Detection and Analysis of Moral Values in Argumentation — Supplementary —

He Zhang[a;*], **Alina Landowska**[b,a] **and Katarzyna Budzynska**[a]

[a]Laboratory of The New Ethos, Warsaw University of Technology, Poland
[b]SWPS University of Social Sciences and Humanities, Poland

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.

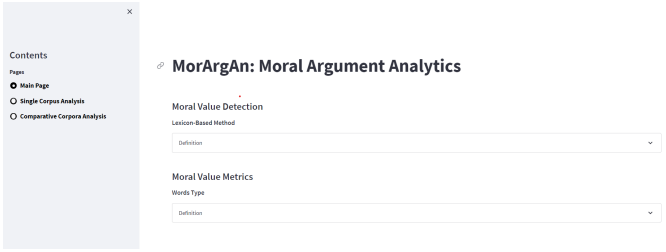

Figure 1. Moral Argument Analytics Interface

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*.

* Corresponding Author. Email: he.zhang@pw.edu.pl

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

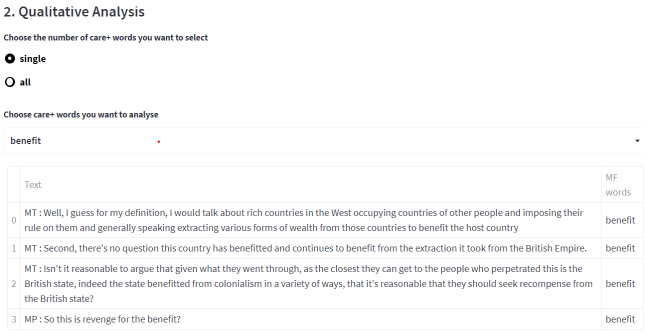

Figure 3. Qualitative analysis on Moral Foundation words

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

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

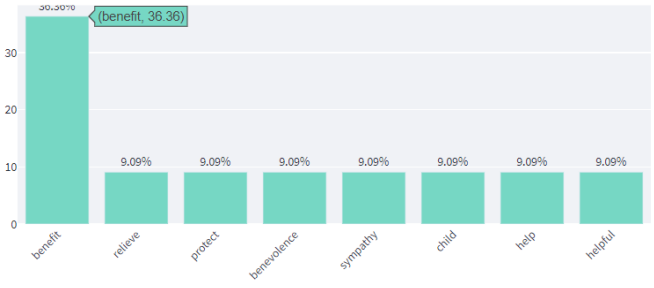

Figure 4. Quantitative analysis on Moral Foundation words

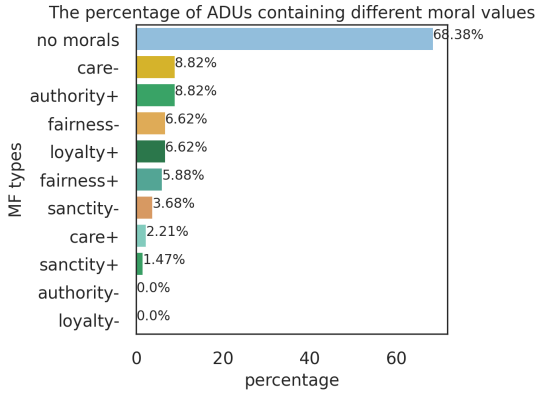

Figure 5. Moral value distribution based on argument inputs in MM corpora

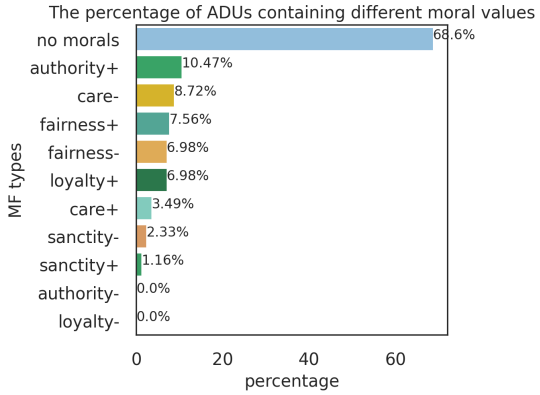

Figure 6. Moral value distribution based on argument outputs in MM corpora

outputs.

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 11 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.

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 12). The presented figure shows that *Michael Gove* only refers to *Sanctity-* in his speech in *MM: Hypocrisy* corpus.

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 14) on pro-arguments and *Care* on con-arguments (see Figure 13).

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: *Fairness*, *Loyalty*, *Authority* and *Sanctity* (see Figures 7-10) 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.

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 1-5).

Table 1. General moral value prevalence in argumentation across different propositional relations

Propositional relations	*Morals*	*No morals*
Support	71.20%	28.80%
Attack	77.66%	22.34%

Table 2. 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 3. Negative moral values distribution in argumentation across different moral topics.

