

# ***A Dialectical Approach for Argument-Based Judgment Aggregation***

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# *Argument-Based Judgment Aggregation*

- shared argumentation framework
- each agent has his own opinion (complete labelling)
- how to aggregate these to form a group opinion(labelling)?
- topic of quite some recent research:
  - Caminada & Pigozzi (JAAMAS 2011)
  - Caminada, Pigozzi & Podlaszewski (IJCAI 2011)
  - Booth, Awad & Rahwan (KR 2014)
  - Booth (Festschrift Brewka, 2015)
  - Podlaszewski (PhD 2015)
  - Awad (PhD thesis 2015)

# Argument-Based JA

## Preliminaries (1/2)

- $\sqcap(Lab_1 \dots Lab_n)$ 
  - in**: argument labelled **in** by each  $Lab_i$
  - out**: argument labelled **out** by each  $Lab_i$
  - undec: all other cases
- $\sqcup(Lab_1 \dots Lab_n)$ 
  - in**: argument labelled **in** by some  $Lab_i$
  - and not labelled **out** by any  $Lab_j$
  - out**: argument labelled **out** by some  $Lab_i$
  - and not labelled **in** by any  $Lab_j$
  - undec: all other cases

# Argument-Based JA Preliminaries (2/2)

- $Lab_1 \sqsubseteq Lab_2$  (“smaller or equal”)  
 $\text{in}(Lab_1) \subseteq \text{in}(Lab_2) \wedge \text{out}(Lab_1) \subseteq \text{out}(Lab_2)$
- $\downarrow Lab$  (“down-admissible”)   
biggest admissible labelling  
that is smaller or equal to  $Lab$
- $\uparrow Lab$  (“up-complete”)   
smallest complete labelling  
that is bigger or equal to  $Lab$

# *Judgment Aggregation Operators* (Camínada & Pigozzi, JAAMAS 2011)

- Sceptical Operator:  $\downarrow \sqcap (Lab_1 \dots Lab_n)$
- Credulous Operator:  $\downarrow \sqcup (Lab_1 \dots Lab_n)$
- Super Credulous Operator:  $\uparrow \downarrow \sqcup (Lab_1 \dots Lab_n)$

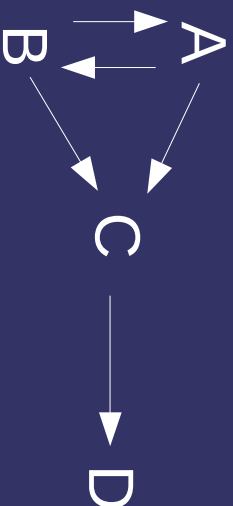
# *Down-Admissible Discussion Game*

- Given a labelling  $Lab$ , is there an admissible labelling  $Lab' \sqsubseteq Lab$  that labels  $A$  **in**?
- Idea: run the discussion game for admissibility (Caminada, Dvorak and Vesic, JLC 2016) with additional restriction that it has to stay “inside” of  $Lab$

# *Up-Complete Discussion Game*

- Observation: the grounded labelling is the up-complete of the all-undec labelling
- Idea: run the grounded discussion game (Caminada 2016) with “forced commitment” whenever the discussion hits **in** or **out** in *Lab*

# Example Credulous JA Discussion Game



Agent 1: (  $\{A,D\}$ ,  $\{B,C\}$ ,  $\emptyset$  )

Agent 2: (  $\{B,D\}$ ,  $\{A,C\}$ ,  $\emptyset$  )

*Proponent*: “We can all agree that D has to be **in**”

*Room*: “Aye” (Agent 1) “Aye” (Agent 2)

*Opponent*: “But then we'd also have to agree that

D's attacker C is **out**. Based on what grounds?”

*Room*: “Aye” (Agent 1) “Aye” (Agent 2)

*Proponent*: “We can all agree that C has to be **out**  
because we can agree that A has to be **in**”

*Room*: “Aye” (Agent 1) “Nay” (Agent 2)



# *Research Context*

- Everyday argumentation tends to have a dialectic nature (dialogue / discussion)
- Formal argumentation tends to be about graph theory
- Research Agenda: How to interpret this graph theory in a dialectical way?
  - stable semantics (Caminada & Wu 2009)
  - preferred semantics (Vreeswijk & Prakken 2000)
  - ideal semantics (Dung, Mancarella & Toni 2007)
  - grounded semantics (Prakken & Sartor 1997)
  - argument-based JA [THIS PAPER]