

# PRIN 2022 Project EPICA

## Deliverable 1.2 Technical report on conceptual analysis, use cases and requirements

Pietro Baroni<sup>1</sup>, Stefano Bistarelli<sup>2</sup>, Bettina Fazzinga<sup>3</sup>, Giulio Fellin<sup>1</sup>, Sergio Flesca<sup>4</sup>, Filippo Furfaro<sup>4</sup>, Massimiliano Giacomini<sup>1</sup>, Francesco Parisi<sup>4</sup>, Carlo Proietti<sup>5</sup>, Irene Russo<sup>5</sup>, Francesco Santini<sup>2</sup>, Carlo Taticchi<sup>2</sup>, and Paola Vernillo<sup>5</sup>

<sup>1</sup>DII - Università di Brescia

<sup>2</sup>DMI - Università di Perugia

<sup>3</sup>DICES - Università della Calabria

<sup>4</sup>DIMES - Università della Calabria

<sup>5</sup>ILC - Consiglio Nazionale delle Ricerche

### Abstract

This document presents the main results of the Work Package 1 of the PRIN 2022 project EPICA. First, it describes the activities of preliminary analysis carried out in the first phase of the project, which led to select campaigns to promote greener diet as a reference case study for EPICA. The document provides then an overview of models and tools for argument analysis in computational linguistics and develops a conceptual analysis, from a formal argumentation perspective, of some communication initiatives devoted to promoting greener diet. On this basis, a set of modelling requirements are identified, representing an input to the subsequent work packages of the project.

# 1 Introduction

This document is the Deliverable 1.2<sup>1</sup> of the PRIN 2022 project Empowering Public Interest Communication with Argumentation (EPICA), funded by European Union – Next Generation EU - Mission 4 “Education and Research” component C2 - investment 1.1 (CUP D53D23008860006).

This deliverable is the main outcome of the Work Package 1 “Conceptual analysis and requirement definition” of the EPICA project. The document is organised as follows. Section 2 describes the activities of preliminary analysis carried out in the first phase of the project, which led to select campaigns to promote greener diet as a reference case study for EPICA. Section 3 provides an overview of models and tools for argument analysis in computational linguistics. Section 4 develops a conceptual analysis, from a formal argumentation perspective, of 5 communication initiatives of different nature devoted to promoting greener diet. Based on this analysis, in Section 5, a set of modelling requirements are identified. Finally, Section 6 concludes the document.

## 2 Preliminary analysis

In order to define the scope and contents of this document a preliminary analysis has been carried out involving two main activities:

- a discussion meeting with a prominent stakeholder in the area of public communication;
- a comparison of a set of potential case studies, in order to select the one most suitable for the development of the conceptual analysis.

### 2.1 Stakeholder meeting

On October 31st 2023, a distance meeting has been held between some representatives of the project (Pietro Baroni, Irene Russo, and Sergio Flesca) and two representatives of a major leading company in the area of strategic communication consultancy in Italy (details omitted due to confidentiality reasons). After a presentation of the goals and structure of the project, the participants

---

<sup>1</sup>This deliverable is subject to changes in the event that errors or omissions are detected after its release.

had a brainstorming session on the relationships between the project and the interests of stakeholders active in the area of public communication.

The main themes emerged in this open discussion can be summarized as follows.

- The evaluations carried out by human experts typically take into account contextual elements which are not considered by current automated analysis tools, which can lead to different evaluations. For instance, tools for sentiment analysis typically refers to the presence of positive or negative linguistic elements independently of the context. However, an expert may be aware that in a given context and for a given subject there is a largely shared sentiment (e.g. a negative one). A proper sentiment evaluation should take into account this situation: for instance a piece of text which is in line with the shared sentiment and does not add further negative elements should not be indicate a negative, but rather a neutral sentiment by its author.
- It is interesting to characterize the communications produced by a given subject in terms of the topics, the stance towards each topic, the kind of arguments typically used, the ability to produce arguments on a given topic.
- Some topics are subject to continuous and rapid changes, as it was for instance COVID-19, while other topics are more stable. In the former case, it is reasonable that changes in the positions of a subject do not indicate a lack of coherence and even different positions may correspond to a stable stance, which is interesting to identify.
- In the preparation of a campaign it is important to identify the main themes to be put forward with specific reference to the target audience and to the reputation that one subject may have in a given context, It is important to identify who should say what to a given audience.
- It would be very useful to have automated tools which analysing a set of communications (e.g. articles in newspapers) can provide objective reasons to ascribe some stance or attitude at general level to the authors of these communications.

After the meeting, the project members examined the main outcomes of the discussion, deriving the following main indications for the subsequent activities:

- any model or tool developed should not be limited to the contents of the communication itself but should properly take into account the context where the communication occurs and the intended targets;
- collective properties of the sets of arguments included in communication campaigns are of particular interest, in particular in relations to the identification of general positions, stances, or attitudes underlying a campaign;
- highly dynamic contexts add specific difficulties to the challenging task of communication analysis.

It was also remarked that the discussion provided a confirmation that the research issues to be tackled in the project have not been previously addressed and require a substantial advancement of the state of the art.

Based on these considerations, it was agreed that a gradual approach in tackling the complexity of the research issues to be faced would be the most effective choice to establish foundations for the subsequent phases of the project. Accordingly, it was agreed to carry out the first phase of conceptual analysis by focusing on a selected public interest communication context, as described in next subsection.

## 2.2 Case study selection

A project meeting was devoted to the discussion and comparison of some general topics of public interest communication in order to select the context the conceptual analysis should focus on.

The following general desiderata were used to formulate a list of candidate topics:

- the topic should be of broad interest for the general public;
- the topic should have been the subject of significant public communication activity;
- there should be an adequate coverage of the topic and the relevant public communication issues in the scientific literature.

Based on these desiderata, three candidate topics were initially selected, namely COVID-19, Climate change, and Greener diet.

The following main considerations led then to the choice of focusing on campaigns promoting greener diet:

- with respect to COVID-19 and Climate change, the topic of Greener diet is less prone to biases and polarisation, which may have a distorting effects on communication activities. Dealing with this kind of effects is beyond the scope of a first conceptual analysis;
- communications concerning COVID-19 and Climate change may involve deeper scientific and technical aspects which are less accessible (and therefore less appropriate for a first conceptual analysis) than those typically involved in promoting greener diet;
- promoting greener diet is central in public interest communication since the '90s, has been the subject of multiple campaigns worldwide and there is a literature on the effectiveness of these campaigns.

### **3 Argument analysis in computational linguistics: models and tools**

Paramount to analysing the role of argumentation in Public Interest Campaigns (PIC) with NLP techniques, it is fundamental to settle upon how to model an argument and the computational tools to use to retrieve arguments in a textual source. These choices determine what type and amount of data one is able to extract and, by consequence, to which extent it is possible to answer the research questions.

#### **3.1 Survey of argument models**

Behind the modelling choice lies the big theoretical question “what is an argument?”, or else the less emphatic one about what are the relevant functional aspects of an argument / an argumentative text. In this sense [20] isolates three macroapproaches: a *dialectic* approach, focusing on the structural and procedural aspects of argumentation, a *rhetoric* one and an *empirical* study of argumentative discourse (e.g. by means of linguistic pragmatics). The line of analysis we follow for our purposes falls mostly in the first of these approaches.

One further relevant choice concerns the level of granularity at which one should analyse an argumentative source. Here, the perspectives vary a lot.

A first relevant divide is between *abstract* and *structured argumentation*.

Abstract argumentation [12] takes arguments as primitive and not further decomposed entities, and focuses on their mutual interactions, most notably attacks from one argument to another. Just by studying the topology of a debate, this level of analysis can provide several insights on the justifiability of a given argumentative position, and, relative to our topic of study, on why, e.g. a certain PIC may be successful or not. One issue with a too abstract approach is that it hinders the retrieval of richer and possibly relevant information from a text. Further, analysis at an abstract level could always be implemented as a second step (as an abstraction from a finer-grained analysis). Last but not least, techniques of direct argument extraction (mining) at an abstract level are relatively less explored, with the exception of [7].

Structured argumentation [4] instead takes arguments as complex entities, and the gist of it lies in the analysis of the argument components. Indeed, here the most relevant issue is about how such an entity should be decomposed. At the intuitive level, an argument is made of a *conclusion* (or claim) and a (set of) *premise(s)* together with an *inferential link* from the latter to the former. Although these elements are present in every approach to structured argumentation, many options are possible, which are explored both within formal-logical approaches [22, 34, 23] and enriched ones (see list below). In fact, there are several levels of argument analysis that are implemented in the literature, ranging richer to simpler. [8] provides a survey of the most relevant approaches in linguistics and ranks them according to their complexity. The main ones are the following:

- **Toulmin's model** [35]. This is the first and arguably the richest model of argument. Here the argument has six components: a *claim* (or conclusion), together with its *qualifier* (e.g. “possibly” or “with certainty”). The claim is supported by a number of premises (*data* or grounds) via an inferential link (*warrant*) whose applicability is guaranteed by a *backing*. Further the argument needs to specify its possible *rebuttal*, i.e. the circumstances under which the conclusion is not guaranteed.
- **Argument schemes** [40]. Here the argument has the three standard components, i.e. premises, conclusion and inferential link. However, arguments are classified according to a rich taxonomy of inferential links (e.g. *cause-effect*, *argument from practical reasoning*, *positive consequences*) which give rise to more than sixty classified argument schemes.
- **Argumentum model of topics (AMT)** [28]. This model provides an alternative close to argumentation schemes. Here as well, there is a

large taxonomy of argument schemes, determined by three dimensions of their so-called *procedural component*: the *locus* (ontological relation between premises and conclusion), the *maxim* (type of inferential connections) and the specific type of *logical form* activated by the maxim. Other elements such as *backing* etc. are taken into account by the so-called *material component* of the argument.

- **Inference anchoring theory (IAT)** [5]. Explains the argumentative structure by anchoring it in persuasive dialogical interactions between discussants. IAT elements therefore include dialogical locutions and transitions between them. From them, a mirroring argumentative structure (made of propositions and propositional relations) is derived by connecting the dialogical elements with those of the argumentative structure by means of so-called illocutionary connections.
- **Freeman's model** [14]. Here the basic elements are premises, conclusions and inferential links. The inferential link between premises and conclusions may constitute different structures, e.g. *divergent* (support of different conclusions by a premise), *serial* (a chain of premises, intermediate conclusions and conclusions), *linked* (joint support of two premises), and *convergent* (independent support of a conclusion by two premises).
- **Periodic table of arguments (PTA)** [37]. Here arguments are constituted only by premises and conclusions. This approach provides a taxonomy of arguments generated along four dimensions consisting of  $3 \times 3 \times 2 \times 2 = 36$  combinatorial possibilities.

Toulmin's model is arguably the richest framework in this list, while AMT, IAT and Walton's schemes are only slightly less complex. On the other hand, both Freeman's model and PTA are significantly simpler. In particular, Freeman's model provides a good compromise between richness and manipulability for the purpose of argument extraction in our study.

### 3.2 Speech Acts for Argument Modelling

A speech act is a linguistic expression that conveys information while performing a specific action, such as asking a question, issuing a command, or making a commitment, through speaking itself [2]. Speech acts play a crucial role in dialogue systems for argumentation. They allow for performing argumentative moves and facilitate the dynamic exchange of ideas, closely mimicking



human interactions. This involves reproducing the complex aspects of human communication, which is essential for constructing realistic and effective conversations. In the following, we examine some speech acts commonly found in the literature, for instance in [24, 25, 26], which aid in understanding how individuals convey ideas, challenge assertions, and revise their perspectives.

Considering a formula  $\phi$  of a communication language,  $claim(\phi)$  refers to stating something ( $\phi$ ) as a fact. In this process, an individual presents a proposition or an assertion with the belief that it reflects reality. This speech act serves, in particular, as the basis for presenting hypotheses, observations, and conclusions. Sometimes, a claim can counter a previously asserted statement ( $\psi$ ), and we can write  $counter(\phi, \psi)$ .  $why(\phi)$  involves expressing doubt or seeking clarification about the validity of a claim  $\phi$ . This act requires the original claimant to provide evidence or reasoning to support his/her assertion, promoting critical examination of ideas.  $argue(\phi)$  represents the process of providing evidence or logical reasoning to support a claim  $\phi$ . This constructive act enriches the debate by introducing justified viewpoints built on evidence or deductive reasoning that seeks to persuade others of the claim's validity. If a specific example, evidence, or related claim  $\psi$  is known that directly supports or contextualises  $\phi$ , the speech act can be rendered as  $argue(\phi, \psi)$ .  $concede(\phi)$  is the act of acknowledging the validity of  $\phi$ , a truth of a point raised by another. In particular, conceding signifies the acceptance of an opposing argument. Finally,  $retract(\phi)$  involves the withdrawal of a previously made claim  $\phi$ , typically when the claimant no longer believes in the validity of his/her statement or when confronted with compelling evidence to the contrary. This act is fundamental for maintaining the integrity of the discourse, as it allows for correcting inaccuracies and refining ideas. Speech acts form a dynamic framework for communication, enabling the expression and evaluation of complex forms of dialogue.