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

Figure 7. Argumentation interaction frequency considering fairness valence

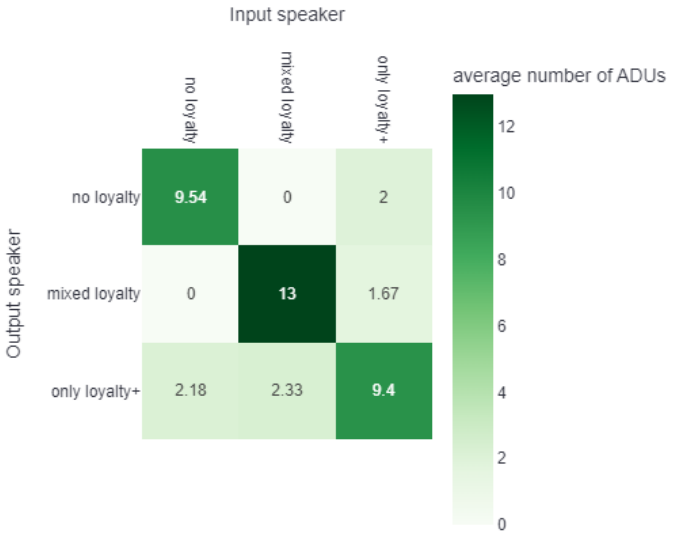

Figure 8. Argumentation interaction frequency considering loyalty valence

Table 4. Positive moral values distribution in argumentation across different moral topics.

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

Table 5. Group profiling for speakers in different moral topic discussions.

