

Detection and Analysis of Moral Values in Argumentation — Supplementary —

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A Appendix

A.1 Visualisation on Interface

In this section, we discuss the developed moral argument analysis interface (see Figure 1). We first illustrate the interface functionality for moral value analysis and then provide visualisation examples that also include the additional analysis result we want to present. The remainder of the section enumerates all the modules we designed for moral value analysis of arguments and offers an intuitive graphical presentation for each module.

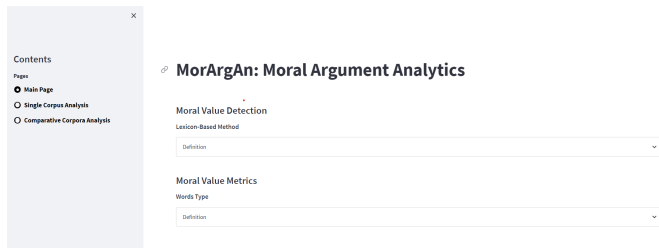


Figure 1. Moral Argument Analytics Interface

A.1.1 Word Cloud

The WordCloud component displays all occurred moral foundation words on the map in the selected corpus (or corpora) given different moral foundation categories. Figure 2 presents all *Care+* words

in *MM: British Empire* corpus, e.g., *sympathy* and *benefit*.

Additional quantitative analysis about moral foundation words frequency was covered to interpret the word cloud (see Figure 4). Apparently, *benefit* is the most commonly applied *Care+* word (36.36%) in *MM: British Empire* corpus. Furthermore, qualitative analysis was introduced to show the representative ADU sequences which contain selected moral foundation words (see Figure 3). In this case, *MM: British Empire* includes 4 ADUs which contain *Care+* word: *benefit*.



Figure 2. Word Cloud for *Care+* based on Moral Foundation Dictionary

A.1.2 Text Distribution

Text distribution focuses on the moral value distribution of ADU sequences or argument elements. Apart from moral values distribution in arguments considering different propositional relations, i.e., supports and attacks, we present the analysis results regarding moral values distribution in different

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2. Qualitative Analysis

Choose the number of care+ words you want to select

☒ single

☐ all

Choose care+ words you want to analyse

	Text	MF words
0	MT : Well, I guess for my definition, I would talk about rich countries in the West occupying countries of other people and imposing their rule on them and generally speaking extracting various forms of wealth from those countries to benefit the host country	benefit
1	MT : Second, there's no question this country has benefited and continues to benefit from the extraction it took from the British Empire.	benefit
2	MT : Isn't it reasonable to argue that given what they went through, as the closest they can get to the people who perpetrated this is the British state, indeed the state benefitted from colonialism in a variety of ways, that it's reasonable that they should seek recompense from the British state?	benefit
3	MP : So this is revenge for the benefit?	benefit

Figure 3. Qualitative analysis on Moral Foundation words

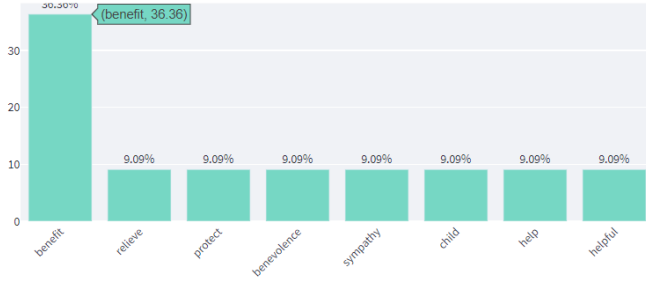


Figure 4. Quantitative analysis on Moral Foundation words

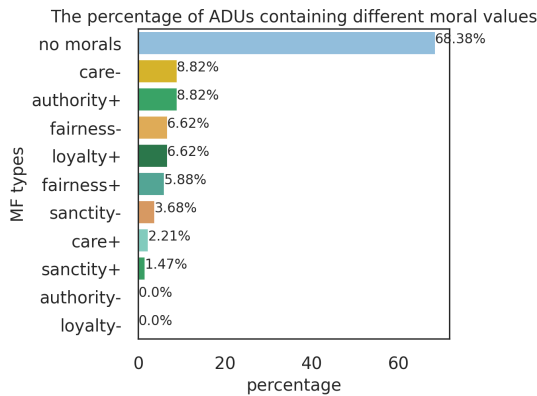


Figure 5. Moral value distribution based on argument inputs in MM corpora

argumentation elements, i.e. argumentation inputs and argumentation outputs (see Figure 5 and Figure 6)