Although PIC is usually non-dialogic and cannot directly use speech acts (which are meant explicitly for dialogues), we could explore some possible applications for later stages of the project.

- By analysing specific examples of PIC, we could identify and extract relevant speech acts, which may be integrated into a chatbot designed for PIC to manage communication with the audience more effectively.
- Another potential avenue involves leveraging Inference anchoring theory [5], which links communication to illocutionary acts.
- Additionally, generating simulated dialogues from PIC could facilitate persuasive communication. This approach might be further refined to



create guided short texts or dialogic interactions (such as those managed by chatbots) for limited audiences.

### 3.3 Survey of argument mining tools

Argument mining consists of a toolbox of techniques for the analysis and extraction of the argumentative structure from natural language corpora, where the main aim is to provide structured and machine-readable data from raw documents. This typically consists in annotating a text by retrieving the argument components (premises, conclusions and inferential links) and possibly the relations between different arguments, e.g. the undermining of the premises of one argument by the conclusion of another. The annotation schema is tailored on a theoretical model of argument as the ones presented in the previous section.

A typical pipeline of argument annotation, as described by [6] consists of:

1. **Data collection.** This phase consists of the gathering of a large amount of natural language sources (the *dataset*). For the sake of effectiveness, the collected material typically needs to belong to a specific and well-defined textual genre (e.g. persuasive essays, or else parliamentary acts etc.). The amount of collected material varies depending on the research goal. For tasks resorting to automatic annotation, where training with machine-learning techniques is needed, the amount of material needs to be very large. Less so for other approaches.
2. **Choice of theoretical model of argument.** This choice is often a trade-off between research desiderata and efficiency. Typically, a richer model provides more information on the argumentative features of the text but it is more difficult to annotate (see next points).
3. **Annotation.** This amounts to first defining an annotation schema, i.e. a set of *tags* identifying the textual components and their additional features. This definition is determined by the choice theoretical model. As a second step, a group of annotators is selected. Depending on the specific task, this may consist of a small number of expert annotators (typically from two to four) or a larger number of non-expert annotators selected via some crowdsourcing mechanism.
4. **Corpus creation and evaluation.** The dataset is annotated by members of the group according to the annotation schema, then this task is evaluated by assessing the *inter-annotator agreement* by means of

the Fleiss-Cohen's  $\kappa$ -coefficient [13, 10] or Krippendorff's  $\alpha$ . Agreement ranges on an interval from 0 to 1 [19], where values in the interval [0.61,0.81] indicate substantial agreement.

The main critical issues in this process concern the complexity of the theoretical model. In fact, The richer the theory, the harder gets the annotation task and the less substantial inter-annotator agreement can be expected, even among expert annotators. Further, a more complex annotation is time consuming and harder to perform on large corpora. A further critical point lies in the selection of the textual genre. Here possibilities range from texts with and explicit and intended argumentative structure (e.g. persuasive essays, parliamentary speeches et similia) to less structured sources (e.g. journal articles, posts and comments on social media etc.).

In light of these criticalities, the choice of the theoretical model and its relative annotation schema is an important one. For the purposes of our present investigation and given the type of textual material that is processed, the choice was oriented towards the annotation schema elaborated by [32]. This schema is based on Freeman's model and simplifies it to a certain extent. It essentially consists of a preliminary identification of the topic of discussion (*Prompt*) together with its *Major claim* (the main conclusion), its *premises*, intermediate conclusions (*Claims*) and the relations among these elements, consisting of supports and attacks.

This type of annotation technique has proven to be very effective when applied to a large corpora of persuasive essays. In fact a high value of inter-annotator agreement has been consistently observed [20], even among large enough groups of non-expert annotators. This pipeline of annotation can be applied to the material relevant to the specific case study of PIC campaigns for a greener diet modulo a preliminary work on already available material

### 3.4 Preliminary pipeline

The preliminary pipeline aims to foster the integration between Argument Mining approaches developed in Natural Language Processing and formal approaches promoted by Computational Argumentation. To better illustrate how texts from PIC campaigns will be handled, we report two examples of short argumentative texts split in sentences from the handbook "Have A Plant ©":

- (a) *Fruit and vegetable intake has been shown to be protective against many diseases.*

*While in some cases, the evidence does not yet show a clear association between produce intake and lower risk of disease, fruit and vegetable intake has consistently been shown to be a staple in a healthy eating pattern—which the DGA, the gold standard of science on healthy eating, recommends we strive for.*

*So, what is the message for the public?*

*Have a Plant!*

*Eat more fruits and vegetables—in any form.*

*This is the single most important behavior we can all do to live a healthy and happy life!*

- (b) *Consumption of fruit and vegetables is an important part of a healthy diet and is associated with reduced risk of chronic diseases, including cardiovascular disease, stroke, and certain types of cancer.*

*Fruit and vegetables contain a variety of vitamins, minerals, fiber and phytochemicals.*

*Phytochemicals are compounds produced by plants that are believed to affect health, but are not traditional 'essential' nutrients.*

*That is, if not consumed, clinical deficiency symptoms do not occur.*

*They are, however, thought to be protective against disease, likely working synergistically with other compounds, including vitamins and minerals, in plants.*

The pipeline is ideally composed of a claim-and-premise identification module based on state-of-the-art models trained on manually annotated datasets plus an arguments' relations identification module that connects premises to claims, considering the expressed stance (basically, if the premise supports or attacks the claim).

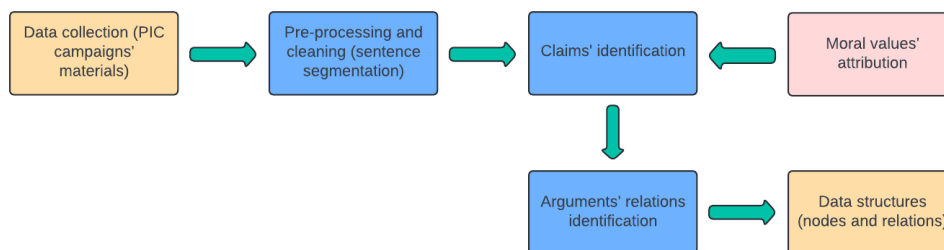


Figure 1: Preliminary pipeline for arguments extraction and classification.

The classification of claims and premises is carried out after basic pre-processing of the textual data extracted from PDF documents and web pages. Texts are

automatically split into sentences.

At this stage, this step represents an oversimplification because there is no conceptual isomorphism between claims and sentences. In principle, a sentence can contain two different claims, and a claim can be split into two sentences, or a long sentence can include a claim and a premise, as in the following example:

1. *While in some cases, the evidence does not yet show a clear association between produce intake and lower risk of disease, fruit and vegetable intake has consistently been shown to be a staple in a healthy eating pattern—which the DGA, the gold standard of science on healthy eating, recommends we strive for.*

Several linguistic strategies can be deployed to identify atomic claims in longer sentences:

- training a model based on a dataset where claims and premises are annotated at the span level;
- automatically parsing the texts and then splitting relatives and subordinate clauses.

A first qualitative evaluation of state-of-the-art models classifying claims and premises [9] reveals that for short texts from greener diet campaigns sentences tend to be classified as premises, with no major claims emerging from the output of the models.

For this reason, the preliminary version of the pipeline focuses on the identification of sentences as arguments (1) or not arguments (2) using a model trained on 25,000 heterogeneous manually annotated sentences [33] of controversial topics (<https://huggingface.co/chklla/roberta-argument>), without committing on the sub-classification into claims and premises:

1. *Consumption of fruit and vegetables is an important part of a healthy diet and is associated with reduced risk of chronic diseases, including cardiovascular disease, stroke, and certain types of cancer.*
2. *Phytochemicals are compounds produced by plants that are believed to affect health, but are not traditional 'essential' nutrients.*

Two complementary strategies are promising for the identification of claims and premises:

- labeling as claims the sentences with the highest probability score as argument in a short text;
- labeling the sentence that more frequently appears in inference or conflict relations after the argument relation identification step.

Both strategies are based on a threshold that could be set only after validation on manually annotated texts from the greener diet campaigns, even if it is possible to test the pipeline on data from different but comparable datasets [11]. The arguments relation identification is performed with a RoBERTa-large model trained on the US2016 and the QT30 corpora [?]ruiz2021), outputting four classes: none, inference, conflict and rephrase. A relation is provided for all pairs emerging from the combinations of sentences, not just for pairs of adjacent sentences. Yet, although this strategy could work (pretty well) for short texts, it could be computationally expensive for longer ones.

#### INFERENCE

- *Consumption of fruit and vegetables is an important part of a healthy diet and is associated with reduced risk of chronic diseases, including cardiovascular disease, stroke, and certain types of cancer.*
- *Fruit and vegetable intake has been shown to be protective against many diseases.*

#### CONFLICT

- *Consumption of fruit and vegetables is an important part of a healthy diet and is associated with reduced risk of chronic diseases, including cardiovascular disease, stroke, and certain types of cancer.*
- *Fruit and vegetable are not very protective against diseases.*

Every sentence or - in the future - every atom of the argumentation can be enriched with features that will also be projected onto formal models of computational argumentation, making the representations of argumentative dynamics more complex. We are specifically interested in experimenting with the inclusion of moral values projected onto arguments/sentences thanks to pre-trained models for moral values classification [27, 17, 18].

Argumentation is commonly described as based on facts and evidence, but it is often substantiated by moral values, more or less explicitly associated with the arguments behind the speaker's stance about a topic. Therefore, neglecting the reference to moral values means missing a crucial aspect that impacts

on the success of an argument. If the audience shares a set of moral values with the speakers, it will be more easily persuaded. On the contrary, persuading someone with radically different values will require more effort and different strategies.

Natural language processing researchers have used two main theories of universal moral values for the manual annotation and automatic classification of moral values.

The Moral Foundations theory [15] was developed by social and cultural psychologists to identify the innate moral beliefs recurring across cultures and populations. The original framework identified five foundations, which are strongly supported by evidence across various cultures: Care/Harm, Fairness/Cheating, Loyalty/Betrayal, Authority/Subversion, Sanctity/Degradation, Liberty/Oppression. This theory guided the annotation of a small set of arguments in the ArgQuality moral values dataset that will be used as a training set [18].

The theory of basic human values [30] is a theory of cross-cultural psychology and universal values that identifies ten basic human values, organized in four higher-order groups: Openness to change (Self-direction, Stimulation), Self-enhancement (Hedonism, Achievement, Power), Conservation (Security, Conformity, Tradition), Self-transcendence (Benevolence, Universalism). Schwartz's theory of moral values was used for two datasets, ValueNet [27] and, partially, Touché23-value-eval [17].

We used the three mentioned training sets (Touché23-value-eval, ValueNet, ArgQuality moral values dataset) for the automatic annotation of arguments. At this stage, in absence of a manually annotated dataset specifically designed for greener diet campaigns, the assessment of the qualitative performance of these models represents a quite challenging task. However, looking comparatively at the outputs of the three models, the convergence of results for models based on Touché23-value-eval and ValueNet are promising:

Another advantage of selecting an adaptable and not content loaded annotation schema lies in its *modularity*. In fact, many features of arguments that are not included in standard annotation schemas can be extracted in a second phase after isolating the argumentative structure of the text. One example concerns the extraction of *values* that arguments refer to, and which are mostly relevant when assessing the impact of argumentation trends in PIC campaigns (see section 4).

*Schwartz theory of basic human values* [29, 31] and *moral foundations theory* [16] provide two empirically-grounded and cross-culturally validated theories of human morality. Both theories identify a set of universal moral values. The relative importance attributed to these values determines the *moral profiles* of

	S D	S T I	H E D	A C H	P O W	S E C	C O N F	T R A	B E N	U N I
<i>Fruit and vegetables are a good source of vitamins and minerals, including folate, vitamin C and potassium.</i>		V N				V E				
<i>Fruit and vegetables taste delicious and there's so much variety to choose from.</i>			V N - V E							
<i>Fruit and vegetables help reduce your risk of heart disease, stroke and some types of cancer.</i>						V E			V N - V E	

Figure 2: Automatic classification of moral values for arguments.

individuals and, by extension, of groups. Reference to central values is what ultimately motivates individual actions and decisions. The extraction of values from relevant textual units, e.g. arguments, is therefore relevant to understand how moral/cultural triggers may influence target audiences. In our case, how they determine the success or failure of a given PIC.

