

Emotions and Personality Traits in Argumentation¹

Hypotheses and Empirical Evaluation

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Outline of the talk

- 1 **Basics of argumentation theory**
- 2 Argumentation and emotions: hypotheses
- 3 Empirical evaluation: the protocol
- 4 Empirical evaluation: the results
- 5 Conclusions and future work

Argumentation: issues

- A **reasoning framework** based on the need of **justifying**.
Fundamental to decide, convince, explain, ...
- **Interdisciplinary topic**
 - **Artificial Intelligence** [Loui (1987), Pollock (1987)]
 - Philosophy [Aristotele, Toulmin (1958)]
 - Psychology [McGuire (1960)]
 - Linguistics [van Eemeren et al. (1996)]
- **Examples of Applications**
 - **Medical domain**: support systems for argumentative diagnosis
 - **Legal domain**: argumentative decisions based on laws
 - Online **debate platforms** (e.g., idebate.org, [debategraph](http://debategraph.com), ProCon.org)
 - Online systems for **conflicts resolution** (e.g., [CyberSettle](http://CyberSettle.com))

Argumentation: reasoning and decision making

Monotonic logic (language \mathcal{L} , consequence relation CR)



Knowledge base $KB \subseteq \mathcal{L}$



Arguments (A)



Attacks ($R \subseteq A \times A$)



Arguments' evaluation =
Computation of extensions E_1, \dots, E_n with $E_i \subseteq A$
Acceptability semantics



Conclusion = plausible inferences from KB

Argumentation: interaction among agents

Example

A dialogue between two journalists

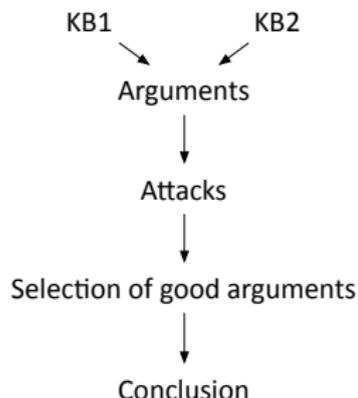
Paul : this information is important, we must publish it (*argument a*)

Mary : it is a private information about a person who does not want to publish it (*argument b*)

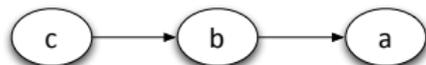
Paul : this person is the Prime Minister so the information is not private (*argument c*)



Argumentation Theory



Argumentation system



Paul is right thus we must publish the information

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Argumentation for critical thinking

- Argumentation as a mechanism to support decision-making and persuasion
- BUT assuming a purely rational behavior of the involved actors
- Humans are proved to behave differently:
 - Mixing rational and emotional attitudes

Emotions for decision making

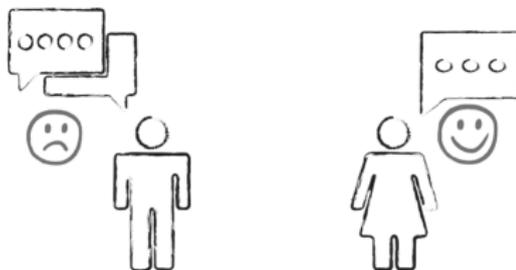
- Emotions play an important role in decision making
- Creative thinking, inspiration, concentration and motivation
- Express participants' beliefs and viewpoints w.r.t. the others' opinions

Context and motivation

- Understanding **how** human **reason** and take decisions in debates is a key issue in **cognitive science** and a challenge for **social applications**
- To apply argumentation to scenarios as e-democracy and online debate systems, designers must take both the **argumentation** AND the **emotions** into account
- **Understand and link the different dimensions of the exchanges**, to detect:
 - a debate turning into a flame war,
 - a content reaching an agreement,
 - a good or bad emotion spreading in a community...

Research questions

- **Connection between the arguments proposed by the participants of a debate and their emotional status?**
 - correlation of polarity of arguments and of detected emotions?
 - relation between the arguments, and the engagement of participants?
 - influence of personality traits and opinions on participants' emotions?



Related literature

- Theoretical approaches to argumentation and emotions
 - [Nawwab et al., COMMA 2010]
 - [Dalibon et al., Revista Iberoamericana de Inteligencia Artificial, 2012]
 - [Lloyd-Kelly and Wyner, UMAP 2011 Workshop]
- Empirical experiments for argumentation theory
 - [Cerutti et al., ECAI 2014]
 - [Rahwan et al., Cognitive Science, 2010]

None of these approaches considers the role of emotions in real life debates providing an empirical evaluation with users: OUR GOAL

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Description of the experiment: protocol

Experimental Setting:

- 4 participants for each discussion group
- each participant is placed far from the other participants
- 2 moderators
- Language: English
- Easy-to-use debate platform: IRC network
- Debate is anonymous and participants only visible with their nicknames
- Each participant has been provided with:
 - 1 laptop device equipped with internet access
 - a camera used to detect facial emotions
 - an EEG headset to detect engagement index.
- Each moderator used only a laptop.

