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# Argument, I Choose You!

## Preferences and Ranking Semantics in Abstract Argumentation

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# Motivation

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  - ...
- Their preferences are more important than rational acceptability criteria

# A Political Debate

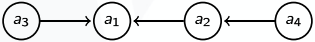
Suppose that two candidates $A$ and $B$ talk about funding the education system:

(A) $a_1$ = "We should reduce the number of professors: paying them is expensive."

(B) $a_2$ = "We cannot reduce the number of professors, actually there should be more professors since the number of students has increased recently."

(B) $a_3$ = "Moreover, a good education system is good for society and economy."

(A) $a_4$ = "There were too many professors in the past, we can't pay for more."



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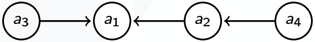


- Classical extension semantics: $a_3$ and $a_4$ accepted, $a_1$ and $a_2$ rejected
- Ranking semantics (e.g. $h$-categorizer): $h(a_1) = 0.4$, $h(a_2) = 0.5$, $h(a_3) = h(a_4) = 1$

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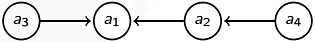


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- Suppose that John likes $A$ and Yoko likes $B$: this does not fit their opinion

# Abstract Argumentation [Dung 95]

## Argumentation Framework (AF)

$F = (A, R)$ with $A$: set of arguments and $R \subseteq A \times A$: attacks between arguments

## Extension Semantics

$S \subseteq A$ is

- *conflict-free* (**cf**) if there is no $a, b \in S$ s.t. $(a, b) \in R$
- *stable* (**st**) if $S \in \mathbf{cf}(F)$ and $S$ attacks each argument in $A \setminus S$
- ...

## Ranking Semantics

Maps $F$ to a pre-order $\geq$: $a \geq b$ means "$a$ is at least as acceptable as $b$"
E.g. $h$-categorizer [Besnard and Hunter 2001]:
$h(a) = \frac{1}{1+\sum_{(b,a)\in R} h(b)}$, and $a \geq b$ iff $h(a) \geq h(b)$

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# Preference-based AFs

## Preference-based Argumentation Framework (PAF)

$F = (A, R, \succeq_p)$, where $a \succeq_p b$ means "$a$ is preferred to $b$"

## Preference Precedence

**(PP)** if $a \succ_p b$, then $a >_\sigma b$

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- Extension semantics for PAFs $\rightarrow$ violate **(PP)**

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# Preference Sensitive Ranking Semantics

Input:

- $F = (A, R, \succeq_p)$
- $\geq_\sigma$ a "classical" acceptability ranking

New ranking $\geq_p$:

- if $a \succ_p b$ then $a >_p b$
- if $a \simeq_p b$ then use $\geq_\sigma$ for tie-breaks: if $a >_\sigma b$ then $a >_p b$

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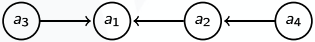


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- John's preferences: $a_1, a_4 \succ_p^j a_2, a_3$
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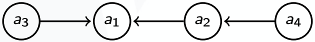


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# Future Work

- Other frameworks:
  - supports
  - weights
  - logic-based
  - ...
- Study preference arbitration: use $\succeq_p$ for breaking ties in $\geq$