In recent years many approaches to automatic extraction of the value dimension from textual units have been implemented, leading to the creation of large annotated datasets such as *ValueNet* [27] and *ValueArg* [17] and a number of applications to opinion and argument mining (see [36] for a recent overview).

## 4 Promoting greener diet: a conceptual analysis from a formal argumentation perspective

In this section we develop a conceptual analysis of some communication initiatives to promote greener diet following the formal argumentation perspective which characterizes the EPICA project. After a short introduction, we describe five examples of greener diet promotion in Section 4.2, analyse their difference and commonalities in Section 4.3, and discuss some modeling desiderata in Section 4.4.



## 4.1 PIC campaigns promoting greener diet: a short introduction

We decided to develop our conceptual analysis on a sample of greener diet promotion initiatives available on the web selected in order to be representative of the different agencies which may issue a communication campaign concerning greener diet and of the different ways its can be realised.

In particular, we selected the following sources:

- a national health service, namely the National Health Service (NHS) of United Kingdom (<https://www.nhs.uk>);
- an independent scientific institution focused on food and health issue, namely the Center for the Science in the Public Interest (CSPI) (<https://www.cspinet.org>);
- the movement “Have A Plant ®” explicitly devoted to promote the “role fruits and vegetables can play to fuel happy, healthy and active lifestyles” (<https://fruitsandveggies.org>);
- a not-for-profit healthcare organization, namely Orlando Health (<https://www.orlandohealth.com>);
- a professional dietitian working for a network of groceries stores, namely Redner’s (<https://www.rednersmarkets.com/>).

Besides the variety concerning their status as institutions, the selected sources also provided a variety of communication forms, namely:

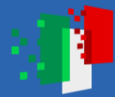
- a dedicated section of the institutional web site in the case of UK NHS;
- a whole book available online for in the case of CSPI;
- lists of Top 10 reasons to eat more fruit and vegetables for the other three sources.

We regarded as particularly interesting to consider alternative lists of Top 10 reasons coming from different sources as they may support a direct comparison of the perspectives adopted by different subjects in terms of commonalities and differences.

Below we provide the URLs of the web resources concerning the five examples<sup>2</sup>:

---

<sup>2</sup>All resources were last visited in May 2024.



- the “5 a Day” section of the web site of the UK National Health Service (NHS) is available at link  
<https://www.nhs.uk/live-well/eat-well/5-a-day/>
- the online book “Six arguments for a greener diet” is available at link  
<https://www.cspinet.org/resource/six-arguments-greener-diet>
- the lists of “Top 10 reasons to eat more fruit & vegetables” by Have A Plant, Orlando Health, and Redner’s are available respectively at the following links:  
<https://fruitsandveggies.org/stories/top-10-reasons-to-eat-more/>  
<https://www.orlandohealth.com/content-hub/top-10-reasons-to-eat-more-fruits-and-vegetables>  
<https://fruitsandveggies.org/stories/insiders-viewpoint-10-reasons-eating-fruits-veggies-matters/>

## 4.2 Examples of greener diet promotion available on the web

In this section we describe, in five dedicated subsections, the five examples of greener diet promotion selected for the conceptual analysis to be developed in Section 4.3.

### 4.2.1 “5 a Day” by NHS

This section describes the “5 a Day” section of the NHS web site. This example will be briefly indicated as 5-NHS in the following.

The “5 a Day” page on the NHS web site is reached through the path “Home > Live Well > Eat well > 5 A Day”. Thus “5 a Day” appears to be placed in the wider context of individual well-being, obviously in the section related to eating.

The page contains just the following short explanatory text: “Information and advice about eating enough fruit and vegetables.” and three links:

- Why 5 A Day?
- 5 A Day: what counts?

- 5 A Day portion sizes

The most relevant link for our argumentative analysis is “Why 5 A Day?” referring to a page structured as follows.

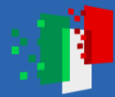
First, it gives main claim, evidenced in bold, “Fruit and vegetables are part of a healthy, balanced diet and can help you stay healthy. It’s important that you eat enough of them.” This can be regarded as an implicit argument, based on the assumption that everyone wants to stay healthy. So the implicit argument could be: since you want to stay healthy, and eating fruit and vegetables helps you stay healthy, you should eat fruit and vegetables. This will be referred as the *main* argument in the following.

The page continues with two comments. The first comment says: “Evidence shows there are significant health benefits to getting at least 5 portions of a variety of fruit and vegetables every day. That’s 5 portions of fruit and veg in total, not 5 portions of each. A portion of fruit or vegetables is 80g.” This can be regarded as a specialization of the first argument, in the sense that the suggested action “getting at least 5 portions of a variety of fruit and vegetables every day” (complemented by further explanations) provides a more precise version of the generic recommendation “eating enough of fruit and vegetables”. The second comment says: “The 5 A Day campaign is based on advice from the World Health Organization (WHO), which recommends eating a minimum of 400g of fruit and vegetables a day to lower the risk of serious health problems, such as heart disease, stroke and some types of cancer.” Here a source for the advice, namely WHO, is introduced, together with another version of the suggested action (“eating a minimum of 400g of fruit and vegetables”) and concrete examples of health benefits.

The page then continues with the section by the self-explanatory title “5 reasons for eating 5 a day”. The five reasons are reported and briefly commented in the following.

1. *Fruit and vegetables are a good source of vitamins and minerals, including folate, vitamin C and potassium.*

Here one can identify the implicit argument that vitamins and minerals are necessary for good health and then one should eat fruit and vegetables to get them. This argument can be regarded as a refinement of the main one as it provides a sort of explanation of the achieved health benefits. It can be noted that while the previous arguments mentioned explicitly disease prevention, thus evidencing the positive effects of eating fruit and vegetables, this argument instead suggests what may be the reasons of the achieved health benefits, which are (implicitly) ascribed



to vitamins and minerals, with particular attention to folate, vitamin C and potassium. One might wonder why these three elements are specially emphasized. A possible reason is the assumption that they are already well-known and considered particularly beneficial by the audience.

2. *They're an excellent source of dietary fibre, which can help to maintain a healthy gut and prevent constipation and other digestion problems. A diet high in fibre can also reduce your risk of bowel cancer.*

This argument is partially similar to the first one, as it provides another reason of the achieved health benefits, namely dietary fibre. Differently from the first one, however, here the beneficial effects of dietary fibre are indicated explicitly: healthy gut, preventing constipation and other digestion problems, reducing the risk of bowel cancer. With respect to the main argument, this one provides a specific indication of the health benefits and also provides a causal link between fruit and vegetables and health benefits, namely the intake of dietary fibre.

3. *They can help to reduce your risk of heart disease, stroke and some types of cancer.*

This argument repeats the claim ascribed to WHO without citing again the source. It is, in a sense, complementary to argument 1: here, some positive effects of eating fruit and vegetables are indicated, without giving any hint of the reasons they are achieved, while argument 1 indicated some possible reasons for health benefits without indicating the benefits themselves. Argument 2 is, in a sense, more complete than both 1 and 3, since it links a reason with its benefits.

4. *Fruit and vegetables contribute to a healthy, balanced diet.*

This argument repeats parts of the main claim. It gives no additional information (but the one possibly coming from reiteration) at this point. It is peculiar that it is provided after the more precise arguments 1, 2, and 3, however it might also be regarded as a sort of recap, towards giving emphasis to the main claim.

5. *Fruit and vegetables taste delicious and there's so much variety to choose from.*

This argument differs from the previous ones because instead of appealing to the value of health it appeals to the pleasure of eating delicious food. This argument can be regarded in terms of an accrual of reasons: health benefits, mentioned above, are not the only reason to eat fruit and vegetables, since eating them is also pleasant. The mention of variety has not a univocal interpretation: one can think that mentioning variety

is a way to support the appeal to pleasure, in the sense that even if there is some fruit or vegetable you don't find delicious, the variety is such that you will find for sure some fruit or vegetable you like. Another interpretation is that variety gives you freedom in choosing and allows you to change the fruit and vegetables you eat in your meals. Freedom and diversification can also be regarded as supporting pleasure in eating, but freedom can be regarded as a value per se, since people may dislike, in general, any recommendation on their behaviors which enforces constraints which are too tight and/or difficult to comply with.

After the 5 reasons there are three paragraphs.

The first one says: "Fruit and vegetables are also usually low in fat and calories (provided you do not fry them or roast them in lots of oil). That's why eating them can help you maintain a healthy weight and keep your heart healthy". This paragraph is structurally similar to argument 2, so that one may wonder why it is not included in the list of reasons. In fact, like argument 2, it indicates specific benefits (healthy weight and healthy heart) connected to a property of fruit and vegetables (being low in fat and calories).

The second paragraph says: "To get the most out of your 5 A Day, your 5 portions should include a variety of fruit and vegetables. This is because different fruits and vegetables contain different combinations of fibre, vitamins, minerals and other nutrients." This is a sort of complementary suggestion with respect to the main claim. It does not explain why but rather suggests how to have 5 portions. In a sense, it is a bit misplaced under the section "5 reasons for eating 5 a day". It however recalls some of the beneficial aspects of fruits and vegetables (fibre, vitamins, minerals and other nutrients) and suggests implicitly that a variety of them is better for health.

The third paragraph says: "Almost all fruit and vegetables count towards your 5 A Day. They can be fresh, frozen, canned, dried or juiced. Potatoes, yams and cassava do not count because they mainly contribute starch to the diet." Like the second paragraph just mentioned, this has more to do with how to have 5 portions (which is actually the subject of the subsequent section). It can also be regarded as making explicit and more precise (also indicating exceptions) the claim on variety in argument 5.

After the three paragraphs, there is a very brief section "How to get your 5 A Day" which consists of a single sentence: "To learn more about what counts towards your 5 A Day, go to 5 A Day: what counts? and 5 A Day portion sizes" where "5 A Day: what counts?" and "5 A Day portion sizes" are hyperlinks to other pages.

The page “5 A Day: what counts?” starts with a short claim: “Almost all fruit and vegetables count towards your 5 A Day, so it may be easier than you think to get your recommended daily amount.” This, in a sense, makes explicit, in a different page, the reason why variety was emphasized in the first page. It appeals to easiness and may be regarded again in terms of accrual of reasons or of cost/benefit perception: health benefits can be achieved without much effort, which should favour adoption by those people who may have the feeling that this diet habit is too difficult to follow. In a sense this claim seems misplaced in this page, it should have been included also in the first page.

The rest of the page provides detailed indications about what counts as a portion of fruit and vegetable. These are mainly “technical” indications not relevant to our analysis. The page “5 A Day portion sizes” also gives detailed indications on portions, not relevant to our analysis.

The following summary considerations can be drawn about 5-NHS. First, the communication strategy is essentially focused on the value of individual health (as one might expect from a health institution) with only one argument connected to the value of pleasure in eating. Thus one might say that most of the provided arguments are variants of a main reference argument which can be synthesized as: “you should eat fruit and vegetables because it is beneficial for your health”. Only a limited form of accrual towards the same conclusion is realized through a collateral argument: “you should eat fruit and vegetables because they are delicious”.

#### **4.2.2 Book: “Six arguments for a greener diet”**

“Six arguments for a greener diet” is a 257 page book available online. This example will be briefly indicated as 6-Arg in the following. The book aims to provide a very detailed account, from the authors’ perspective, of why one should adopt a greener diet. The length of the book make it, in a sense, incomparable with other more synthetic communication initiatives. We carry out a synthetic analysis of the six arguments proposed, each of which is the subject of a full chapter in the book. A detailed examination of the whole book contents is beyond the scope of this document.

The list of the 6 arguments is a follows.

1. Less Chronic Disease and Better Overall Health

This argument is similar to the main argument of 5-NHS. It promotes the value of individual health by providing evidences of the benefits of a green diet. Differently from 5-NHS there is a specific emphasis on

the bad consequences of several kinds of food, mainly meat but also others, e.g. refined grains and soft drinks. In the same vein, the benefits for health are particularly emphasized for a fully vegetarian diet rather than just for a greener diet. Along the chapter there is also a remark concerning a social, rather than individual, benefit namely the reduction of healthcare costs.

