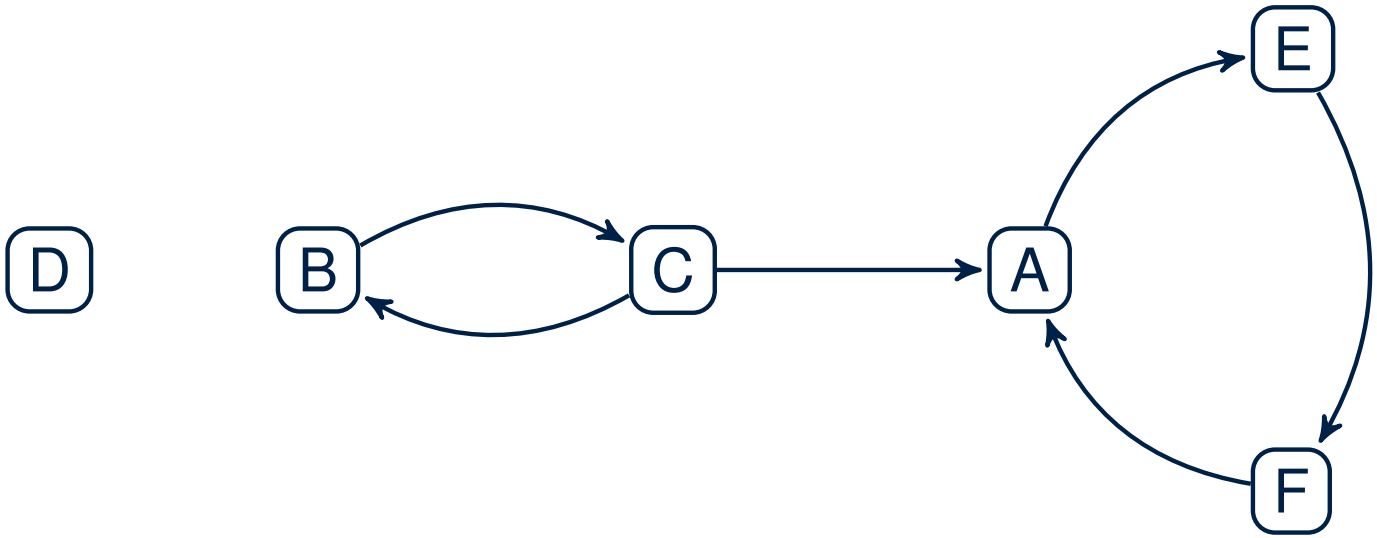
Abstract Argumentation - Example

- ... and *admissibility* semantics. A set *S* of arguments:
  - **defends** itself if *S* attacks each of its attackers;



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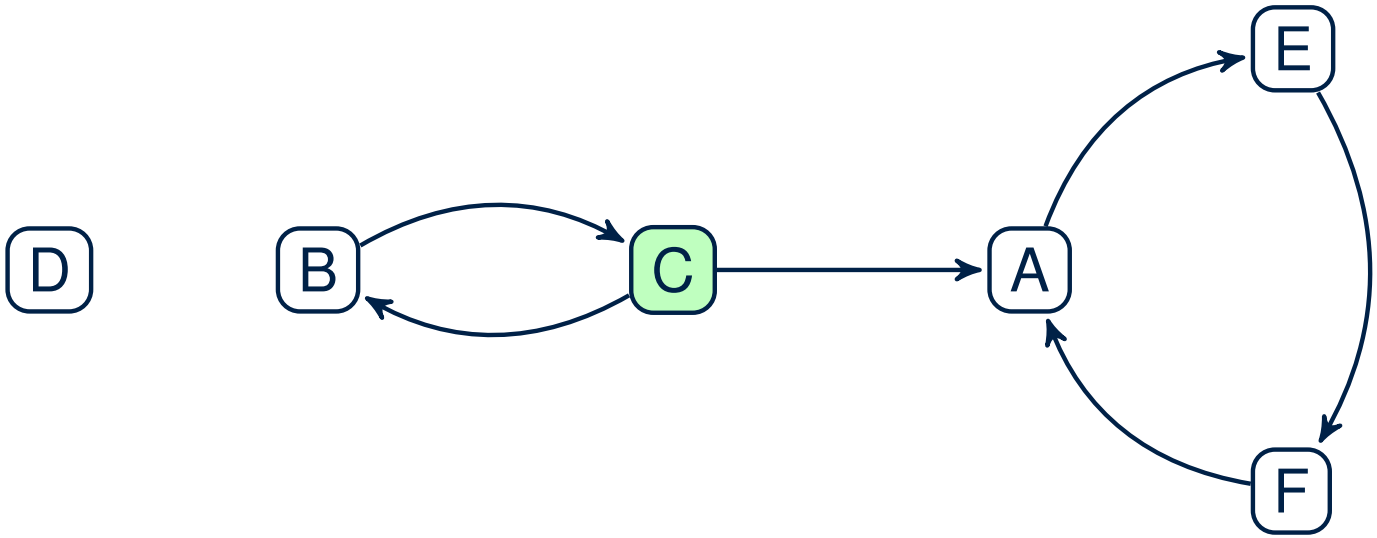