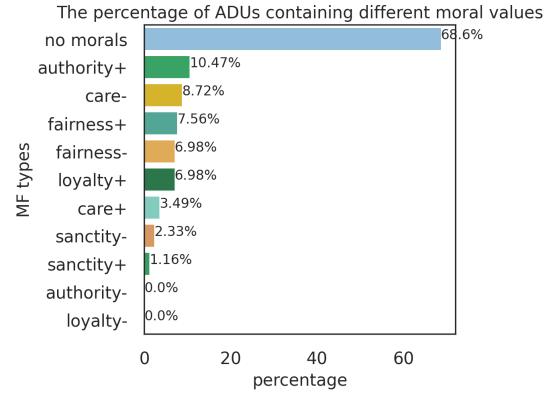


Figure 6. Moral value distribution based on argument outputs in MM corpora

There is no significant difference in moral value distribution between argument inputs (31.62%) and argument outputs (31.4%). It indicates the coherence of moral value usage in argument inputs and outputs.

A.1.3 Interlocutor Distribution

Interlocutor Distribution describes interlocutor-type distribution considering the valence of each moral foundation in the speakers' locutions, i.e., empty, positive, negative or mixed valence. Figure 10 shows that speakers applied most *Care-* strategy (36.84%) when they refer to *Care* foundation and most *Authority+* strategy (63.16%) when they refer to *Authority* foundation.

A.1.4 Interlocutor Score

Interlocutor score is the percentage of moral value category they conveyed during the debate. The results represent the interlocutor profiling concerning moral values (see Figure 11). The presented figure shows that *Michael Gove* only refers to *Sanctity-* in his speech in *MM: Hypocrisy* corpus.

A.1.5 Interlocutor's Argumentation Network

Interlocutor's Argumentation Network visualises the argument exchange between different speakers

during the debate with regard to their interlocutor types for the specific moral foundation dimension. We provide the whole argumentation network constructed on MM corpora considering *Fairness* (see Figure 13) on pro-arguments and *Care* on con-arguments (see Figure 12).

A.1.6 Interlocutor Interaction

It is designed to interpret argumentation interaction in the presented interlocutor argumentation network. We provide visualisation results of argumentation interaction frequencies considering the valence of moral foundations: *Loyalty*, *Authority* and *Sanctity* (see Figures 7-9) to supplement the discussion in the paper. It turns out that speakers with the same moral foundation valence tend to exchange arguments more frequently for each moral foundation.

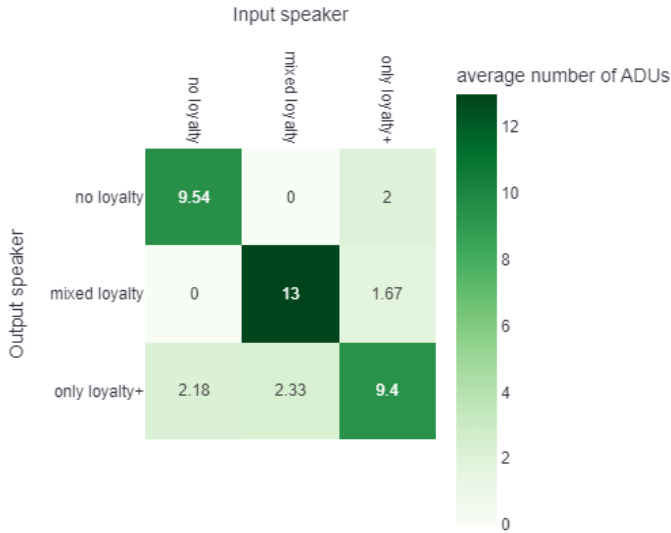


Figure 7. Argumentation interaction frequency considering loyalty valence

A.2 Table Statistic

This section refers to all the statistics presented on the visualisation results in the paper. We present all the graphical information in the table format. Tables are organised according to the graphic ordering mentioned in the paper (see Tables 1-4).