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

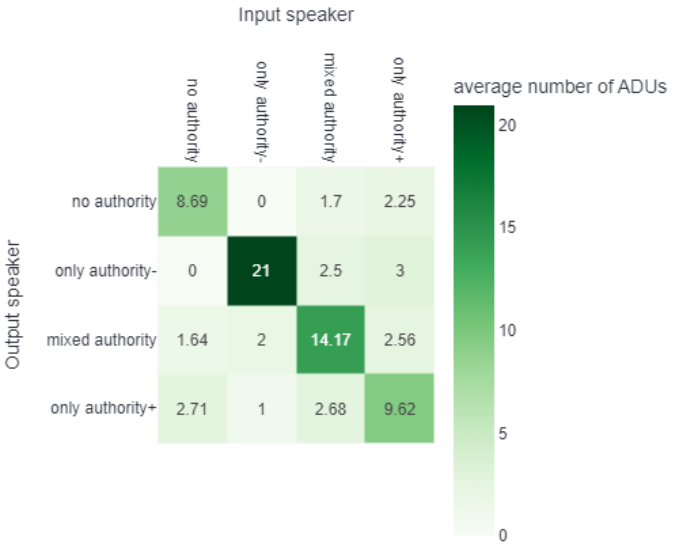

Figure 9. Argumentation interaction frequency considering authority valence

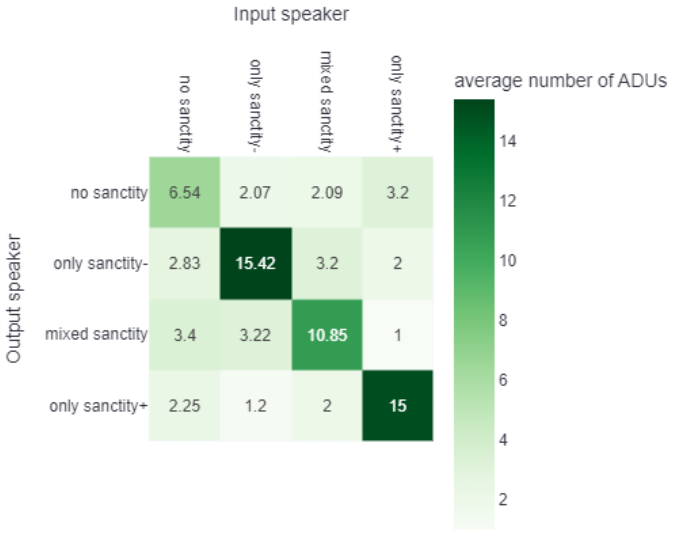

Figure 10. Argumentation interaction frequency considering sanctity valence

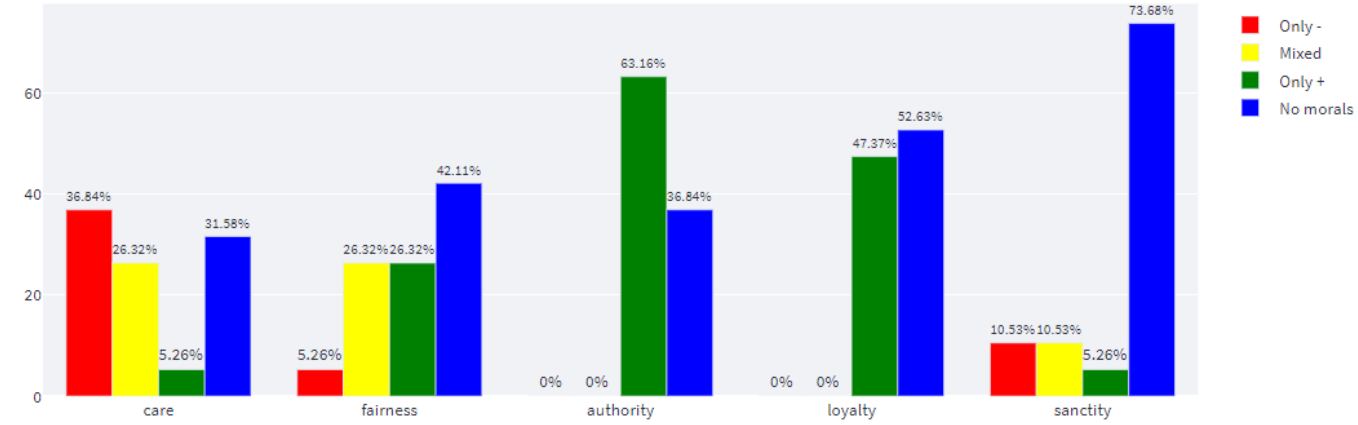

Figure 11. Interlocutors' distribution regarding their moral foundation valence on *MM: British Empire*