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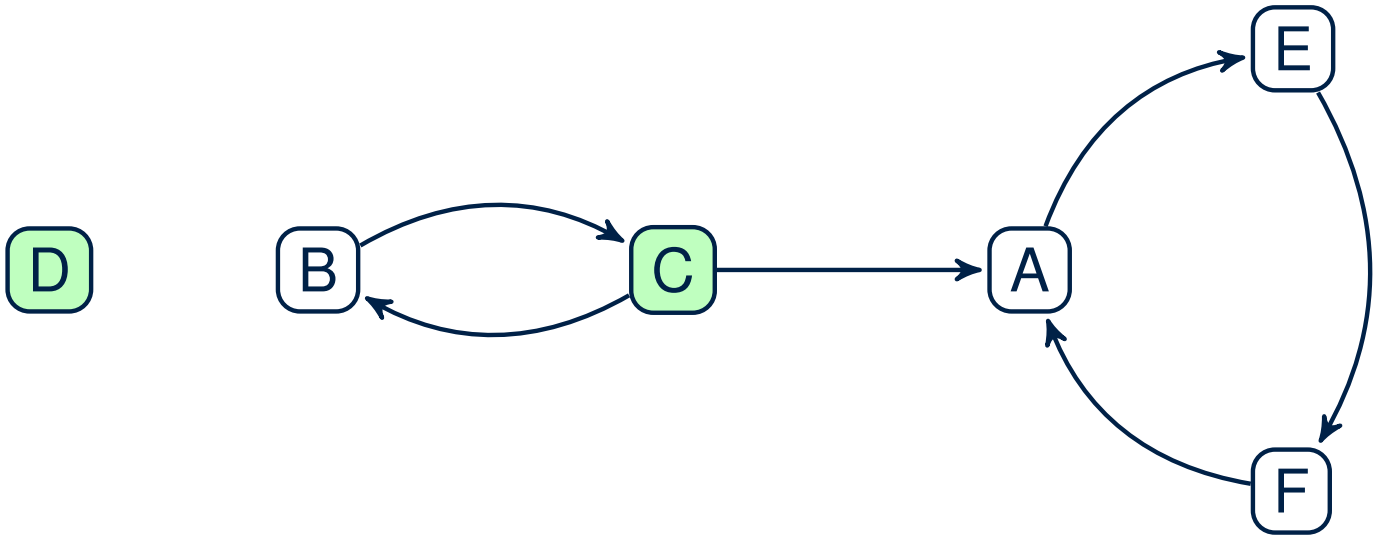