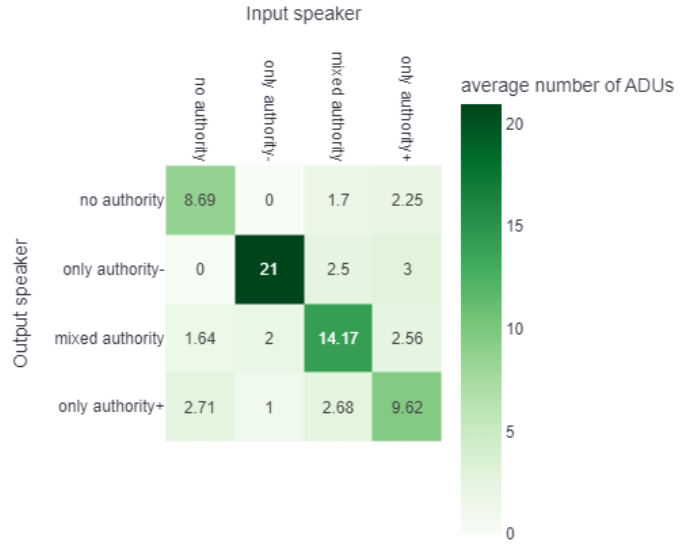


Figure 8. Argumentation interaction frequency considering authority valence

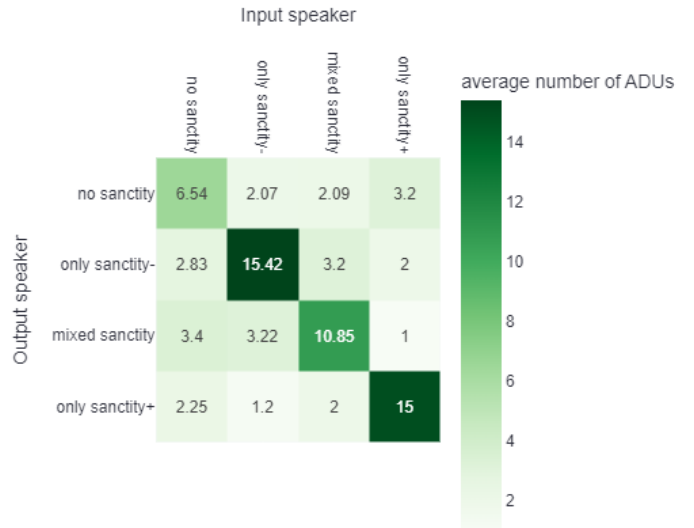


Figure 9. Argumentation interaction frequency considering sanctity valence

Table 1. Moral values distribution in argumentation across different propositional relations. It includes supports, attacks and all propositional relations.

Propositional relations	C+	C-	F+	F-	L+	L-	A+	A-	S+	S-	No morals
Support	5.5%	4.69%	4.61%	5.18%	6.39%	0.08%	5.26%	0.89%	1.70%	6.80%	71.20%
Attack	7.45%	3.19%	2.66%	7.98%	1.60%	0.00%	5.32%	0.53%	2.13%	3.72%	77.66%
All	5.76%	4.49%	4.35%	5.55%	5.76%	0.07%	5.27%	0.84%	1.76%	6.39%	72.05%

Table 2. Negative moral values distribution in argumentation across different moral topics.