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Protocol (continued)

- Participants' familiarization with the debate platform;
- **The debate** - 2 debates each, about two different topics, 20 minutes each:
 - Moderator provides the topic to be discussed;
 - Moderator asks participants about his/her opinion concerning the topic;
 - Participants expose their opinion to the others;
 - Participants are asked to comment on the opinions of the other participants;
 - If no active debate among the participants, moderator posts new arguments.

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Emotions and Engagement Detection

Emotion detection (Heron Lab, University of Montreal)

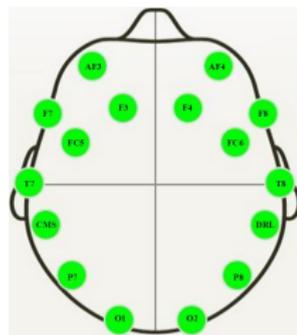
- webcams for facial expressions analysis [FACEREADER 6.0]
- physiological sensors (EEG) for cognitive states [Chaouachi et al., 2010]

Real-time engagement

- engagement index [Pope et al., 1995]
- EEG frequency bands

Real-time facial analysis

- classifying 500 key points in facial muscles
- neural network
 - happy, sad, angry, surprised, scared, disgusted.
 - valence, arousal
 - neutral probability.



Personality traits

Big Five personality traits: 50 questions

- Totally Disagree, Disagree, Neutral, Agree, Totally Agree
 - O Openness, Originality, Open-mindedness
 - C Conscientiousness, Control, Constraint
 - E Extraversion, Energy, Enthusiasm
 - A Agreeableness, Altruism, Affection
 - N Neuroticism, Negative Affectivity, Nervousness

Data collection and annotation

During the experiment:

- minimum, average and maximum **engagement** of every participant
- **most dominant emotion** (having maximum value)
- pleased/unpleased **valence**
- active/inactive **arousal**

After the experiment:

- synchronize arguments, relations and emotional indexes
- **bipolar argumentation** [1] labelled with:
sources, arguments, emotional states
- two independent annotators (IAA of Cohen's kappa=0.82)

[1] S. Villata, G. Boella, D. Gabbay, L. van der Torre. Modelling defeasible and prioritized support in bipolar argumentation. *Ann. Math. Artif. Intell.* 66(1-4): 163-197 (2012).

Obtained Dataset - annotated following the methodology of [1]

Dataset				
Topic	#arg	#pair	#att	#sup
BAN ANIMAL TESTING	49	28	18	10
GO NUCLEAR	40	24	15	9
HOUSEWIVES SHOULD BE PAID	42	18	11	7
RELIGION DOES MORE HARM THAN GOOD	46	23	11	12
ADVERTISING IS HARMFUL	71	16	6	10
BULLIES ARE LEGALLY RESPONSIBLE	71	12	3	9
DISTRIBUTE CONDOMS IN SCHOOLS	68	27	11	16
ENCOURAGE FEWER PEOPLE TO GO TO THE UNIVERSITY	55	14	7	7
FEAR GOVERNMENT POWER OVER INTERNET	41	32	18	14
BAN PARTIAL BIRTH ABORTIONS	41	26	15	11
USE RACIAL PROFILING FOR AIRPORT SECURITY	31	10	1	9
CANNABIS SHOULD BE LEGALIZED	43	33	20	13
TOTAL	598	263	136	127

[1] E. Cabrio, S. Villata. Natural Language Arguments: A Combined Approach. ECAI 2012: 205-210

Dataset: first layer (source and flow)

```
<argument id="2" debate_id="4" participant="4" time-from="20:30" time-to="20:30"> The religion is an independent factor, it should not be a dissociative factor separating people. </argument>
```

```
<argument id="3" debate_id="4" participant="1" time-from="20:32" time-to="20:32"> The religion gives to his followers hope and help them to overcome some problem of the life so it's not all bad. </argument>
```

```
<argument id="4" debate_id="4" participant="4" time-from="20:32" time-to="20:32"> Here in Canada it is appreciable to find the liberty of religion a practice in a peaceful way. </argument>
```