## 2. Less foodborne illness

This argument is still related to health but considers short-term problems rather than long term-problems. It deals with acute food poisoning episodes. The idea is that foodborne illnesses are more commonly (though not exclusively) caused by animal food and that bacteria causing these illnesses are often of animal origin even when they affect fruit and vegetables. It can be observed that there are actually two arguments embedded in the discourse. One concerns individual health: since a large percentage of foodborne illnesses is caused by animal products, eating less animal products reduces the risk of foodborne illnesses. The other argument is at general level and, in a sense, much more indirect: a greener diet reduces animal farming and hence reduces the main cause of foodborne illnesses.

## 3. Better soil

This argument concerns an environmental value: the preservation of soil and in particular topsoil. The idea is that raising livestock creates a huge demand for corn, soybeans, and a few other crops and in turn livestock feed crops, such as corn and soybeans, that are grown in rows, endanger topsoil since the bare patches between each row are relatively susceptible to erosion. In turn, the loss of topsoil reduces fertility, which increases the need for chemical fertilizers. Then the switch from healthy natural topsoil to artificial nutrients leads to a whole host of problems: nutrient imbalances, runoff, and water pollution. Finally, pesticides disrupt ecosystems, harm wildlife, and may pose threats to human health. As evident, this is a complex argument, with an articulated series of reasoning steps. The general idea is that reducing the consumption of meat may reduce all the negative side effects listed above. It can be observed that in this case, the action of eating more fruit and vegetables has not a positive effect per se: the argument relies on the assumption that eating more fruit and vegetables is accompanied by eating less meat or anyway less food of animal origin. In turn this reduces the negative side effects of animal farming on environment, in particular on soil.

## 4. More and Cleaner Water



Similarly to the previous one, this argument concerns an environmental value: the preservation of water resources. Again this argument is multifaceted. A first point is that raising livestock requires enormous amounts of water and this may cause a problem of water shortage and damage lakes and rivers. Moreover, water can be polluted by fertilizers and pesticides, whose use is increased by the needs of raising livestock. As above, the idea is that reducing the consumption of meat may reduce all the negative side effects listed above. Comments similar to the ones drawn for the previous argument are applicable.

5. Cleaner air

Similarly to the previous ones, this argument concerns an environmental value: the preservation of clean air. It must be remarked however that, more explicitly than in the case of the previous ones, air pollution may have an impact also on human health and animal health. Again this argument is multifaceted. On one hand, livestock excreta are an evident source of smell and air pollution. Pesticides and fertilizers are other sources of air pollution. Moreover, cattle are a source of greenhouse gases. As above, the idea is that reducing the consumption of meat may reduce all the negative side effects listed above. Comment similar to the ones drawn for arguments 3 and 4 are applicable.

6. Less animal suffering

This argument concerns a different value, animal welfare. There is plenty of examples of current farming practices which cause animal sufferings of any kind. As in the previous arguments, the relation with a greener diet is indirect, the idea being that reducing the consumption of meat may reduce animal suffering. However, one might see in this argument a sort of call to shared responsibility: if you eat meat, you are accomplice of these bad practices. So you should avoid eating meat and, as consequence, eating more fruit and vegetables as a replacement in your diet.

The following summary considerations may be drawn about 6-Arg.

While 5-NHS mainly focused on the single value of individual health, 6-Arg encompasses on three main values: individual health, better environment, animal welfare. The presentation is so broad and articulated that of course other values are also touched, in particular social welfare related to reducing health costs. The value of individual health is related to arguments 1 and 2: the former concerns reducing the risk of long-term health problems (similarly to 5-NHS), while the latter concerns preventing short-term foodborne illnesses.

The value of a better environment is related to arguments 3, 4 and 5. Indeed they can all be seen as instances of the same pattern: animal farming has bad effects on the environment therefore animal farming should be reduced. In order to reduce animal farming one should eat less meat. Increasing consumption of fruit and vegetables is an indirect consequence of this decision, unless one reduces food intake. In any case, a “greener diet” is adopted. The three arguments differ in the targets of the bad effects they focus on: is soil, water, and air respectively. The value of animal welfare is related to argument 6, here a sort of appeal not to be an accomplice of animal suffering caused by animal farming can be identified. Thus the pattern is similar to arguments 3-5, but refers to a different class of bad effects: on animal welfare rather than on the environment.

#### 4.2.3 Top 10 Reasons by “Have a plant”

The web site of the “Have a plant” movement includes in its Stories a list of “Top 10 reasons to Eat More Fruits & Vegetables”. This example will be briefly indicated as Top10HaP in the following. The list is presented as a countdown, as presented below (boldface and italic as in the original presentation).

10. **Color & Texture.** Fruits and veggies add **color**, texture ... and *appeal* ... to your plate.  
This argument provides a generic reference to positive sensorial experience.
9. **Convenience.** Fruits and veggies are nutritious in any form - **fresh, frozen, canned, dried and 100% juice**, so they're ready when you are!  
This argument provides a generic reference to variety and readiness of fruits and veggies.
8. **Fiber.** Fruits and veggies provide **fiber** that helps fill you up and keeps your digestive system happy.  
This argument is related to health and in particular to the benefits of fiber. An argument of 5-NHS was similarly devoted to fibers, but focused on long term benefits in disease prevention, while here the focusing is on very short term benefits.
7. **Low in Calories.** Fruits and veggies are naturally **low in calories**.  
An argument implicitly related to the value of health, similar to a remark included in 5-NHS.



6. **May Reduce Disease Risk.** Eating plenty of fruits and veggies may help reduce the risk of many diseases, including heart disease, high blood pressure, and some cancers.  
Argument concerning long term health benefits.
5. **Vitamins & Minerals.** Fruits and veggies are rich in **vitamins and minerals** that help you feel healthy and energized.  
Another argument related to promoting health, through the intake of vitamins and minerals. It emphasises however more positive sensations than actual health benefits.
4. **Variety.** Fruits and veggies are available in an almost infinite variety . . . there's always something new to try!  
This argument partially overlaps with argument 5 of 5-NHS. It emphasises the positive experience inherent to variety and novelty.
3. **Quick, Natural Snack.** Fruits and veggies are nature's treat and easy to grab for a snack.  
This argument mixes an appeal to pleasure and to readiness.
2. **Fun to Eat!** Some crunch, some squirt, some you peel . . . some you don't, and some grow right in your own backyard!  
Another argument appealing to pleasure and fun.
1. **Fruits & Veggies are Nutritious AND Delicious!** A mix between a slogan and an argument. It emphasises the combination between health and pleasure.

The following considerations can be drawn on Top10HaP. This list has an evident emphasis on various types of pleasant experience related to fruit and vegetables, as indicated by the values related to 6 out of 10 arguments: argument 10 (mostly on visual experience), argument 9 (mostly on readiness), argument 4 (variety and novelty), argument 3 (pleasure and readiness), argument 2 (fun), argument 1 (taste). The other 4 arguments (8, 7, 6, 5) are related to the value of health, with only argument 6 referring to long term benefits, while 5 and 8 mention short term benefits and 7 leaves the benefits implicit. In addition argument 1 combines a value related to health (nutrition) with the value of pleasure- All arguments are rather short. The target audience appears to be people who are primarily sensitive to immediate rewards of dietary choices and are also partially sensitive to health issues, with emphasis mainly on short term benefits.

#### 4.2.4 Top 10 Reasons by “Orlando health”

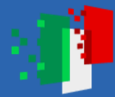
The web site Orlando Health gives in turn a list of “Top 10 Reasons to Eat More Fruits and Vegetables”. This example will be briefly indicated as Top10OH in the following.

This page starts with an introduction emphasizing several health problems caused by some kinds of “non natural foods” and suggests that fruit and vegetables help to avoid these risks:

No matter where you look, the food we consume is getting farther away from nature. Grocery store shelves are filled with processed foods with preservatives and additives that are hard to pronounce. When we're not buying food at the store, it's a cheeseburger and fries for dinner. When you think about the effect this type of diet can have on your health, it's troubling. It's of little wonder the rates of obesity, heart disease, diabetes and other metabolic diseases have increased steadily over the last few years. To avoid being part of these statistics, you can start bringing your diet more in line with nature, and that means eating more fruits and vegetables. Here are the top 10 reasons that's a great idea!

The list then follows.

- 1. Fruits and vegetables are a great source of vitamins and minerals.** You won't find a better nutritional source than fruits and veggies, which are packed with vitamins A, C and E, as well as magnesium, zinc, phosphorous and folic acid. For potassium, one of the most important minerals for your health, eat plenty of avocados, sweet potatoes, bananas, prunes and even tomato paste puree.  
This is a detailed version of the argument about vitamins and minerals already seen in other examples. Plenty of examples are given, but, like in 5-NHS, the benefits of vitamins and minerals are left implicit.
- 2. You get to enjoy a variety of flavors and textures.** With all their unique and interesting flavors, plant-based foods let you get creative in the kitchen. You can try strong flavors like onions, olives and peppers, or milder options such as mushrooms and corn. For sweet flavors, fruits like pineapple, grapes or plums are great, while lemons and grapefruits are more sour.  
A detailed version of the argument about the variety of available options already seen in other examples.



3. **Lots and lots of fiber.** Most fruits and vegetables have plenty of fiber to fill you up and boost gut health, but some have more than others. Fiber-rich vegetables include artichokes, green peas, broccoli and cauliflower. High-fiber fruits include raspberries, pears, apples and pumpkin. A detailed version of the argument about fiber already seen in other examples. The reference to health benefits is mostly implicit and short-term oriented.
4. **They're low-calorie and low-fat.** On average, fruits and especially vegetables are very low in calories and fat, which means you can eat more to keep you feeling full without worrying about extra calories or fat. You can save more than 200 calories by eating half a cup of grapes versus a fourth of a cup of M&Ms. That said, there are **exceptions**, such as avocados, olives and coconuts. Another version of arguments already seen in other examples with a lot of details.
5. **Protect against cancer and other diseases.** Many vegetables and fruits contain phytochemicals, which are biologically active substances that can help protect against some diseases. That means you can lower your risk of type 2 diabetes, stroke, heart disease, high blood pressure and cancer by adding them into your diet. Specifically cruciferous veggies, such as broccoli, cabbage, collards and watercress, have been linked to reducing cancer risks. A detailed version of the argument about disease prevention already seen in other examples.
6. **Fruits and vegetables help you maintain good health.** Because they're low in saturated fat, salt and sugar, fruits and vegetables are part of a well-balanced diet that can help you lose weight or prevent weight gain. Plus, they can help you decrease inflammation, and lower cholesterol levels and blood pressure. A complementary argument concerning disease prevention. It emphasizes health benefits from the perspective of avoiding some causes of disease (weight gain, inflammation, cholesterol, blood pressure) rather than mentioning the diseases themselves.
7. **Low in sodium and cholesterol.** Fresh fruits and veggies contain only trace amounts of sodium. Many people think that celery is high in sodium, but in fact, one stalk contains a mere 30mg, which contributes 1 percent to the recommended daily value. Cholesterol doesn't exist in fruits and veggies at all.

Somehow similar to the previous one: it implicitly assumes that sodium and cholesterol are unhealthy and remarks that fruits and veggies do not contain them.

8. **Fresh, frozen, canned, dried – they're ALL nutritious.** While eating fresh fruits and vegetables may be your preference, there's not much difference from a **nutrition standpoint** when you compare frozen, canned or dehydrated products. In fact, most frozen and canned products are processed within hours of harvest, so the nutritional value is locked in quickly.

An argument about variety similar to some found in other examples. It provides in addition a specific detail on why frozen, canned or dehydrated products are similar to fresh products from a nutrition standpoint.

9. **Convenient, quick and easy.** Unlike granola bars or crackers, many fruits and vegetables don't need any packaging. So you can easily grab a banana or an apple as you're heading out the door.

An argument on readiness, similar to some found in other examples.

10. **Finally ... Smoothies!** If you have a blender, all you need is fruit and ice to whip up a delicious smoothie using all of your favorite flavors. And here's a tip – when you make a fruit smoothie, feel free to throw in as much fresh spinach as you like. Spinach doesn't start to taste like "spinach" until you cook it. Even kids can't tell the difference!

A quite specific argument on a specific kind of food (smoothie) based on fruit (and possibly some vegetables). It focuses on the pleasant experience given by a specific food. This argument can indeed be regarded as a specialization of argument 2 in this list. It looks like a simple closing message evoking pleasant sensations in the reader just at the end of the list.

After the list, a final comment is given: "Enjoying fruits and vegetables is a great way to improve your health and actually enjoy what you eat. While it may take a little creativity, effort and an open mind to try new things, switching to a diet with more fruits and veggies is definitely worth it!"