Topic	Care-	Fairness-	Loyalty-	Authority-	Sanctity-
<i>MM: British Empire</i>	8.46 %	6.54 %	-	-	3.08 %
<i>MM: DDay</i>	16.52 %	1.74 %	0.87 %	-	4.35 %
<i>MM: Morality of Hypocrisy</i>	3.45%	15.36 %	-	2.51 %	22.57 %
<i>MM: Morality of Money</i>	1.97 %	2.54 %	-	0.56 %	0.28 %
<i>MM: Welfare State</i>	1.33 %	0.53 %	-	0.53 %	1.33 %

Table 3. Positive moral values distribution in argumentation across different moral topics.

Topic	Care+	Fairness+	Loyalty+	Authority+	Sanctity+
<i>MM: British Empire</i>	2.69 %	6.15 %	6.92 %	9.62 %	1.54 %
<i>MM: DDay</i>	1.74 %	1.74 %	30.43 %	17.39 %	3.48 %
<i>MM: Morality of Hypocrisy</i>	2.19 %	10.34 %	0.94 %	2.19 %	4.39 %
<i>MM: Morality of Money</i>	2.82 %	1.41 %	2.54 %	4.51 %	0.56 %
<i>MM: Welfare State</i>	14.93 %	1.60 %	4.53 %	1.87 %	0.27 %

Table 4. Group profiling for speakers in different moral topic discussions.

Topic	Care	Fairness	Loyalty	Authority	Sanctity
<i>MM: British Empire</i>	0.1553	0.1188	0.0916	0.1634	0.0240
<i>MM: DDay</i>	0.1212	0.2298	0.3783	0.0938	0.1212
<i>MM: Morality of Hypocrisy</i>	0.0455	0.1674	0.078	0.0405	0.2715
<i>MM: Morality of Money</i>	0.0326	0.0315	0.0224	0.0288	0.053
<i>MM: Welfare State</i>	0.1365	0.0162	0.0522	0.0193	0.0057

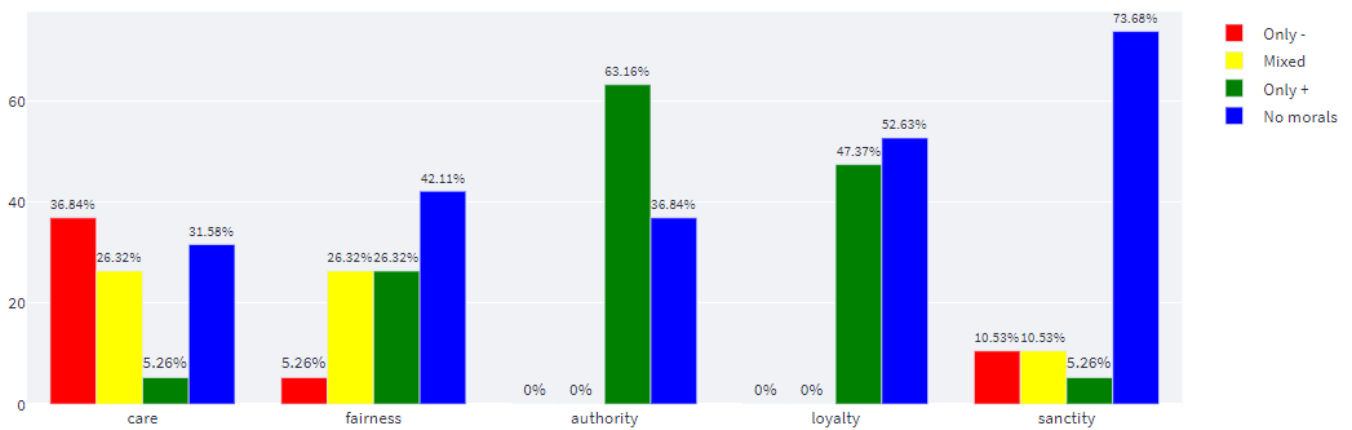


Figure 10. Interlocutors' distribution regarding their moral foundation valence on *MM: British Empire*