Figure 12. Interlocutors' moral value scores on *MM: Hypocrisy*

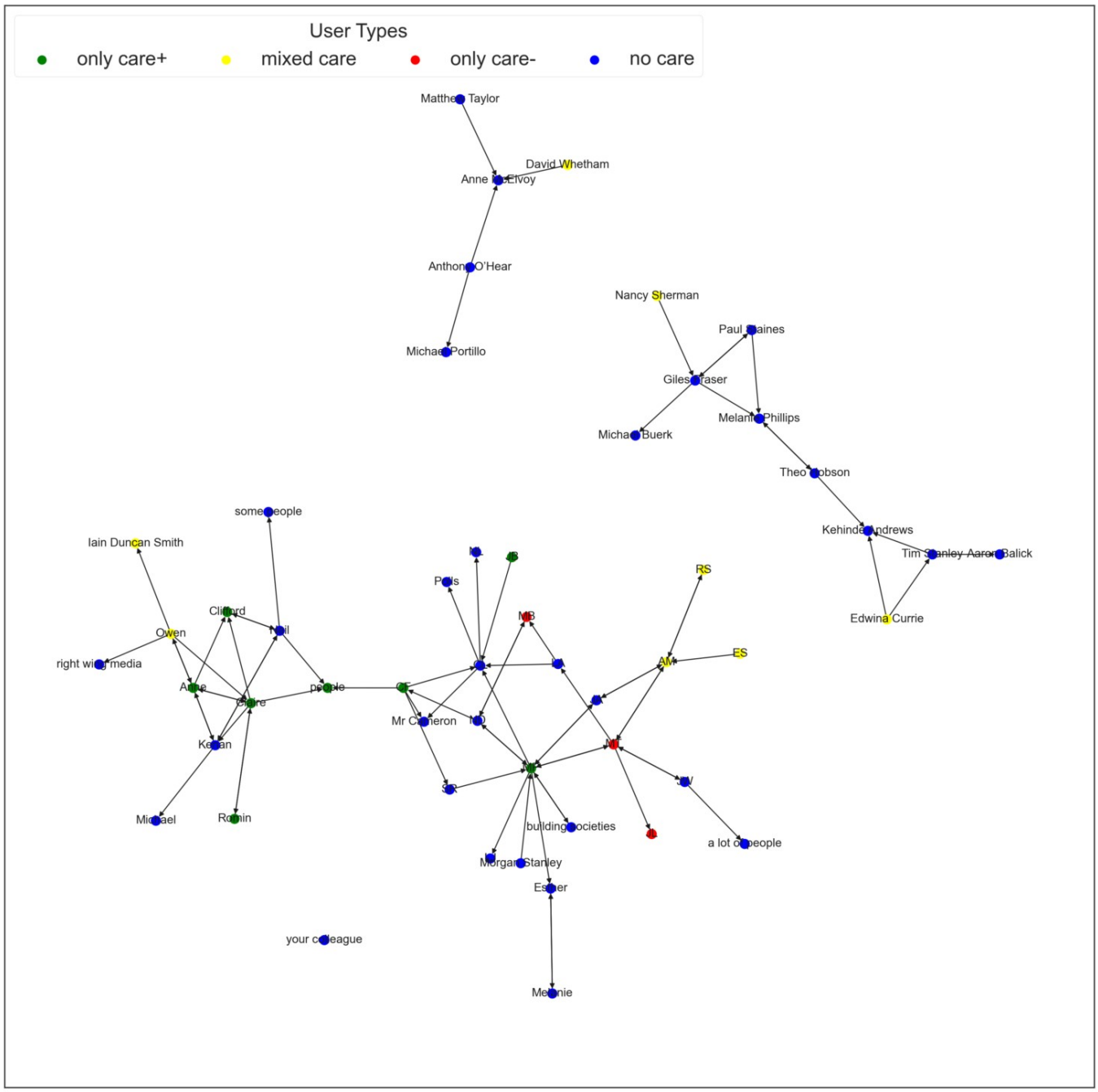

Figure 13. Care valence in argumentation attack interactions. Arrows represent argumentation attacks from the input to the output

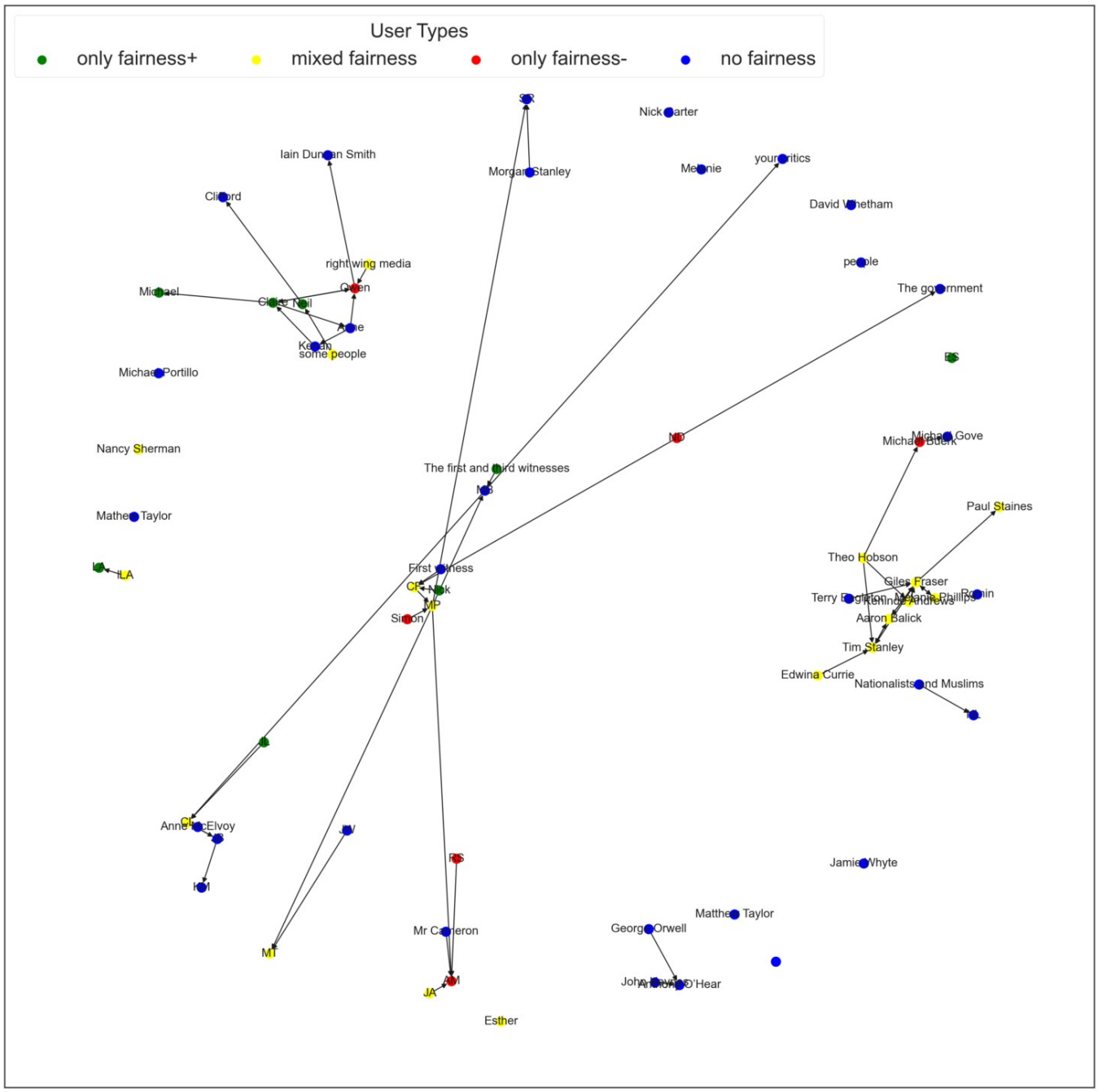

Figure 14. Fairness valence in argumentation support interactions. Arrows represent argumentation supports from the input to the output