While this comments remarks again the two main values underlying the arguments in the list, namely health and pleasure, it also acknowledges that an effort may be required to change diet but suggests it is well justified.

In summary, Top10OH provides mostly arguments related to health (1, 3, 4, 5, 6, 7) mixed with others related to variety (2, 8), readiness (9) and pleasant sensations (2, 10). The communication style is oriented to providing many

explanatory details, and the last argument appears to be a specific expedient to entice the reader at the end.

#### 4.2.5 Top 10 Reasons by “Redner’s Warehouse Markets”

Another list entitled “Insider’s Viewpoint: 10 Reasons Why Eating MORE Fruits & Veggies Matters” has been produced by a dietitian of the Redner’s Warehouse Markets company. This example will be briefly indicated as Top10RWM in the following.

The list is introduced by the following sentence “September is here and it’s that time again to celebrate National Fruits and Veggies More Matters Month. We have heard it before - **fruits** and **vegetables** are good for you - but something this good is worth repeating. **Here are the top 10 reasons why we should all be eating MORE!**”

This introduction does not give specific messages, apart that it repeats something well-known and that this happens in the frame of a National Month devoted to the campaign in support of fruit and vegetables.

The list, in countdown format, is as follows.

10. **All Forms Matter.** It doesn’t matter how you get them or where you get them, they all matter! Fruits and vegetables are available in a variety of forms: **fresh, frozen, canned, dried and 100% juice**. They are all nutritious so pick the best one for the right occasion.  
This argument emphasises variety, similar to some found in other examples.
9. **Calories that Count.** With obesity on the rise, calories “in” continue to trump calories “out.” The only way to bring this trend to a halt is to eat less and move more! Make the best use of your calories by selecting nutrient-dense foods (foods that contain plenty of good stuff and much less of the bad stuff)! Fruits and vegetables contain few calories, but tons of important vitamins and minerals.  
This argument mixes two messages. The main one is about calories, similarly to arguments in other examples. Then it quickly mentions also vitamins and minerals, in line with other arguments of the previous examples. As in 5-NHS, the benefits of vitamins and minerals are left implicit.
8. **Fiber** Most Americans are falling short on **fiber** consumption, which is vital for heart and digestive health along with weight maintenance. Fill the gap with fruits and vegetables, which along with whole grains are the



top sources of fiber.

This argument makes a specific reference to the American situation of fiber consumption. Some benefits of fiber consumption are mentioned similarly to arguments in previous examples.

7. **Nutrient-Packed** The food we eat not only needs to taste good, but it also needs to provide our bodies with necessary **nutrients** such as vitamins and minerals. Many fruits and vegetables are “high” and “good” sources of nutrients such as **folate**, **iron**, **magnesium**, **potassium**, and vitamins **A** and **C**.

This argument is devoted to vitamins and minerals and can be regarded as an expansion of the final part of argument 10. The remark on the balance between taste and nutrients may suggest that there is the implicit message that fruits and vegetables are worth assuming even when they do not taste good.

6. **Something for Everyone** With a wide **variety of colors**, textures, tastes and forms, there is a fruit and vegetable out there for everyone. So don't just stop at a few favorites, expand your palate and improve your health with MORE!

This argument emphasizes variety, like several similar arguments in previous examples.

5. **Disease Prevention** **Phytonutrients**, which include well-known antioxidants, have shown to play a great role in our health and more importantly, disease prevention. Fruits and vegetables contain many of these nutrients, all with unique functions and benefits.

Argument concerning disease prevention, as several arguments in previous examples. It does not give examples of diseases, but provides an indication of the mechanism underlying disease prevention.

4. **Quick & Easy** Thanks to our wonderful farmers and produce industry partners, preparing fruits and vegetables can meet any skill set or time clock! No matter which form you choose, there are varieties that require no peeling, chopping, slicing, or dicing and can be prepared in a snap! Argument concerning readiness similar to those found in other examples.

3. **Budget-Friendly** Cost per nutrients, fruits and vegetables are a no-brainer when compared to the items we spend our food budget on that are expensive and provide little nutrition (sugar sweetened beverages, grain based desserts and salty snacks). Make a list, buy **in-season**, and

keep non-perishable items stocked to help keep costs down. Argument related to the value of saving money, with suggestions on how to keep costs down. Remarkably, nothing similar is present in other examples.

2. **Simply Sweet** Satisfy that sweet tooth with naturally sweet fruit. The sugar in fruit, known as fructose, is sweeter than table sugar and has a low glycemic index. Swap your favorite fruits for high calorie, high-fat desserts to save calories. or add fruit to your existing desserts for extra nutrition.

Specific argument concerning replacing some sweet food with fruit, which is also sweet and healthier (this is implicit in the mentions of glycemic index, calories, and fat). The argument is specifically addressed to people with sweet tooth. Nothing similar, at this level of specificity, is present in other examples.

1. **Delicious!** No explanation needed here. Fruits and vegetables are just plain delicious!

The idea is to conclude with a short-term incentive to eat fruits and vegetables, based on an appeal to pleasure, as seen also in other examples.

In summary, the arguments in this lists has several overlaps with other examples and combine the value of health (9, 8, 7, 5, partially 2) with others related to variety (6, 10), readiness (4) and pleasant sensations (2, 1). This list is the only one touching budget issues (3).

### 4.3 Conceptual analysis of the examples: differences and commonalities

The arguments included in the examples surveyed in Section 4.2 have of course a basic commonality: they share the conclusion that one should eat enough fruit and vegetables. The reasons underlying the common conclusions and the way they are presented however, vary significantly. In the following subsections we examine, from a general perspective, various aspects where these arguments differ. This analysis will provide a basis for defining the features that an argumentation formalism should capture in order to enable an expressive representation of different instances of communication campaigns and to support their characterization and comparison on a formal basis.

### 4.3.1 Values promoted by arguments

As well-recognized in the literature, especially in situations involving practical reasoning (namely reasoning about what to do) arguments are typically associated with values and their acceptance by a given audience depends on the values they promote, since different subjects may have different importance orderings on values [3].

Arguing about dietary habits is clearly a form of practical reasoning: we identified the following main values involved in the examples of Section 4.2:

LTH long-term health preservation;

STH short-term health preservation;

SP sensory pleasure;

ED easiness in daily life;

IES individual economic saving;

EP environment protection;

AW animal welfare;

CES collective economic saving.

Table 1 indicates the association between the first for values and arguments in the considered example. Each cell indicates the identifiers of the arguments from the example in the corresponding row which are associated with the value in the corresponding column. The value IES is not included in the Table as it is present only in argument 3 of Top10RWM. The values EP, AW, and CES are not included in the Table as they are present only in the 6-Arg example. In particular, EP is promoted by arguments 3, 4, 5 of 6-Arg, AW is promoted by argument 6 of 6-Arg, while CES is associated with arguments 1 and 2.

As evident from the Table, the examples differ significantly in the choice of values and in the emphasis they put on them.

As one might expect, 5-NHS is mostly focused on health issues, with a limited (but conclusive) mention of pleasant aspects of fruit and vegetables. Concerning health issues, we distinguish short-term and long-term preservation since it is easy to imagine people which give different importance to serious (but hypothetical) health problems in the future (e.g. preventing cancer) with respect to immediate daily well-being (e.g. having a good digestion). However it must

Examples/Values	LTH	STH	SP	ED
<b>5-NHS</b>	1, 2, 3, 4	1, 2, 4	5	
<b>6-Arg</b>	1	2		
<b>Top10HaP</b>	7, 6	8, 7, 5	10, 4, 2, 1	9, 3, 2
<b>Top10OH</b>	1, 4, 5, 6, 7	1, 3, 4, 6, 7	2, 10	8, 9
<b>Top10RWM</b>	9, 8, 7, 5, 2	9, 8, 7, 5, 2	6, 2, 1	10, 4

Table 1: Association between values and arguments in the examples of Section 4.2.

also be remarked that some arguments leave implicit the health benefits (e.g. when suggesting to eat fruit and vegetables because they are a source of vitamins and minerals without further indications). In this case both long-term and short-term benefits can be considered and we include arguments of this kind in both the relevant columns of Table 1.

The book 6-Arg adopts a radically different approach from other examples, with three out of six arguments devoted to environment protection and one argument devoted to animal welfare. Health benefits are considered in arguments 1 and 2, devoted respectively to long-term and short-term issues. However, while argument 1 has analogies with other examples, argument 2 is unique in considering prevention of foodborne illnesses. 6-Arg is also unique in associating arguments 1 and 2 to reduction of collective health costs and in not considering pleasant aspects of fruit and vegetables. Thus 6-Arg appears to follow the approach of driving behavior by awareness of social/global issues with limited attention to values related to a mainly individual perspective.

Top10HaP in turn appears to adopt a complementary approach, by mainly putting emphasis on individual advantages, like pleasant experiences and readiness, to which 6 out of 10 arguments are devoted (notably they include the first two and last four of the “countdown” list). The other four arguments concern health issues, with only argument 6 referring explicitly to long-term prevention. These observations suggests that Top10HaP is addressed to people who are more sensible to immediate rewards rather than to long-term goals.

Both Top10OH and Top10RWM seem to aim for a balance between health issues and pleasant aspects, with the former having slight more emphasis. In particular, in Top10OH 6 arguments are related to health, with 4 of them being neutral with respect to the distinction between long-term and short-term issues. The other four arguments are equally partitioned between pleasure and easiness, and it is remarkable that the last one provides an appeal to a very

specific pleasant experience (smoothies). In Top10RWM five arguments are related to health issues, all of them being neutral with respect to the distinction between long-term and short-term issues and one also touching the value of pleasure. Four other arguments are equally partitioned between pleasure and easiness, and also in this case the last one is a direct appeal to deliciousness. Finally, Top10RWM is the only example where an argument is devoted to individual budget issues.

### 4.3.2 Argumentation schemes

Argumentation schemes are patterns for arguments (or for inferences), representing the structure of common types of arguments used both in everyday discourse as well as in special contexts such as legal and scientific reasoning [38, 39, 21].

An argumentation scheme consists of some premises, of a conclusion, which can be presumptively derived from the premises in lack of contrary reasons, and of some critical questions, which represent the defeasibility conditions of the presumptive derivation.

Identifying the argumentation schemes used in a communication campaign is interesting since different audiences can have different attitudes towards alternative patterns of presumptive reasoning and/or can be more or less sensitive to the relevant critical questions.

In the examples considered in Section 4.2 one can identify as a common reference the *argumentation scheme for practical reasoning*, namely the basic scheme considered in the literature to justify the selection of a given action.

This scheme can be summarized as follows:

Premise 1: Agent *A* has a goal *G*

Premise 2: Action *B* is a means to realize *G*

Conclusion: Therefore agent *A* should carry out action *B*.

Critical Question (CQ) 1: What other goals do I have that should be considered that might conflict with *G*?

CQ 2: What alternative actions to my bringing about *A* that would also bring about *G* should be considered?

CQ 3: Among bringing about *A* and these alternative actions, which is arguably the most efficient?

CQ 4: What grounds are there for arguing that it is practically possible for me

to bring about A?

CQ 5: What consequences of my bringing about A should also be taken into account?

In our examples the considered action is the same for all arguments, namely eating more fruit and vegetables, and the various arguments differ in the goals realized by the actions (e.g. preventing diseases, having delicious meals, avoiding animal suffering).

Concerning the relevant critical questions, it can be observed that attention has mainly been devoted to CQ 4, since the arguments about variety and readiness present in various examples provide exactly grounds for arguing that eating more fruit and vegetables is feasible and indeed easy.

The following comments can be made about other critical questions:

- as to CQ 1, the pursued goals are probably considered so valuable that they are universally accepted. Moreover mentioning various goals in a campaign suggests that they are not in conflict (in particular health preservation and pleasure can both be achieved);
- as to CQ 2, alternative actions are not considered, probably because dietary choices are not alternative but possibly complementary to other means to achieve the considered goals. For instance, also physical exercise is a means to preserve health, but it not an alternative nor a replacement of a greener diet;
- as to CQ 3, the same comment as for CQ 2 applies;
- as to CQ 5, it seems to be implicitly assumed that eating more fruit and vegetables has no negative side effects.

While the above comments on the use of the argumentation scheme for practical reasoning apply in a similar way to all examples we considered, it can be remarked that also other schemes are used in the examples and, in particular, that examples of combinations of schemes can be identified.