Dataset: second layer (relations)

```
<debate id="4" title="Religion" task="relation">
<pair id="1" relation="support">
  <argument id="2" debate_id="4" participant="4" time-from=
  "20:30" time-to="20:30"> The religion is an independent
  factor, it should not be a dissociative factor separating
  people. </argument>
  <argument id="3" debate_id="4" participant="1" time-from=
  "20:32" time-to="20:32"> The religion gives to his followers
  hope and help them to overcome some problems of the life so
  it's not all bad. </argument>
</pair>
```

Dataset: third layer (emotions)

```
<argument id="31" debate_id="4" participant="1" time-from="20:43" time-to="20:43" emotion_p1="angry" emotion_p2="neutral" emotion_p3="angry" emotion_p4="disgusted">
```

I don't totally agree with you Participant2: science and religion don't explain each other, they tend to explain the world but in two different ways.

```
</argument>
```

```
<argument id="32" debate_id="4" participant="3" time-from="20:44" time-to="20:44" emotion_p1="angry" emotion_p2="happy" emotion_p3="surprised" emotion_p4="angry">
```

Participant4: for recent wars ok but what about wars happened 3 or 4 centuries ago? </argument>

Hypotheses

H1 : some emotional and behavioral trends can be extracted from a set of debates. [1]

H2 : the number and the strength of arguments, attacks and supports exchanged between the debaters are correlated with particular emotions. [1]

H3 : the number of expressed arguments is connected to the degree of mental engagement and social interactions. [1]

H4 : the personality of the participants modulates their emotional experiences during the debates. [2]

H5: the debaters' opinions regarding the discussed topics have an impact on their emotions. [2]

[1] S. Benlamine, M. Chaouachi, S. Villata, E. Cabrio, C. Frasson, F. Gandon. Emotions in Argumentation: an Empirical Evaluation. IJCAI 2015: 156-163.

[2] S. Villata, E. Cabrio, I. Jraidi, S. Benlamine, M. Chaouachi, C. Frasson, F. Gandon. Emotions and Personality Traits in Argumentation: an Empirical Evaluation. Argument & Computation, 2017.

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Hypotheses

H1 : some emotional and behavioral trends can be extracted from the debates.

Methodology: Pearson product-moment correlation coefficient r

- most frequent emotion expressed by participants was **anger**
- second most frequent emotion was **disgust**
- negative emotions have generally more impact on a person's behavior and cognition than positive ones: negativity effect
- a high level of engagement in 70.2% to 87.7% of the times, correlated with appearance of anger ($r = 0.306$)

Hypotheses

H2 : the number and the strength of arguments, attacks and supports exchanged between the debaters are correlated with particular emotions.

H3 : the number of expressed arguments is connected to the degree of mental engagement and social interactions.

	NB ARG	ATTACK	SUPPORT
Pleasant	0,1534	0,0134	-0,0493
Unpleasant	-0,1534	-0,0134	0,0493
High ENG	-0,0246	-0,0437	0,3185
LowENG	0,2054	0,1147	0,1592
Neutral	0,0505	0,1221	-0,2542
Disgusted	-0,0177	-0,0240	0,2996
Scared	-0,0278	0,0297	-0,2358
Angry	0,0344	-0,2206	0,0782

Hypotheses

H4 : the personality of the participants modulates their emotional experiences during the debates.

Methodology: multivariate analyses of variance with OCEAN personality traits as fixed factors and debaters' emotions as dependent variables.

- **Extroversion and facial expressions**: extroverted participants showed significantly more frequently expressions of surprise than the introverted ones;
- **Conscientiousness and emotional valence**: conscientious participants expressed significantly higher proportions of negatively valenced emotions during the debates w.r.t. the other participants;
- **Neuroticism and mental engagement**: participants with an anxious temperament had on average significantly fewer proportions of high engagement levels during the debates as compared to the other participants;

Hypotheses

H5: the debaters' opinions regarding the topics have an impact on their emotions

- **no statistically reliable effect** was found in the performed analyses;
- no significant differences in terms of facial expressions, valence, engagement and workload, neither between the debaters who kept the same opinions and the debaters who changed their opinion, nor between those who were for and those who were against the topics.

Starting/Final	No-opinion	For	Against	<i>Total</i>
No-opinion	2	5	0	7
For	0	12	1	13
Against	0	1	19	20
<i>Total</i>	2	18	20	40

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Future work

- 1 From argumentation to emotions and back
 - Definition of emotional argumentative agents
 - Envisioned applications: education, mental diseases treatment
- 2 Study the link between emotions and persuasive argumentation
 - Is persuasion influenced by emotions? If so, how?
 - Three kinds of strategy: ethos, logos, pathos
- 3 Study emotions propagation among the debaters to verify whether emotions can be seen as a predictor of the solidity of an argument

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Thanks for your attention!

SEEMPAD Project:

<https://project.inria.fr/seempad/>

