

# Mining, Assessing, and Improving Arguments in NLP and the Social Sciences

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## Abstract

Computational argumentation is an interdisciplinary research field, connecting Natural Language Processing (NLP) to other disciplines such as the social sciences. The focus of recent research has concentrated on *argument quality assessment*: what makes an argument good or bad? We present a tutorial with a strong interdisciplinary and interactive nature structured along three main coordinates: (1) the notions of argument quality (AQ) across disciplines (how do we recognize good and bad arguments?), with a particular focus on the interface between Argument Mining (AM) and Deliberation Theory; (2) the modeling of subjectivity (who argues to whom; what are their beliefs?); and (3) the generation of improved arguments (what makes an argument better?). The tutorial will also touch upon a series of topics that are particularly relevant for the LREC-COLING audience (the issue of resource quality for the assessment of AQ; the interdisciplinary application of AM and AQ in a text-as-data approach to political science), in line with the developments in NLP (LLMs for AQ assessment), and relevant for the societal applications of AQ assessment (bias and debiasing). We will involve the participants in two annotation studies on the assessment and the improvement of quality. The full materials of this tutorial can be found at <https://sites.google.com/view/argmintutorial-2024/home-page>.

**Keywords:** argument mining, quality assessment, annotation, data quality

## 1. Introduction

Computational argumentation is a field encompassing varying tasks on the automated analysis and synthesis of natural language arguments. Until recently, research in Natural Language Processing (NLP) mostly dealt with *Argument Mining* (AM), that is, the identification of argumentative claims that convey a stance towards some controversial issue, along with evidence given as reasons for the claims. AM has been studied for various genres (Mochales and Moens, 2011; Habernal and Gurevych, 2017; Dusmanu et al., 2017a) and argument models (Toulmin, 1958; Walton et al., 2008; Freeman, 2011).

Whether we conceptualize the function of argumentation as “reason giving” or “persuasion” (refer to Lawrence and Reed (2019) for a discussion of this dichotomy) the question of what makes an argument good (or better than another argument) has been at the core of research in argument mining (Wachsmuth et al., 2017; Lauscher et al., 2020; Marro et al., 2022). A first edition of this tutorial has been taught by the same authors of this tutorial at EACL 2023 (Lapesa et al., 2023). In the following, we present the main tutorial coordinates, shared with the previous edition (Section 1.1). This LREC-COLING 2024 edition, beyond the obvious update of the literature, will feature new topics that we de-

vised to fit the conference audience, to account for the fast pace of research in NLP, particularly in the context of large language models, and to broaden the interdisciplinary scope of the tutorial (Section 1.2).

### 1.1. Tutorial coordinates

In this tutorial, we start from the body of research on AM. Unlike earlier NLP tutorials on argumentation (Budzynska and Reed, 2019; Bar-Haim et al., 2021), however, our focus is a task that recently got into the center of attention: *argument quality assessment*, that is, to rate or to compare how good arguments are with respect to one or more defined quality dimensions.

**The NLP Perspective: Assessing Argument Quality** Let us start with the concrete example of argument quality annotations in Figure 1, taken from Lauscher et al. (2020). The topic is “freedom of speech”, and the stance is “against” (i.e., the government has the right to censorship). Quality is assessed here in four dimensions: *cogency* (is the conclusion adequately supported with acceptable, relevant, and sufficient premises?), *effectiveness* (how persuasive is the argument?), *reasonableness* (is the argument good in the context of the debate in which it is framed?), and *overall quality*.

The example illustrates the challenges which

<i>Title: Should 'blogging' be a capital crime? Iran is considering it...</i>				
<i>Stance: A government has the right to censor speech (...)</i>				
<i>Text: My government doesn't give me freedom of speech, so I have to argue for this side. Freedom of speech is bad because ... um ... then Our Leader's beliefs could be challenged. No one wants that. I mean, if everyone would just say and believe what Our Leader says to, we wouldn't need those firing squads altogether! Everyone wins.</i>				
	Cogency	Effectiveness	Reasonableness	Overall
Annotator 1	4	1	1	2
Annotator 2	4	5	3	4
Annotator 3	2	2	2	2