First of all, as discussed in previous section, arguments are related to the promotion of values underlying specific goals. For instance preventing diseases is related to the value of health and so on. Though the underlying values are sometimes left implicit (maybe because considered obvious) they play a key role in justifying the goals adopted and hence the whole argumentative structure. In this perspective, one can refer to the scheme for *argument from positive value* whose structure is as follows:

Premise 1: Value  $V$  is positive as judged by agent  $A$ .

Premise 2: If  $V$  is positive, it is a reason for  $A$  to commit to goal  $G$ .

Conclusion:  $V$  is a reason for  $A$  to commit to goal  $G$

Thus one can assume that Premise 1 of the argumentation scheme for practical reasoning is obtained as conclusion of an instance of argument from positive value.

As a matter of fact, in the literature there are proposals of schemes combining practical reasoning and values like the scheme for value-based practical reasoning [1]. It must be remarked however that this scheme also includes aspects which do not appear to fit our examples: in particular it mentions some current circumstances and some new circumstances to be brought about by the action. The detail on circumstances can be useful in some contexts but does not appear to be relevant in the case of general recommendations like the ones we are considering.

Another kind of combination concerns the embedding of a scheme within another scheme.

To exemplify, let us refer to the following comment in 5-NHS: “The 5 A Day campaign is based on advice from the World Health Organization (WHO), which recommends eating a minimum of 400g of fruit and vegetables a day to lower the risk of serious health problems, such as heart disease, stroke and some types of cancer.”

Here the fact that eating fruit and vegetables lowers the risk of disease is connected to an advice by World Health Organization. This can be regarded as an instance of the *argument from expert opinion* scheme, where the credibility of an assertion is derived from the fact that the source of the assertion has suitable expertise in the domain the assertion pertains to. Interestingly, in this case the assertion coming from the expert source is in fact an argument for practical reasoning, suggesting an action to achieve a goal. Thus, a combination of argument schemes emerges in this case, with one being embedded in another one.

Another kind of combination emerges in other examples. Consider the argument: “They’re an excellent source of dietary fibre, which can help to maintain a healthy gut and prevent constipation and other digestion problems. A diet high in fibre can also reduce your risk of bowel cancer.” Here, with respect to the basic scheme for practical reasoning, the relation between the action  $A$  (eating fruit and vegetables) and the final goal  $G$  is expanded in terms of a cause-effect chain. Eating fruits and vegetables has the effect of bringing dietary fibre to your body, which in turn has specific beneficial effects on health.



Using a cause-effect relation corresponds to the use of the *argument from cause to effect* scheme embedded in the argument for practical reasoning. In this way a more detailed account is provided of how the action brings the goal.

It can be observed that while this can be satisfactory for people in the audience who want to have a better understanding of the benefits of fruit and vegetables, it also opens the way to further potential critical questions, e.g. one might wonder whether there are other sources of dietary fibre, alternative to fruit and vegetables.

In more articulated arguments, causal relations can be chained. Consider for instance argument 3 in 6-Arg. Here the goal is to ensure a better soil and the relation between eating more fruit and vegetables and achieving a better soil is quite articulated and goes through a series of steps: eating more fruit and vegetables reduced animal farming, thus in turn reducing the demand of livestock crops. Since livestock crops are grown in rows they endanger topsoil, hence reducing their demand has a beneficial effect on soil.

The idea is that foodborne illnesses are more commonly (though not exclusively) caused by animal food and that bacteria causing these illnesses are often of animal origin even when they affect fruit and vegetables. It can be observed that there are actually two arguments embedded in the discourse. One concerns individual health: since a large percentage of foodborne illnesses is caused by animal products, eating less animal products reduces the risk of foodborne illnesses. The other argument is at general level and, in a sense, much more indirect: a greener diet reduces animal farming and hence reduces the main cause of foodborne illnesses.

It can be imagined that such an articulated argument is less immediate to appreciate and admits many more critical questions than a simpler argument. On the other hand, however, it must be recognized that some potential beneficial effects of eating more fruit and vegetables can only be identified through articulated chains of relations. Thus, these chains might be regarded as necessary if one wants to provide a broader (or alternative) view on the positive consequences of some action.

### **4.3.3 Argument presentation**

The same argument can be presented in a variety of ways, corresponding to different amounts of explicit information. On one hand, an argument can be presented in a reduced form, where some elements are left implicit, e.g. some premises or even the conclusion of the argument itself are assumed to be clear to the audience and hence do not need to be included in the communication.

On the other hand, an argument can be presented in an extended form, including examples, illustrations and even repetitions, which are not necessary *per se* to build the argument and derive its claim, but can be useful for a more effective communication.

It is interesting to note that reduction and extension can be present together in different parts of the presentation of a given argument. Consider the statement “Fruit and vegetables are a good source of vitamins and minerals, including folate, vitamin C and potassium”. Here both the premise that vitamins and minerals are good for health and the claim that therefore one should eat more fruit and vegetables are left implicit. On the other hand the indication “including folate, vitamin C and potassium” is not necessary but provides examples of vitamins and minerals which may strengthen the perception of validity of the argument.

The use of reduced and extended argument instances may correspond to the choice between different communication styles in a campaign. To exemplify, we have seen that in Top10OH the presentation of arguments includes rich explanatory details, while in Top10HaP they are quick and concise.

Compare for instance the following argument from Top10OH:

**They're low-calorie and low-fat.** On average, fruits and especially vegetables are very low in calories and fat, which means you can eat more to keep you feeling full without worrying about extra calories or fat. You can save more than 200 calories by eating half a cup of grapes versus a fourth of a cup of M&Ms. That said, there are **exceptions**, such as avocados, olives and coconuts.

with the following one from Top10HaP:

**Low in Calories.** Fruits and veggies are naturally **low in calories**.

They are meant to convey the same claim but one could say that they are somehow at the two extremes of the spectrum of extended versus reduced presentation. Note however that both leave implicit the fact that eating food with low calories is better.

Consider then the following argument from Top10RWM:

**Calories that Count.** With obesity on the rise, calories “in” continue to trump calories “out.” The only way to bring this trend to a halt is to eat less and move more! Make the best use of your calories by selecting nutrient-dense foods (foods that contain plenty of good stuff and much less of the bad stuff)! Fruits and vegetables contain few calories, but tons of important vitamins and minerals.

Differently from the previous ones, this argument gives an explicit motivation on while calories should be avoided. It then remarks explicitly the advantages of fruit and vegetables (as in Top10OH but not in Top10HaP), but differently from Top10OH does not provide examples and exceptions.

A similar comparison could be applied to other arguments with the same (or similar claim).

The above observations indicate that the choice of argument presentation can be regarded as an important trait in communication campaigns.

This suggests that given a reference argument scheme it can be instantiated in a multiplicity of forms, depending on which components of the scheme are included or left implicit in the instance and also on the possible extended forms adopted for some of the included components.

Consider, for instance, the basic argument scheme for practical reasoning “you have a goal G, action A promotes goal G, then you should carry out action A”.

You may have a generic instance like “you have the goal of being healthy, eating 5 portions of fruit and vegetables each day promotes the goal of being healthy, then you should eat 5 portions of fruit and vegetables each day”.

This instance may be specialized by indicating subgoals of the generic goal G. In our case, examples of considered subgoals are “lowering the risk of serious health problems, such as heart disease, stroke and some types of cancer” or “maintaining a healthy weight and keep your heart healthy” or “reducing the risk of bowel cancer”. Note that the relation of subgoal may give rise to a hierarchy: “lowering the risk of some types of cancer” is a subgoal of “being healthy” and in turn “reducing the risk of bowel cancer” is a subgoal of “lowering the risk of some types of cancer”. More specialized arguments can be more persuasive for some audience but also possibly less immediate to appreciate and understand. Another possibility consists in describing the action A at different level of details: “eating enough fruit and vegetables” is a possible indication of an action, while “getting at least 5 portions of a variety of fruit and vegetables every day” is a detailed description of a way to carry out that action. To give another example “doing enough physical exercise” is an action while “going to the swimming pool for an hour at least three times a week” is a detailed description of a way to carry out that action. Besides specializing goals and refining the description of an action, one may provide more details on the chain connecting the action to the goal. In particular the component “action A promotes goal G” of the argument scheme, may be replaced by a more articulated structure like “action A has effect E which promotes goal G”.

An example is provided by "They're an excellent source of dietary fibre, which can help to maintain a healthy gut and prevent constipation and other digestion problems", where A is the action of eating fruit and vegetables, E is getting dietary fibre, and G are the listed health benefits

#### 4.3.4 Relationships between arguments

In the literature, the main relationships considered between argument are the ones of subargument, attack, and support. These relations typically concern different arguments which are considered together in a single reasoning or communication context, e.g. the arguments produced by an inference mechanism from a set of premises and rules or the arguments exchanged in a dialogue between two agents.

In the case of communication campaigns, it may however be interesting to consider relationships holding between arguments belonging to different contexts, e.g. between arguments included in different campaigns and/or produced at different time moments. Moreover these relationships may concern aspects which are related to variants in the construction or in the presentation (as discussed in Section 4.3.3) of arguments sharing the same claim and/or other aspects.

As an example, consider the argument "Eating enough of fruit and vegetables is beneficial for health" and the somehow similar argument "Evidence shows there are significant health benefits to getting at least 5 portions of a variety of fruit and vegetables every day". The latter can be regarded as an expansion and specialisation of the former, since on one hand it adds the explicit information that the claim is supported by evidence, and on the other hand it gives the more specific indication "getting at least 5 portions of a variety of fruit and vegetables every day" in replacement of the generic indication "Eating enough of fruit and vegetables".

As a more articulated example, consider the basic argument scheme "you have a goal G, action A promotes goal G, then you should carry out action A". You may have a generic instance like "you have the goal of being healthy, eating 5 portions of fruit and vegetables each day promotes the goal of being healthy, then you should eat 5 portions of fruit and vegetables each day". This instance may be specialized by indicating subgoals of the generic goal G. In our case, examples of considered subgoals are "lowering the risk of serious health problems, such as heart disease, stroke and some types of cancer" or "maintaining a healthy weight and keep your heart healthy" or "reducing the risk of bowel cancer". Note that the relation of subgoal may give rise to a

hierarchy: “lowering the risk of some types of cancer” is a subgoal of “being healthy” and in turn “reducing the risk of bowel cancer” is a subgoal of “lowering the risk of some types of cancer”. More specialized arguments can be more persuasive for some audience but also possibly less immediate to appreciate and understand. As already mentioned, another possibility consists in describing the action A at different level of details: “eating enough fruit and vegetables” is a possible indication of an action, while “getting at least 5 portions of a variety of fruit and vegetables every day” is a detailed description of a way to carry out that action. To give another example “doing enough physical exercise” is an action while “going to the swimming pool for an hour at least three times a week” is a detailed description of a way to carry out that action. Besides specializing goals and refining the description of an action, one may provide more details on the chain connecting the action to the goal, which involves embedding schemes, as discussed in section 4.3.2 In particular the component “action A promotes goal G” of the argument scheme, may be replaced by a more articulated structure like “action A has effect E which promotes goal G”. An example is provided by “They’re an excellent source of dietary fibre, which can help to maintain a healthy gut and prevent constipation and other digestion problems”, where A is the action of eating fruit and vegetables, E is getting dietary fibre, and G are the listed health benefits.

Another possible relation between arguments is repetition, which essentially would make no sense in the contexts typically considered in the formal argumentation literature, but may be effective for communication purposes.

#### **4.3.5 Argument importance**

The authors of a communication campaign may ascribe different importance to different arguments. Moreover, independently of the intentions underlying a campaign, the audience may perceive different levels of importance for different arguments.

In the considered examples, several elements affecting the importance of arguments can be considered.

First of all, the repetition of an argument (or possibly of some variants of the same argument) can be regarded as an indication of intended importance. For instance, in case there is a recap after the presentation of a list of arguments, the notions recalled in the recap can be assumed to be considered (and perceived) as more important than others. A similar consideration applies if some notions are introduced in a preliminary text before a list of arguments and then appear again in some of the arguments.

Second, the order of presentation can be related to the ascribed importance. In general one could assume that more important arguments are put at the beginning or at the end of a list. In any case, is it reasonable to assume that the reader of a list tends to pay more attention at the beginning and at the end, provided that the list is not too long. This general indication however can be affected by the way a list is presented. In particular, when a list is presented in a countdown form (e.g. with a numbering from 10 to 1) one can imagine that the importance and the reader's attention increase from the start to the end.

Last but not least, the language used may put more or less emphasis on different arguments. The use of terms involving special appeals or emotions, slogans and exclamation marks, obviously tend to convey a sense of importance and to specially attract the attention of the reader.