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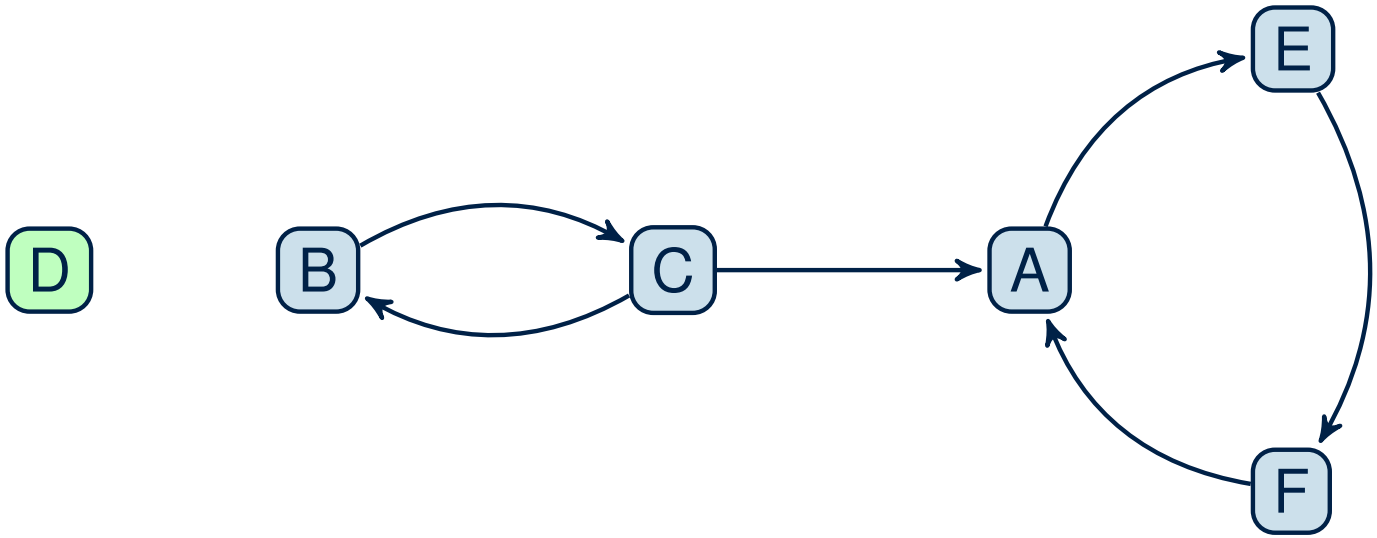
Abstract Argumentation

- Let $F(S) = \{A | S \textit{ defends } A\}$, a set of arguments S is:
  - admissible iff S is conflict-free and $S \subseteq F(S)$.
  - a complete extension iff S is a conflict-free fixpoint of F, i.e., if S is conflict-free and $S = F(S)$.
  - a grounded extension iff S is the minimal conflict-free fixpoint of F.
  - a preferred extension iff S is a maximal conflict-free fixpoint of F.
  - a stable extension iff S is a conflict-free fixpoint of F such that $S \cup S^+ = Ar$.
  - a semi-stable extension iff S is a conflict-free fixpoint of F with maximal $S \cup S^+$.

Abstract Argumentation - Example

- The extensions of our example are: $E_1 = \{D\}$, $E_2 = \{D, B\}$, $E_3 = \{D, C, E\}$; E_1 is the grounded extension, while E_2, E_3 are preferred. Only E_3 is stable. Only E_3 is semi-stable.



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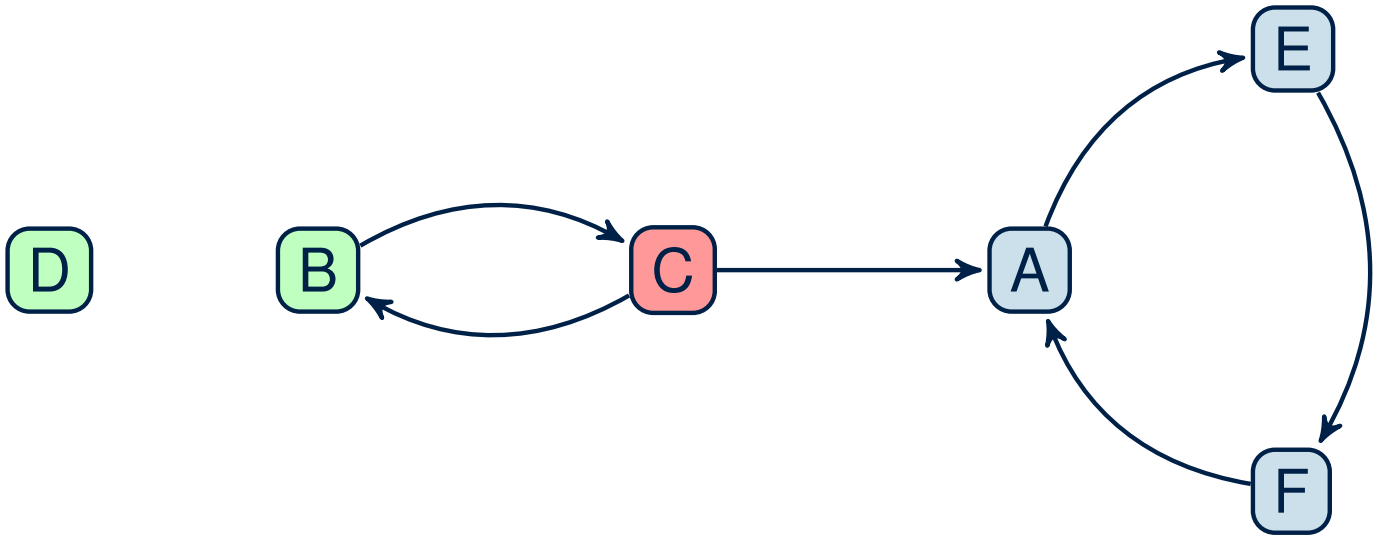