Figure 11. Interlocutors' moral value scores on *MM: Hypocrisy*

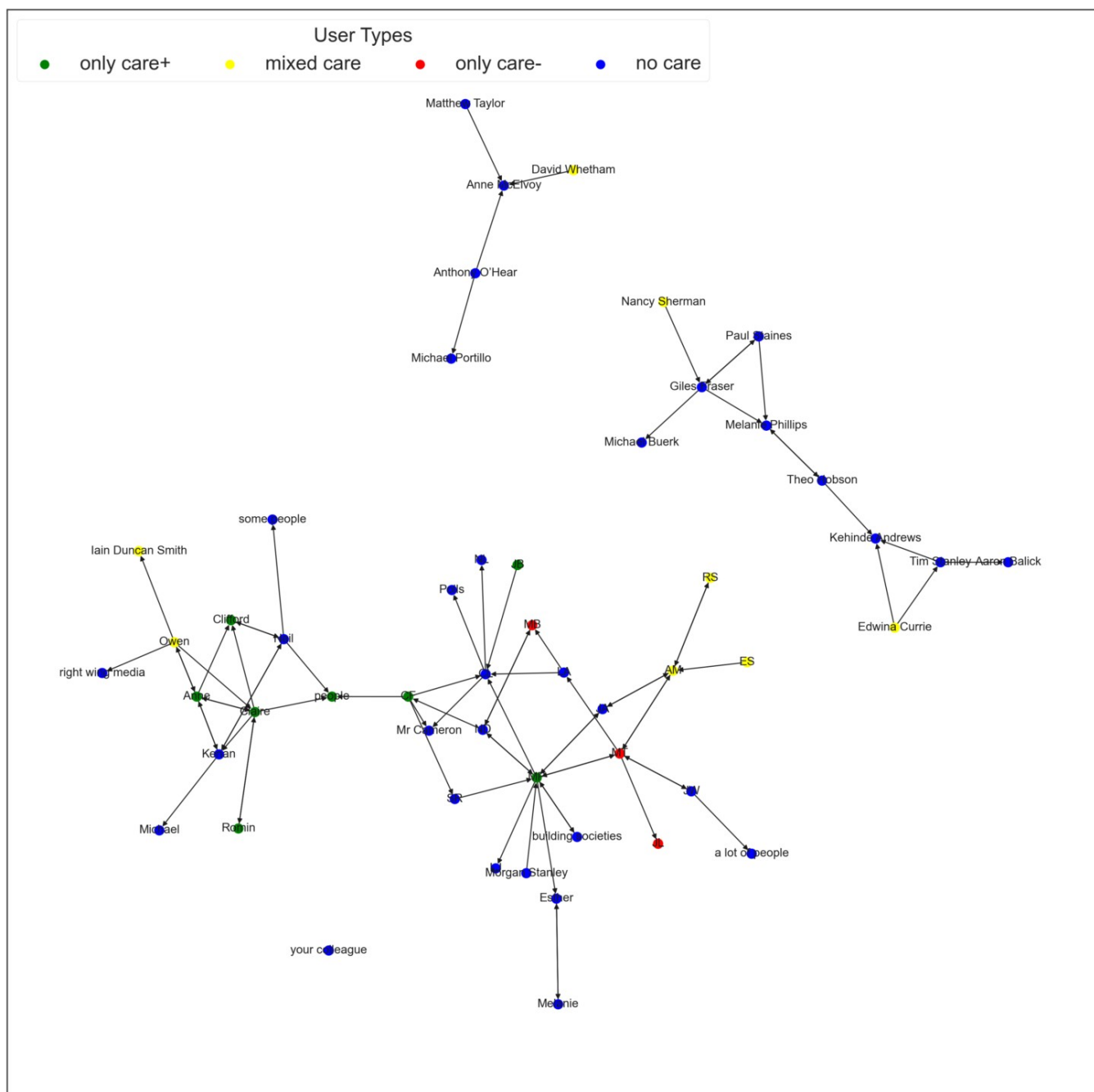


Figure 12. Care valence in argument attack interactions. Arrows represent argument attacks from the input to the output