It may be expected that the choice of the arguments to which more importance is ascribed is coherent with the features of the intended communication target. For instance, if special emphasis is put on pleasant aspects of eating fruit and vegetables, as we have seen in some cases, one would expect that the campaign is directed to an audience which is more sensitive to these aspects than, for instance, to health related issues.

#### **4.3.6 Argument source**

As mentioned in Section 4.1, we considered campaigns from different sources, ranging from a national health institution to a professional dietitian employed by a network of groceries stores.

The institutional nature of the source, as well as its explicit or implicit goals, appears to have an influence on the contents and the presentation of the campaign. For instance, it is rather natural that health-related institutions use mainly, though not exclusively, arguments concerning health issues. It is also not surprising that the only list including an argument which indicates that fruit and vegetables are budget friendly is the one coming from an employee of groceries stores.

While the fact that the contents of a campaign somehow depend on the source of the campaign can be regarded as partly unavoidable, it must be remarked that, at least in some cases, this may affect the credibility of the campaign.

For instance if there can be some suspicion that the source is biased or has a conflict of interest, its arguments could lose credibility and be rejected by an audience independently of their contents and actual validity. It is worth noting that the capability or propensity to identify problematic aspects in the relation



between a source and the arguments is a subjective property of the recipients of the campaign, also depending on possible biases of the recipients themselves. For instance, while most people tend to consider a public authority as a reliable source, people adhering to conspiracy theory might regard arguments coming from any authority as highly suspicious.

Generalizing this observation, it appears that the acceptance of an argument by an audience, besides depending on the relation between the properties of the argument itself and the audience, may be heavily affected by other factors like:

- critical aspects identified by the audience concerning the relation between the source and the arguments (e.g. conflict of interest concerning the argument claim or incompatibility with the values promoted by the argument);
- the different background knowledge of the audience with respect to the source, which may lead, in case of enthymematic arguments, to a misunderstanding about what the actual argument put forward is;
- a negative attitude of the audience with respect to the source, independently of the proposed arguments (e.g. a general mistrust against some category of institutions, people, companies, ...)

#### **4.3.7 Temporal dimension**

The campaigns promoting greener diet we have examined have no temporal dimension, in the sense that they present all at once a single set of arguments whose validity is not time-dependent.

Based on the analysis carried out in the previous sections, it is however interesting to draw some considerations on aspects which might vary over time and consequently lead to changes in the contents of the campaign.

First of all, there can be some changes in the world inducing changes of the elements of some arguments. For instance, some factual data may evolve and affect the validity of the premises of some arguments. In the considered examples this might be the case, e.g., for the data used to justify some claims, as the many statistical data concerning the US situation included in the book “Six arguments for a greener diet”.

Other changes can involve the intended communication target and the relationships between the campaign and the target. Assuming that a campaign



is designed taking into account the estimated characteristics of one or more audiences to which the communication is addressed. Then, the following situations may induce a change in a communication campaign:

- the authors of the campaign decide to address a different target, for instance to focus on elder rather than younger people, or on people particularly sensitive to collective (e.g. environment related) rather than personal (e.g. health related) issues;
- the campaign target is the same but its characteristics change over time, for instance considering a campaign addressed to younger people, it is realised that the values to which they are more sensitive have changed with respect to the moment the campaign has been conceived;
- the campaign target is the same but it is realised that its characteristics have been incorrectly estimated at the moment of the design of the campaign and some adjustments are required.

In general, the situations listed above can induce the following non mutually exclusive variations:

- a change of the sets of argument that can be put forward;
- a change of the features of the considered target.

Accordingly, a campaign may need to be adjusted or redesigned from scratch, so that the new version of the campaign includes only arguments which are currently valid and such that they appropriately fit the considered target.

## **4.4 Modeling desiderata emerging from the conceptual analysis**

### **4.4.1 Values in communication**

The analysis carried out in Section 4.3.1 evidences that the choice and balance of the values promoted by argument is a one of the key traits characterizing different arguments used in a communication campaign.

A basic modeling requirement is then the ability to encompass a representation of a set of values and of their association with arguments, where an argument can in general promote more than one value, possibly at different

degrees. Since a campaign usually resorts to several arguments, the association of values to the campaign, together with an assessment of their relative importance should also be encompassed.

As shown in Section 4.3.1, some values admit variations, for instance the value of health preservation can be considered at a generic level or referred more specifically to short-term and long-term issues. This suggests that a hierarchical representation of values could be useful, where the most general values are at the top of the hierarchy and their more specialised versions are connected with them at the lower levels through an inheritance relation. This kind of representation could also be useful in order to characterize campaigns with respect to general theories like, for instance, Schwartz's theory of basic human values [29]. In this context, just to give a couple of examples health preservation can be seen as a specialization of the value of security, in turn belonging to the higher group of preservation, while sensory pleasure can be seen as a specialization of the value of hedonism, in turn belonging to the higher group of self-enhancement.

Combinations of values, at various levels, associated with a campaign could in turn be compared with stereotypical combinations of values associated e.g. to personal attitudes (e.g. values corresponding to a selfish vs. altruistic attitude) or social categories (e.g. values more typically found in young vs. elder people, or in different political areas, and so on). An interesting idea would be then to define some notion of matching or coverage of a campaign with respect to one or more target categories in terms of values.

Another potentially interesting aspect to model would be a notion of compactness (or simplicity) of a campaign with respect to the promoted values. Independently of which are the promoted values, a campaign can resort to a compact set of values (e.g., in the extreme case, focus on just one value) or encompass a broader perspective (e.g. by touching a variety of values).

Both choices seem to have pros and cons with respect to different audiences. A single-value can be regarded as more focused and clear and also less prone to be attackable if the value is an undebatable one and the relation between the campaign claims and the value is solid. On the other hand, a single-value campaign may fail to be effective on people who are not sensitive to the promoted value and look narrow and boring. A multi-value campaign may be a bit confusing and fail to convey a clear message (e.g. the 6 arguments in the 6-Arg example could have been just 3 for the sake of more concision and clarity) and include more attackable sections which may hinder the whole campaign effectiveness (e.g. some people may not recognize animal welfare as a value). On the other hand, a multi-value campaign may address the priorities of more

people (e.g. a young person may have a limited perception of long term health risks, while being more aware of global environmental issues) and give the impression of a broader and more solid support for the main claim.

#### 4.4.2 Argumentation schemes

While argumentation schemes are a standard reference to classify stereotypical reasoning patterns, the analysis carried out in Section 4.3.2 evidences that they need additions and developments for a detailed modelling of communication campaigns, as discussed in the following.

First, the identification of the argumentation schemes relevant to a given campaign appears to be a challenging task per se: a variety of schemes have been proposed in the literature, with some schemes being similar to others. Given an actual argument (with possibly some parts left implicit) putting it in correspondence with an argument scheme may not be obvious: in some cases several options can be available, in other cases it may seem that no existing scheme is fitting and one may consider the definition of a new variant.

This difficulty being acknowledged, the use of argument schemes looks desirable for our modeling purposes.

In particular, the notion of critical questions appears a very useful modeling tool to consider the possible reactions/objections of an audience to an argument and different communication strategies can be envisaged in this respect. First, given an audience, one should identify which critical questions are more significant for that audience. For instance, consider the *argument from expert opinion* where an expert E in the field F makes an assertion A, and the critical questions relevant to this scheme, listed below:

- Expertise Question: How credible is E as an expert source?
- Field Question: Is E an expert in the field F that A is in?
- Opinion Question: What did E assert that implies A?
- Trustworthiness Question: Is E personally reliable as a source?
- Consistency Question: Is A consistent with what other experts assert?
- Backup Evidence Question: Is E's assertion based on evidence?

Some people may give more importance to the Expertise Question, e.g. since they tend to be generally suspicious about the information coming from some

authority, while other people may give more importance to the Backup Evidence Question, since they prefer to have an understanding of the reasons underlying an assertion. On this basis, different communication strategies can be devised for different audiences, in particular by anticipating the answers to the critical questions considered more important. It should be remarked however that anticipating answers to potential questions, while possibly useful, is not immune from drawbacks: it may have the side effect of attracting attention on issues, which otherwise might remain unnoticed. The choice of the proper strategy between anticipating and skating over should again take into account the characteristics and inclinations of the audience.

Turning to the combinations of argument schemes, a general method for their definition would be very useful for a more accurate modeling of the articulated argument which are used in actual communication campaigns. As to our knowledge, the issue of formalizing combinations of argumentation schemes has not been previously addressed in the literature. In particular, such a formalisation should encompass a generic method to embed a scheme within another scheme and to derive the critical questions relevant to the whole combination from the critical questions relevant to the schemes it includes.

As a further aspect, properties of the scheme combinations in relation to communication effectiveness should be identified. To give an example an articulate argument based on a combination of schemes can be regarded as more informative but possibly also as more difficult to understand with respect to a simpler one. Again, different audiences may show different receptivity with respect to these features.

#### **4.4.3 Argument presentation**

As evidenced in Section 4.3.3 given a reference argumentation scheme it can be instantiated in a multiplicity of forms of presentation, depending on which components of the scheme are included or left implicit in the instance and also on the possible extended forms adopted for some of the included components.

It would interesting to formalise this variety of presentation forms by defining, for each components of an argument, a set of presentation variants, generated by applying actions of reduction or extension to the component. The most drastic reduction for a component would be non-inclusion in the presentation, while extensions can include for instance the addition of examples, exceptions, details, and so on.

On this basis, given an argument which is an instance of an argumentation scheme, one might identify the presentation pattern of the argument, con-

sisting of the reductions and extensions applied to obtain the instance under consideration.

Given a campaign including a set of arguments, one could then identify the presentation patterns of these arguments and verify whether they follow a uniform style or are varied in the use of reductions and extensions.

General properties like conciseness, clarity, or informativeness could be associated to presentation patterns. In turn, these properties could be used to characterize the adequacy of a presentation pattern to the needs of a given audience.

#### **4.4.4 Relationships between arguments**

As discussed in Section 4.3.4 the set of relationships traditionally considered in the literature does not cover all the needs involved in the analysis of communication campaigns.

In particular, the identification of relationships between arguments used in different contexts but similar in some respects (e.g. having the same claim or being instances of the same scheme) appears to be useful for the purpose of comparing different campaigns and/or analysing the development of a given campaign over time.

The definition of these relationships may occur at different levels. At a finer level of granularity, relationships involving individual components of an argument can be identified. For instance, as discussed in Section 4.3.4, a relation of subgoal could be defined between goals considered in different arguments. As another example, a relation of specialisation could be identified between actions, or a relation of expansion could be identified between argument premises.

Thus, given a pair of arguments, a network of relationships between their components could be identified. Then, relationships at the level of granularity of entire arguments could be derived from the relationships between their components. For instance, one could say that an argument is a refinement of another one, depending on the fact that some of its components are a specialisation of the corresponding components of the other one. Similarly, one could say that an argument is an expansion of another one if some of its components are an expansion of those of the other argument.

Connecting this kind of relations with the notion of presentation forms discussed in Section 4.3.3 appears to be a particularly interesting line of investigation.

#### 4.4.5 Argument importance

Based on the discussion in section 4.3.5, it would be useful to formalise a notion of importance for arguments in a communication campaign and to define a method to derive the importance of the arguments from an analysis of the campaign which may take into account, for instance, the order of presentation the arguments, argument repetitions if present, the total number of arguments included in the campaign, the language used for presenting the argument.

If different campaigns include the same (or similar) arguments, as it happens for those concerning greener diet, they could be compared in terms of the different importance profiles of arguments. Moreover it would be interesting to define methods to project the assessment of importance from arguments to other characteristic elements in a campaign, like for instance the promoted values.

One may expect that the importance profile of a given campaign corresponds to a given communication target, so that the arguments which are ascribed more importance in the campaign are those which are supposed to be more effective for the intended target. In this respect it would interesting to define a notion of importance profile also for the potential audiences of a campaign, and to investigate a notion of fitting of a given campaign for the various audiences, based on the respective importance profiles.

#### 4.4.6 Argument source

Based on the discussion in section 4.3.6, it would be useful that the adopted formalisation is able to capture a variety of situations where the nature of the source and/or its relations with the argument and the audience affect the acceptability of the argument by the audience.

Given the complexity and heterogeneity of situations that may occur in different domains, this modelling goal should preferably be achieved by some general mechanism which is flexible enough to accommodate an open set of acceptability issues that can be experienced by an audience.

This could be achieved, for instance, by including in the argument schemes relevant to the arguments produced in a given domain some critical questions, each corresponding to a potential problem concerning the source  $S$  of the argument like:

- Is  $S$  involved in any conflict of interest about the argument?

