

## Introducing the Fourth International Competition on Computational Models of Argumentation

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1: CRIL, CNRS and Université d'Artois, Lens  
2: LIPADE - Distributed Artificial Intelligence

8th International Conference on Computational Models of Argument  
(COMMA 2020)

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- *The competition aims at nurturing research and development of implementations for computational models of argumentation.*  
<http://argumentationcompetition.org/>
  - Systematically compares algorithms for reasoning with argumentation frameworks
  - Current steering committee: S. Gaggl (Pres.), N. Oren (Vice-Pres.), J.-G. Mailly (Secr.), F. Cerutti, M. Thimm, M. Vallati, S. Villata
  - ICCMA 2015: M. Thimm and S. Villata
    - 18 solvers
  - ICCMA 2017: S. Gaggl, T. Linsbichler, M. Maratea and S. Woltran
    - 16 solvers/6 benchmarks
  - ICCMA 2019: S. Bistarelli, F. Santini, L. Kotthoff, T. Mantadelis and C. Taticchi
    - 9 solvers/2 benchmarks
  - ICCMA 2021: J.-M. Lagniez, E. Lonca, J.-G. Mailly and J. Rossit



1 Background: AFs and ABA

2 Competition Rules

3 Conclusion

## Argumentation Framework (AF) and Extension Semantics

$F = (A, R)$  where  $A$  is a set of arguments and  $R \subseteq A \times A$  represents attacks between arguments.  $S \subseteq A$  is

- *conflict-free* (**cf**) if there is no  $a, b \in S$  s.t.  $(a, b) \in R$
- *admissible* (**ad**) if  $S \in \mathbf{cf}(F)$  and  $S$  defends all its elements
- *stable* (**stb**) if  $S \in \mathbf{cf}(F)$  and  $S$  attacks each argument in  $A \setminus S$
- *complete* (**co**) if  $S \in \mathbf{ad}(F)$  and  $S$  doesn't defend any argument in  $A \setminus S$
- *preferred* (**pr**) if  $S$  is  $\subseteq$ -maximal in  $\mathbf{ad}(F)$
- *semi-stable* (**sst**) if  $S \in \mathbf{co}(F)$  and  $S$  is range-maximal in  $\mathbf{co}(F)$
- *stage* (**stg**) if  $S \in \mathbf{cf}(F)$  and  $S$  is range-maximal in  $\mathbf{cf}(F)$
- *ideal* (**id**) if  $S \in \mathbf{ad}(F)$  s.t.  $\forall S' \in \mathbf{pr}(F), S \subseteq S'$ , and  $S$  is  $\subseteq$ -maximal among those sets

## ABA Framework

$F = (L, R, A, \bar{\phantom{x}})$  where

- $L$ : set of symbols (language)
- $R$ : set of rules  $x_0 \leftarrow x_1, \dots, x_n$ ,  $x_i \in L$  and  $n \geq 0$
- $A \subseteq L$ : assumptions
- $\bar{\phantom{x}} : A \rightarrow L$ : contrariness

## ABA Arguments and Attacks: An Example

$F = \langle L, R, A, \bar{\phantom{x}} \rangle$  with  $L = \{a, b, c, p, q, r, s, t\}$ ,  $R = \{(p \leftarrow q, a), (q \leftarrow), (r \leftarrow b, c)\}$ ,  $A = \{a, b, c\}$  and  $\bar{a} = r$ ,  $\bar{b} = s$ ,  $\bar{c} = t$ .

- $Arg_1 = (\{b, c\} \vdash r)$ : from the rule  $r \leftarrow b, c$
- $Arg_2 = (\{a\} \vdash p)$ : from the rules  $q \leftarrow$  and  $p \leftarrow q, a$
- $Arg_1$  attacks  $Arg_2$ :  $r$  (concl. of  $Arg_1$ ) is contrary of  $a$  (an assumption in  $Arg_2$ )

### Assumption-based Extensions

- $A_1 \subseteq A$  attacks  $A_2 \subseteq A$  iff an argument supported by a subset of  $A_1$  attacks an argument supported by a subset of  $A_2$
- A set of assumptions  $A_1$  defends an assumption  $a$  if  $A_1$  attacks each set of assumptions that attacks  $a$
- Then, extension semantics are defined classically, e.g. for  $S_A \in A$ ,
  - $S_A \in \mathbf{cf}(F)$  iff it does not attack itself
  - $S_A \in \mathbf{ad}(F)$  if  $S_A \in \mathbf{cf}(F)$  and  $S_A$  defends all its elements
  - ...

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- Main track: static abstract argumentation
- Dynamic track: evolving AFs
- Structured argumentation: ABA
- In each track, one sub-track for each semantics
- In each sub-track, several reasoning tasks



- Semantics under consideration:  $\sigma \in \{\mathbf{co}, \mathbf{pr}, \mathbf{stb}, \mathbf{sst}, \mathbf{stg}, \mathbf{id}\}$ 
  - we choose to remove the grounded semantics (not challenging enough)
- Tasks: Given an AF  $F = \langle A, R \rangle$ 
  - **CE- $\sigma$** : give the number of  $\sigma$ -extensions of  $F$
  - **SE- $\sigma$** : give one  $\sigma$ -extension of  $F$
  - **DC- $\sigma$** : for  $a \in A$  an argument, is  $a$  credulously accepted in  $F$ ?
  - **DS- $\sigma$** :  $a \in A$  an argument, is  $a$  skeptically accepted in  $F$ ?
- Four problems for each subtrack except  $\sigma = \mathbf{id}$  (**CE-id** = 1, and **DC-id** = **DS-id**)

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- Semantics under consideration:  $\sigma \in \{\mathbf{co}, \mathbf{pr}, \mathbf{stb}\}$
- Tasks: **CE**- $\sigma$ , **SE**- $\sigma$ , **DC**- $\sigma$ , **DS**- $\sigma$
- **New**: instead of reading the full set of updates in a text file given as an input, the solvers will wait for updates on the standard input
  - “online” behaviour
  - seems closer to the process of a real debate: one does not generally know all the future arguments at once

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- Tasks: **CE**- $\sigma$ , **SE**- $\sigma$ , **DC**- $\sigma$ , **DS**- $\sigma$ 
  - Reminder: we consider the assumption version of the semantics

- One ranking for each sub-track
  - six rankings for abstract argumentation
  - three rankings for dynamic argumentation
  - three rankings for ABA
  - To be ranked, a solver must participate to the full sub-track
  - No requirement to participate to all the (sub-)tracks
- Scoring:
  - Any wrong result: exclusion from the sub-track (*still under discussion*)
  - Correct answer in the runtime limit: 1 point
  - Timeout or non-parsable output: 0 point
  - Tie-break: cumulated runtime over the instances correctly solved

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- More details: our SAFA paper *Introducing the Fourth International Competition on Computational Models of Argumentation*
  - Solver interface, call for participation and call for benchmarks will be released before the end of 2020
  - Tentative deadlines:
    - Jan 15, 2021: Declaration of intent by participants
    - Feb 1, 2021: Benchmark submission
    - Mar 15, 2021: Solver submission
    - Apr 15, 2021: System descriptions
    - Aug, 2021: Presentation of results
  - For up to date information,
    - Official website: <http://argumentationcompetition.org/2021/>
    - Mailing list: [argumentationcompetition@inria.fr](mailto:argumentationcompetition@inria.fr)
    - Twitter: @argcompetition
  - For any question, [iccma2021@cril.univ-artois.fr](mailto:iccma2021@cril.univ-artois.fr)
  - We welcome all participations from academics, students, or anyone: spread the word!