Introducing the Fourth International Competition on Computational Models of Argumentation

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Third International Workshop on Systems and Algorithms for Formal Argumentation (SAFA 2020)
About ICCMA

• The competition aims at nurturing research and development of implementations for computational models of argumentation.
  http://argumentationcompetition.org/

• 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

Outline

1. Background: AFs and ABA
2. Competition Rules
3. Conclusion
Abstract Argumentation [Dung 95]

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

\[ F = (L, R, A, \overline{\top}) \text{ where} \]

- \( L \): set of symbols (language)
- \( R \): set of rules \( x_0 \leftarrow x_1, \ldots, x_n, x_i \in L \) and \( n \geq 0 \)
- \( A \subseteq L \): assumptions
- \( \overline{\top} : A \rightarrow L \): contrariness

### ABA Arguments and Attacks: An Example

\[ F = \langle L, R, A, \overline{\top} \rangle \text{ with } L = \{a, b, c, p, q, r, s, t\}, \quad R = \{(p \leftarrow q, a), (q \leftarrow), (r \leftarrow b, c)\}, \quad A = \{a, b, c\} \text{ and } \overline{a} = r, \overline{b} = s, \overline{c} = t. \]

- \( \text{Arg}_1 = (\{b, c\} \vdash r) \): from the rule \( r \leftarrow b, c \)
- \( \text{Arg}_2 = (\{a\} \vdash p) \): from the rules \( q \leftarrow \) and \( p \leftarrow q, a \)
- \( \text{Arg}_1 \) attacks \( \text{Arg}_2 \): \( r \) (concl. of \( \text{Arg}_1 \)) is contrary of \( a \) (an assumption in \( \text{Arg}_2 \))
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 $S_A \in A$,
  - $S_A \in \text{cf}(F)$ iff it does not attack itself
  - $S_A \in \text{ad}(F)$ if $S_A \in \text{cf}(F)$ and $S_A$ defends all its elements
  - ...
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Tracks

- 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
Main Track: Static AFs

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

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

- Semantics under consideration: $\sigma \in \{\text{co, pr, stb}\}$
- Tasks: $\text{CE}-\sigma, \text{SE}-\sigma, \text{DC}-\sigma, \text{DS}-\sigma$
  - Reminder: we consider the assumption version of the semantics
Scoring Rules

- 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
  - 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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• 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,
  • Officiel website: http://argumentationcompetition.org/2021/
  • Mailing list: argumentationcompetition@inria.fr
  • Soon: probably Twitter

• For any question, iccma2021@cril.univ-artois.fr

• We welcome all participations from academics, students, or anyone: spread the word!