Figure 1: Argument quality assessment from Lauscher et al. (2020): Example argument, annotated for four dimensions by three annotators, with partial agreement.

we take as coordinates of this tutorial. The first challenge is the identification and definition of appropriate *dimensions* for quality assessment: for example, in this case, the effectiveness label conflates several aspects. The second challenge in quality assessment is *subjectivity*. In our example, the three annotators (linguistics experts) clearly disagree in their assessment. Lauscher et al. (2020) report that a crucial factor of disagreement of Annotators 1 and 2 was their perception of the ironic tone behind the text. Interestingly, for both of them, the text has a medium-high degree of cogency (so it is logically pretty “healthy”). A further challenge would be to improve the quality of this argument: How would we make this argument more effective? Do we need more irony, less irony, or a stronger statement of the stance?

To inform participants about argument quality, the tutorial will systematically review existing research on argument quality based on the literature (Wachsmuth et al., 2017), outlining the subjectiveness of quality dimensions as a key problem. In an interactive annotation session, participants will explore and discuss the assessment of quality on real-life arguments. They will be encouraged to take a critical standpoint to the annotation guidelines, learning in a concrete scenario how difficult it is to establish a trade-off between expressivity of the annotation schema and feasibility of the task.

**The Social Science Perspective: Assessing Deliberative Quality** To demonstrate the impact of argument quality in practice, the tutorial will bridge research in NLP with the social sciences, looking at deliberative democracy in particular. Deliberative democracy is an approach to democratic processes which does not focus on the output of decision-making, but on the discourse exchange that precedes it (Bächtiger and Parkinson, 2019). Crucially, deliberative theory scholars have been asking the same question as computational argumentation: What makes a contribution to a discussion good? This has led to the development of a *discourse qual-*

*ity index* to assess the quality of a discourse contribution (Steenbergen et al., 2003; Gerber et al., 2016).

**Modeling Subjectivity** Next, we will deal with subjectivity, modeling the parties involved in debates along with their values and beliefs. The connections of argument quality and deliberative quality highlight the subjective nature of argumentation, one of the three main coordinates of this tutorial. Subjectivity has been the trigger of an “affective turn” in both deliberative theory and computational argumentation. In the former, this has implied a switch from a purely rational perspective on deliberation to one which incorporates emotions, personal narratives, humor (Hoggett and Thompson, 2002; Black, 2020; Esau, 2018; Esau and Friess, 2022). In the latter, the affective turn has brought personal argumentation at center stage, highlighting the role played by human values (Kiesel et al., 2022), moral discourse (Alshomary et al., 2022), and narratives (Falk and Lapesa, 2022). In the tutorial, we aim to encourage participants to reflect on the two-fold role that subjectivity plays in quality assessment: subjective factors in quality assessment (e.g., interpretation of humor, as in the example above), and subjective factors in the production of an argument (e.g., all the “personal argumentation” ingredients listed before).

**Improving Arguments** The subjectivity topic will lead to another interactive session where the goal is to improve the quality of arguments. Limitations will be discussed as well as first research on quality-related argument generation (Gurcke et al., 2021; Skitalinskaya et al., 2023), before the tutorial concludes with an outlook on future perspectives.

## 1.2. Further topics

**Data Quality** What are the requirements for a high-quality resource to model AQ assessment? Is annotator disagreement necessarily a cue to bad quality? What is the role of human baselines in AQ assessment? Which sample should the annotated data be representative of? Which challenges are posed by crowdsourcing as an annotation method? We will wrap up every session with a dedicated slot for reflection on available resources and desiderata.

**Bias and Debiasing** Tightly related to the notion of data quality is the one of bias in AM datasets (Spliethöver and Wachsmuth, 2020) and debiasing methods for AM (Holtermann et al., 2022)

**LLMs and AQ Assessment** The fast developments and performance boosts offered by LLMs represent an incredible opportunity. What are the challenges and the potential risks of LLMs for AQ assessment?

**Text-as-Data Approaches to political science** AM and text-as-data approaches to political sci-

ence research find a natural overlap in the tasks of claim, stance, evidence detection. Moving a step forward, what is the relation between AQ and widely investigated phenomena in political science, such as electoral success or polarization?