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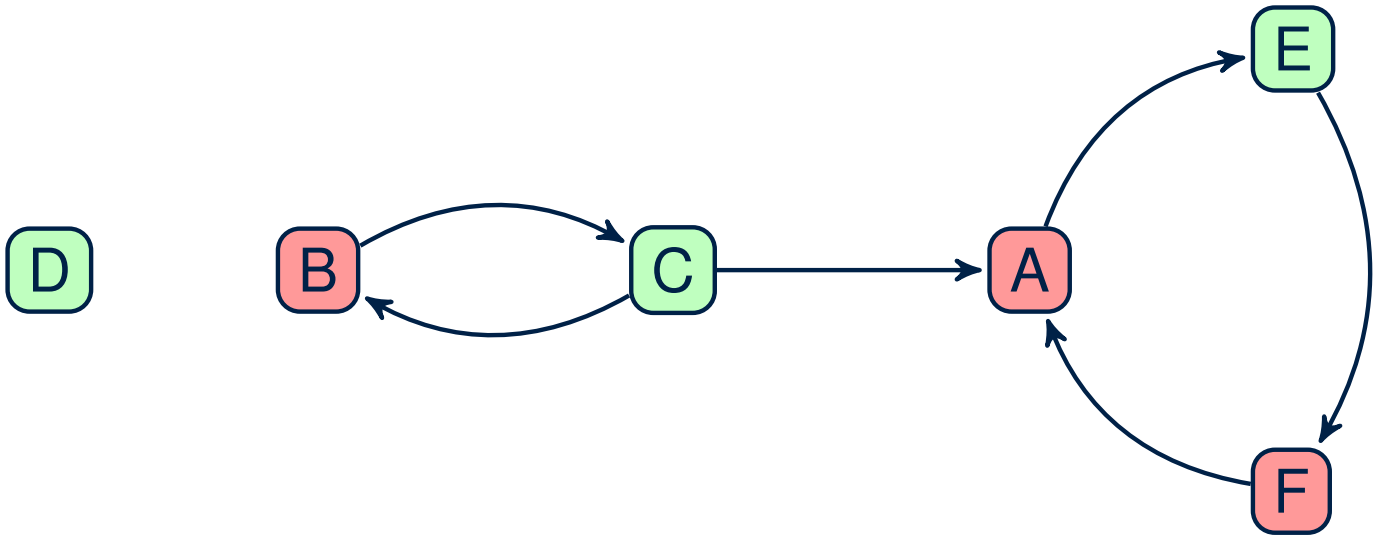

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Structured Argumentation

Several formalisms:

- Defeasible Logic Programming [Simari and Loui, 1992],
- Assumption-Based Argumentation [Bodarenko, et. al., 1993],
- Deductive Argumantation [Besnard and Hunter, 2001],
- ASPIC [Caminada and Amgoud, 2007],
- ASPIC+ [Prakken 2009].

The ASPIC Family

ASPIC / ASPIC+ aim to instantiate abstract argumentation frameworks.

- ASPIC was limited to classic negation and provability.
- ASPIC+ generalized ASPIC, including the introduction of *contrariness*, but offers barriers to argumentation and reasoning in multiagent settings.
- We are currently working on an alternative ASPIC generalization more oriented to multiagent argumentation *ongoing work*.

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Structured Argumentation: Logic Programming

In [Caminada et.al. 2015], we provide an in-depth study on the relation between Logic Programming semantics and Abstract Argumentation semantics.