



Universiteit
Leiden
The Netherlands

Opinion diversity through hybrid intelligence

Meer, M.T. van der

Citation

Meer, M. T. van der. (2025, March 26). *Opinion diversity through hybrid intelligence*. *SIKS Dissertation Series*. Retrieved from <https://hdl.handle.net/1887/4209024>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/4209024>

Note: To cite this publication please use the final published version (if applicable).

Contents

Summary	vii
Samenvatting	ix
1 Introduction	1
1.1 Research Questions	4
1.2 Research Methodology	5
1.2.1 Fundamental Issues (Q1)	5
1.2.2 Hybrid Intelligence (Q2)	6
1.2.3 Perspective Hierarchy (Q3)	9
1.3 Dissertation Scope	11
1.4 Outlook	12
I NLP for Online Discussion Analysis	15
2 An Empirical Analysis of Diversity in Argument Summarization	19
2.1 Introduction	20
2.2 Related Work	21
2.2.1 Key Point Analysis	21
2.2.2 Opinion Summarization	21
2.2.3 Diversity in Societal Decision Making	21
2.3 Method	21
2.3.1 Task setup	22
2.3.2 Modeling Diversity in Key Point Analysis	22
2.4 Experimental Setup	23
2.4.1 Data	23
2.4.2 Approaches	24
2.4.3 Evaluation Metrics	25
2.5 Results and Discussion	26
2.5.1 KPG Performance	26
2.5.2 KPM Performance	26
2.5.3 Analysis	27
2.6 Conclusion	30
3 Will It Blend? Mixing Training Paradigms & Prompting for Argument Quality Prediction	33
3.1 Introduction	34
3.2 Related Work	34
3.3 Data and Training Paradigms	35
3.3.1 Data	35

3.3.2	Training Paradigms	35
3.4	Approach.	36
3.4.1	Implementation details	37
3.5	Experiments and Results	37
3.5.1	Error Analysis	38
3.6	Conclusion	39
3.7	Access and Responsible Research	39
II	Hybrid Intelligence for NLP	41
4	A Hybrid Intelligence Method for Argument Mining	45
4.1	Introduction	46
4.2	Related work	48
4.2.1	Computational Argument Analysis	48
4.2.2	Summarization of Arguments.	49
4.3	Method	49
4.3.1	Opinion Corpora	50
4.3.2	Key Argument Annotation	51
4.3.3	Key Argument Consolidation.	52
4.3.4	Key Argument Selection	54
4.4	Experimental Setup.	54
4.4.1	Phase 1: Key Argument Annotation.	55
4.4.2	Phase 2: Key Argument Consolidation	56
4.4.3	Phase 3: Key Argument Selection	56
4.4.4	Baselines	58
4.5	Results	60
4.5.1	Annotator Agreement	60
4.5.2	Phase 1: Key Argument Annotation.	61
4.5.3	Phase 2: Key Argument Consolidation	63
4.5.4	Phase 3: Key Argument Selection	64
4.5.5	Comparison with Automated Baseline	67
4.5.6	Comparison with Manual Baseline	68
4.6	Discussion	69
4.7	Conclusion and Future Directions	71
5	Annotator-Centric Active Learning for Subjective NLP Tasks	73
5.1	Introduction	74
5.2	Related work	75
5.2.1	Learning with annotator disagreement	75
5.2.2	Active Learning	75
5.3	Method	76
5.3.1	Soft-label prediction	76
5.3.2	Active Learning	76
5.3.3	Annotator-Centric Active Learning.	77

5.4	Experimental Setup	78
5.4.1	Datasets	78
5.4.2	Evaluation metrics	78
5.4.3	Training procedure	79
5.5	Results	79
5.5.1	Highlights	79
5.5.2	Efficiency and Fairness	80
5.5.3	Convergence	83
5.5.4	Impact of subjectivity	83
5.6	Conclusion	85

III Social Science with Hybrid Intelligence 87

6	Do Differences in Values Influence Disagreements in Online Discussions?	91
6.1	Introduction	92
6.2	Related Work	93
6.2.1	(Dis)-agreement and discussion analysis	93
6.2.2	Value models	94
6.2.3	Value estimation	94
6.3	Method	94
6.3.1	Data	95
6.3.2	Value Extraction	95
6.3.3	Value Profile Estimation	96
6.4	Experiments and Results	96
6.4.1	Training Models for Value Estimation	96
6.4.2	Value Profile Estimation	97
6.4.3	Value Conflicts and Disagreement	98
6.4.4	Use Case: Predicting (Dis-)agreement	102
6.5	Conclusion	103

IV Conclusions 105

7	Contributions and Future Work	107
7.1	Research Findings	108
7.1.1	NLP for Perspective Analysis	109
7.1.2	Hybrid Intelligence for NLP	110
7.1.3	Perspective Hierarchy	112
7.2	Contributions	112
7.2.1	Scientific Relevance	112
7.2.2	Societal Relevance	114
7.3	Limitations	115
7.4	Future Work	116

V	Appendices	119
A	An Empirical Analysis of Diversity in Argument Summarization	121
A.1	Detailed Experimental Setup	121
A.1.1	Data	121
A.1.2	Per-approach Specifics	122
A.1.3	Evaluation metrics	124
A.2	Additional results.	125
A.2.1	Detailed ROUGE scores for Key Point Generation.	125
A.2.2	Additional BERTScores for Key Point Generation	125
A.2.3	Long-tail experiment for KPG	125
A.2.4	ChatGPT generated key points for PVE	126
B	Will It Blend? Mixing Training Paradigms & Prompting for Argument Quality Prediction	129
B.1	Hyperparameters.	129
B.2	Additional results.	130
B.2.1	Per-label Performance	130
B.2.2	Label confusion	130
B.2.3	Seed Variance	130
B.2.4	Topics	131
C	A Hybrid Intelligence Method for Argument Mining	133
C.1	Experiment Protocol & Description.	133
C.1.1	Preliminaries	133
C.1.2	Phase 1: Argument Annotation	133
C.1.3	Phase 2: Argument Consolidation	134
C.1.4	Comparison to Automated Baseline.	134
C.1.5	Annotation platform	134
C.2	Method Details.	135
C.2.1	Parallel Pairwise Annotation Algorithm.	135
C.2.2	Hyperparameters.	135
C.3	Detailed Results	138
C.3.1	Unclear Translation Actions	138
C.3.2	Clustering Arguments	138
C.3.3	Key Arguments.	138
D	Annotator-Centric Active Learning for Subjective NLP Tasks	149
D.1	Detailed Experimental Setup	149
D.1.1	Dataset details	149
D.1.2	Hyperparameters.	149
D.1.3	Training details.	150
D.1.4	ACAL annotator strategy details	150
D.1.5	Disagreement rates	151
D.2	Detailed results overview	152
D.2.1	Annotator-Centric evaluation for other MFTC and MHS tasks	152
D.2.2	Training process	152

E	Do Differences in Values Influence Disagreements in Online Discussions?	159
E.1	Methodological details	159
E.1.1	Training Value extraction methods	159
E.1.2	Annotator experiment	160
E.1.3	Training agreement analysis models.	162
E.2	Additional Results	165
E.2.1	Value Extraction	165
E.2.2	Value Survey	165
E.2.3	Qualitative Examples of Value Conflicts and (Dis-)agreement	165
E.2.4	Decomposition of BF_{10} results	165
E.2.5	Kendall τ vs. Spearman ρ	166
E.2.6	Agreement Analysis	166
	Bibliography	171
	Acknowledgments	217
	Curriculum Vitæ	219
	List of Publications	221
	SIKS Dissertations	223