## 2. Target Audience

The tutorial targets both participants who are new to the field of computational argumentation and those who need a comprehensive overview of techniques and applications. As the tutorial is interdisciplinary by design, it is also of interest to participants from a social sciences background who hope to integrate their knowledge within NLP. Finally, we expect the tutorial to attract attention from people interested in NLP techniques that currently impact the social and political world, in general. Basic knowledge of linguistics and computational linguistics is required.

## 3. Outline

### Part I (60 min.) Mining Arguments

- Overview of computational argumentation
- Argument mining: Humans vs. computers
- Achieved results and open challenges
- Data quality: resources overview & reflection on desiderata

### Part II (60 min.) The NLP Perspective: Assessing Argument Quality

- What makes an argument “good”?
- Logical, rhetorical, and dialectical dimensions of argument quality
- Subjectiveness as the key challenge for annotation and modeling
- Discussion of the notions of argument quality: Are they sufficient? Are they all necessary?
- Data quality: resources overview & reflection on desiderata

### Part III (60 min.) Interactive Session 1

- Annotation: Assessment of sample arguments
- Consolidation: To what extent participants agree? Where not, and why?
- Discussion: What are alternative strategies to subjective quality annotation?

### Part IV (60 min.) The Social Sciences Perspective

- Direct democracy, deliberative theories, and e-deliberation
- Deliberative quality: Features and annotation
- Integration of deliberative features in computational architectures
- Application: Argument quality for social good
- Application: Argument Mining in political science text-as-data research.

- Data quality: resources overview & reflection on desiderata

### Part V (60 min.) Modeling Subjectivity

- Authors, audiences, and third parties
- Human values, moral foundations, narratives
- Issues with subjectivity: exploiting annotators’ disagreements
- Bias and debiasing
- Data quality: resources overview & reflection on desiderata

### Part VI (60 min.) Interactive Session 2

- Annotation: Rewriting of sample arguments
- Consolidation: What was improved and how?
- Discussion: What can be improved, what not?

### Part VII (60 min.) Conclusion: open challenges and lessons learned

- Generation Methods to improve argument quality
- Challenges: multilinguality, multimodality
- LLMs for AQ assessment
- Conclusions and next steps for the field

## 4. Diversity Considerations

We believe that exposing the students to the deliberative perspective of argumentation will be fruitful and enriching, as it might not be known to the typical \*CL audience. It is our goal that participants leave our tutorial having learned the value of taking multiple disciplinary perspectives into account, even in a rather technical (logic- and NLP-oriented) subject such as computational argumentation. Besides, our focus on subjectivity and personal argumentation as positive features (and not bugs) brings individuals and their differences at center stage, contributing to inclusivity in the field.

## 5. Reading List

**Survey Papers** (Cabrio and Villata, 2018; Lawrence and Reed, 2019; Vecchi et al., 2021; Lauscher et al., 2022; Wang et al., 2023)

**Mining Arguments** (Habernal and Gurevych, 2017; Daxenberger et al., 2017; Dusmanu et al., 2017b; Schaefer and Stede, 2020)

**Assessing Argument Quality** (Wachsmuth et al., 2017; Lauscher et al., 2020; Marro et al., 2022; Ziegenbein et al., 2023)

**Assessing Deliberative Quality** (Steenbergen et al., 2003; Gerber et al., 2016)

**Improving Arguments** (Hua and Wang, 2018; Gurcke et al., 2021; Syed et al., 2023; Skitalinskaya and Wachsmuth, 2023; Skitalinskaya et al., 2023)

**Challenges** (Durmus et al., 2019; Toledo-Ronen et al., 2020; Spliethöver and Wachsmuth, 2020)

## 6. Presenters

**Gabriella Lapesa** is a team lead for Data Science Methods in the Department for Computational Social Sciences at the Leibniz Institute for Social Sciences (GESIS Köln) and a junior professor of Responsible Data Science and Machine Learning at the Heinrich-Heine University of Düsseldorf. She also leads the research group E-DELIB (*Powering-up E-DELIBeration: towards AI-supported moderation*) at the University of Stuttgart. Her research targets the intersection between NLP and the Social Sciences, with a general focus on the development of NLP methods to support social science research and real-world applications (i.e., moderation in deliberative discussions). She co-chaired the 9th Argument Mining workshop (2022) and co-taught a course and a tutorial on interdisciplinary Argument Mining, respectively ESSLLI 2022 (with E.M. Vecchi) and EACL 2023 (with the other authors of this proposal).

**Eva Maria Vecchi** holds a Ph.D. degree in cognitive and neurosciences. She is a postdoctoral researcher at the Institute for Natural Language Processing at IMS Stuttgart, working on the E-DELIB project. Her focus is on the interdisciplinary effort between NLP techniques for argument mining (AM) and theories in the social sciences with the goal of a more collaborative, productive, and ethical endeavor for e-Deliberation. She has taught courses and tutorials on AM and other topics, e.g., ESSLLI 2022 (with G. Lapesa) and EACL 2023 (with the authors of this proposal). Her current research aims at a better understanding of the role bias has in computational argumentation and e-Deliberation, particularly the impact it has on the models, implementation, and social aspects of computational argumentation.

**Serena Villata** is a research director in computer science at CNRS, and she pursues her research at the I3S laboratory in Sophia Antipolis (France). Her research area is computational argumentation, with a focus on legal and medical texts, political debates and social network harmful content (abusive language, disinformation). Her work conjugates argument-based reasoning frameworks with natural language arguments extracted from text. She is the author of over 150 scientific publications on the topic. She holds a Chair of the Interdisciplinary Institute for AI 3IA Côte d’Azur on “Artificial Argumentation for Humans”. Serena has co-chaired the 7th Workshop on Argument Mining at COLING 2020. She has also given tutorials on Argument Mining at ESSLLI 2017<sup>1</sup> and IJCAI 2016<sup>2</sup>.

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<sup>1</sup><https://www.irit.fr/esslli2017/courses/39.html>

<sup>2</sup>[https://ijcai-16.org/index.php/welcome/view/accepted\\_tutorials/](https://ijcai-16.org/index.php/welcome/view/accepted_tutorials/)

**Henning Wachsmuth** is the head of the Natural Language Processing Group at Leibniz University Hannover. He is an internationally leading researcher on computational argumentation with about 70 publications on the topic, many at major NLP and AI venues. Other interests include social bias mitigation, computational reframing, and explainable NLP. Henning has co-chaired the 6th Workshop on Argument Mining at ACL 2019, and has given tutorials on argumentation at ASIRF 2018 (Cole and Achilles, 2019), EuroCSS 2018,<sup>3</sup> KI 2019 (Benzmüller and Stuckenschmidt, 2019), and KI 2020 (Schmid et al., 2020). He is an initiator of the CLEF shared task series Touché on argument retrieval (Bondarenko et al., 2022), and co-chaired SemEval tasks on argument reasoning comprehension (Habernal et al., 2018), propaganda technique detection (Da San Martino et al., 2020), and identifying human values in arguments (Kiesel et al., 2023).

## 7. Ethics statement

The breadth of computational argumentation research, from previous focus on mining to more recent interest in assessment and improvement, encompasses huge benefit to various fields, e.g., NLP and Computational Social Sciences; however, we acknowledge the responsibility of the research to remain sensitive to the ethical concerns that are both generally shared in these fields as well as unique to automated assessment and improvement of arguments. Privacy concerns arise regarding the mining and analysis of private or sensitive data, such as social media posts, emails, or personal correspondence, without informed consent or when the data is not properly anonymized.

Argument quality assessment may be used in sensitive applications, e.g., argumentative writing support, legal or ethical decision-making processes, or guidance on political opinion formation, in which factual errors, bias concerns, and unfair evaluations are particularly problematic, as they may easily lead to or perpetrate wrong or shifted beliefs. Implementing measures to assess and improve arguments, particularly when incorporating subjectivity and human values, may open the door to the manipulation of arguments, such as strategically crafting arguments to achieve desired outcomes. In the contexts of social sciences, political campaigns, and social media, this is of considerable concern as it can lead to the spread of misinformation and unethical persuasion tactics at both a local and global level.

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<sup>3</sup><http://symposium.computationalsocialscience.eu/2018/>

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