- Is  $S$  a credible source for the intended audience of the argument?
- Can the argument be misunderstood due to a communication gap between  $S$  and the intended audience?

The list of such critical questions should be regarded as in principle open-ended and be adapted to the needs of different communication contexts.

While this is just an example and other modeling approaches could be adopted, they should allow the same degree of openness and adaptability exemplified above.

#### 4.4.7 Temporal dimension

On the basis of the discussion in Section 4.3.7, it would be interesting to define a notion of communication trajectory, which describes the evolution of a communication campaign over time.

Each point in a trajectory should correspond to a time instant where a new version of the campaign is issued, which is characterised by:

- the set of arguments included in the campaign at the given time instant, together with their properties in terms of promoted values, presentation, relationships, and importance;
- the estimated properties of the audiences to which the campaign is addressed, which can be used to determine the expected fitting of the campaign to the audiences.

It would then be interesting to model the events that can determine the course of a communication trajectory (like changes in facts which play a role in the construction of arguments and changes in the properties of audiences) and define mechanisms for providing support in the definition of proper changes in face of these events.

## 5 Modeling requirements

Based on the analysis carried out in Sections 4 and 3 the following synthetic modeling requirements can be identified.



## 5.1 Basic entities

The following entities represent the basic elements of the models to be developed:

- Argument, conceived as the basis communication unit used to support a given claim;
- Campaign, conceived as a set of arguments put forward together in a communication activity;
- Audience, conceived as a group of people to which a campaign is addressed (in general a campaign can be addressed to multiple audiences which altogether constitute the target of the communication)

## 5.2 Value modeling

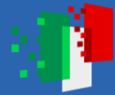
- The values associated to individual arguments and to sets of arguments included in a campaign should be explicitly represented;
- The model should allow a possibly hierarchical representation of values and of their relations;
- The model should support the definition of relationships between the values considered in a campaign and general theories of values available in the literature;
- There should be a representation of the importance that each value has in the context of an argument and of a campaign;
- The model should encompass the definition of general properties of a campaign (e.g. compactness, clarity, coverage) with respect to values;
- There should be a representation of the values which are significant for a given audience and of their importance for that audience;
- The model should support some form of evaluation of the appropriateness of a campaign with respect to an audience as far as the promoted values and their properties are concerned.

### 5.3 Argumentation schemes

- There should be a representation of the argumentation schemes on which the arguments used in campaigns can be based;
- There should be a representation of the appropriateness of a given scheme for a given audience and of the sensitivity of the audience to the different critical questions associated to a specific scheme;
- The model should support the definition of communication strategies based on the critical questions to which a given audience is more sensitive;
- The model should encompass a general method for defining combinations of argumentation schemes and deriving properties of these combinations, e.g. the overall set of critical questions;
- The model should encompass the definition of general properties of a combination of schemes (e.g. informativeness vs complexity);
- The model should support some form of evaluation of the appropriateness of a campaign with respect to an audience as far as the use of argumentation schemes is concerned.

### 5.4 Argument presentation

- Given the canonical representation of an argument according to some argumentation scheme, there should be a formal mechanism to identify the different forms of presentation of the argument;
- The formal mechanism should encompass operators of modification of the presentation form referring to the components of the argument as identified by the argumentation scheme;
- The model should support the definition of presentation patterns in terms of common combinations of modification operators yielding stereotypical presentation forms;
- The model should encompass the definition of general properties of presentation patterns (e.g. conciseness, clarity, informativeness)



- The model should support the analysis of the presentation patterns adopted in a campaign which could be related to different styles of communications (e.g. uniform vs varied argument presentation approach)
- The model should support some form of evaluation of the appropriateness of a campaign with respect to an audience as far as argument presentation is concerned.

## 5.5 Relationships between arguments

- The model should allow the representation of the main argument relations traditionally considered in the literature, namely subargument, attack, and support;
- The model should encompass the definition of relationships concerning the individual components (e.g. premises, goals, actions) of arguments;
- The model should encompass a method to derive relationships between arguments from those at the level of their components;
- The model should encompass some a connection between the definition of relationships between argument components and the definition of different presentation forms for an argument;
- The model should support the comparison between different campaigns based on the relationships between the arguments they include.

## 5.6 Argument importance

- The model should encompass a notion of importance of the arguments included in a campaign;
- The model should support a method to derive the importance of arguments from the properties of a campaign (e.g. the order of presentation of arguments, possible repetitions)
- The model should support a method to compare campaigns which use similar arguments with respect to the relevant importance profiles;
- The model should support a method to project importance from arguments to entities they are related with (e.g. values)

- The model should support some form of evaluation of the appropriateness of a campaign with respect to an audience as far as argument importance is concerned.

## 5.7 Argument source

- The model should encompass a method to capture effects on the credibility of arguments which do not depend on the contents and properties of the argument themselves;
- The adopted method should be flexible enough able to encompass a variety of causes affecting credibility, involving in particular the source of the argument, the audience of the argument, and their relationships;
- The adopted method should allow tailoring the set of considered effects and relevant causes to the characteristics of specific communication contexts.

## 5.8 Temporal dimension

- The model should encompass a formal representation of the evolution of a campaign over time;
- The model should capture changes over time of the arguments included in a campaign along with their properties;
- The model should capture changes over time of the audiences to which the campaign is addressed and their estimated properties;
- The model should encompass the representation of events which determine the changes of a campaign over time;
- The model should encompass the definition of mechanism for providing decision support in the management of a campaign over time.

## 6 Conclusions

The main results presented in this document can be summarized as follows:

- on the basis of the preliminary analysis described in Section 2, the promotion of greener diet has been selected as reference case study of Public Interest Communication (PIC);
- a preliminary pipeline for argument analysis has been defined, on the basis of the survey developed in Section 3;
- five examples of PIC campaigns promoting greener diets have been analysed from a formal argumentation perspective in Section 4, considering the following aspects: Values promoted by arguments, Argumentation schemes, Argument presentation, Relationships between arguments, Argument importance, Argument source, Temporal dimension;
- in Section 5 a synthetic list of modelling requirements referring to the aspects listed above has been derived.

These results fulfil the goals specified for Work Package 1 in the EPICA project proposal and provide a basis for the development of the subsequent work packages of the project, in particular Work Package 2 “Formal modelling” and Work Package 3 “Model-based case analysis and model validation”.

## References

- [1] Katie Atkinson, Trevor J. M. Bench-Capon, and Peter McBurney. Computational representation of practical argument. *Synthese*, 152(2):157–206, 2006.
- [2] John Langshaw Austin. *How to do things with words*, volume 88. Oxford university press, 1975.
- [3] Trevor J. M. Bench-Capon. Persuasion in practical argument using value-based argumentation frameworks. *J. Log. Comput.*, 13(3):429–448, 2003.
- [4] Philippe Besnard, Alejandro Garcia, Anthony Hunter, Sanjay Modgil, Henry Prakken, Guillermo Simari, and Francesca Toni. Introduction to structured argumentation. *Argument & Computation*, 5(1):1–4, 2014.
- [5] Katarzyna Budzynska and Chris Reed. Speech acts of argumentation: Inference anchors and peripheral cues in dialogue. In *Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence*, 2011.

- [6] Katarzyna Budzynska and Serena Villata. Processing natural language argumentation. *Handbook of formal argumentation*, 1:577–627, 2018.
- [7] Elena Cabrio and Serena Villata. A natural language bipolar argumentation approach to support users in online debate interactions. *Argument & Computation*, 4(3):209–230, 2013.
- [8] Henrique Lopes Cardoso, Rui Sousa-Silva, Paula Carvalho, and Bruno Martins. Argumentation models and their use in corpus annotation: Practice, prospects, and challenges. *Natural Language Engineering*, 29(4):1150–1187, 2023.
- [9] Artem Chernodub, Oleksiy Oliynyk, Philipp Heidenreich, Alexander Bondarenko, Matthias Hagen, Chris Biemann, and Alexander Panchenko. TARGER: Neural argument mining at your fingertips. In Marta R. Costa-jussà and Enrique Alfonseca, editors, *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics: System Demonstrations*, pages 195–200, Florence, Italy, July 2019. Association for Computational Linguistics.
- [10] Jacob Cohen. A coefficient of agreement for nominal scales. *Educational and psychological measurement*, 20(1):37–46, 1960.
- [11] Scott Andrew Crossley, Perpetual Baffour, Yu Tian, Alex Franklin, Meg Benner, and Ulrich Boser. A large-scale corpus for assessing written argumentation: Persuade 2.0. 2024.
- [12] Phan Minh Dung. On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artificial intelligence*, 77(2):321–357, 1995.
- [13] Joseph L Fleiss. Measuring nominal scale agreement among many raters. *Psychological bulletin*, 76(5):378, 1971.
- [14] James B Freeman. *Dialectics and the Macrostructure of Arguments: A Theory of Argument Structure*. Number 10. Walter de Gruyter, 1991.
- [15] Jesse Graham, Jonathan Haidt, Sena Koleva, Matt Motyl, Ravi Iyer, Sean Philip Wojcik, and Peter H. Ditto. Moral foundations theory: The pragmatic validity of moral pluralism. 2012.
- [16] Jonathan Haidt and Craig Joseph. Intuitive ethics: How innately prepared intuitions generate culturally variable virtues. *Daedalus*, 133(4):55–66, 2004.

- [17] Johannes Kiesel, Milad Alshomary, Nicolas Handke, Xiaoni Cai, Henning Wachsmuth, and Benno Stein. Identifying the human values behind arguments. In *Proceedings of the 60th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 4459–4471, 2022.
- [18] Jonathan Kobbe, Ines Rehbein, Ioana Hulpuş, and Heiner Stuckenschmidt. Exploring morality in argumentation. In Elena Cabrio and Serena Villata, editors, *Proceedings of the 7th Workshop on Argument Mining*, pages 30–40, Online, December 2020. Association for Computational Linguistics.
- [19] J Richard Landis and Gary G Koch. The measurement of observer agreement for categorical data. *biometrics*, pages 159–174, 1977.
- [20] Anna Lindahl and Lars Borin. Annotation for computational argumentation analysis: Issues and perspectives. *Language and Linguistics Compass*, 18(1):e12505, 2024.
- [21] F. Macagno. Argumentation schemes in ai: A literature review. introduction to the special issue. *Argument & Computation*, 12(3):287–302, 2021.
- [22] Sanjay Modgil and Henry Prakken. The aspic+ framework for structured argumentation: a tutorial. *Argument & Computation*, 5(1):31–62, 2014.
- [23] Donald Nute. Defeasible logic. In *International Conference on Applications of Prolog*, pages 151–169. Springer, 2001.
- [24] Simon Parsons, Michael J. Wooldridge, and Leila Amgoud. An analysis of formal inter-agent dialogues. In *The First International Joint Conference on Autonomous Agents & Multiagent Systems, AAMAS 2002, July 15-19, 2002, Bologna, Italy, Proceedings*, pages 394–401. ACM, 2002.
- [25] Henry Prakken. Coherence and flexibility in dialogue games for argumentation. *J. Log. Comput.*, 15(6):1009–1040, 2005.
- [26] Henry Prakken. Formal systems for persuasion dialogue. *Knowl. Eng. Rev.*, 21(2):163–188, 2006.
- [27] Liang Qiu, Yizhou Zhao, Jinchao Li, Pan Lu, Baolin Peng, Jianfeng Gao, and Song-Chun Zhu. Valuenet: A new dataset for human value driven dialogue system. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 36, pages 11183–11191, 2022.



- [28] Eddo Rigotti and Sara Greco Morasso. Comparing the argumentum model of topics to other contemporary approaches to argument schemes: The procedural and material components. *Argumentation*, 24:489–512, 2010.
- [29] Shalom H. Schwartz. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. volume 25 of *Advances in Experimental Social Psychology*, pages 1–65. Academic Press, 1992.
- [30] Shalom H. Schwartz. An overview of the schwartz theory of basic values. *Online Readings in Psychology and Culture*, 2:11, 2012.
- [31] Shalom H Schwartz. An overview of the schwartz theory of basic values. *Online readings in Psychology and Culture*, 2(1):11, 2012.
- [32] Christian Stab and Iryna Gurevych. Annotating argument components and relations in persuasive essays. In *Proceedings of COLING 2014, the 25th international conference on computational linguistics: Technical papers*, pages 1501–1510, 2014.
- [33] Christian Stab, Tristan Miller, Benjamin Schiller, Pranav Rai, and Iryna Gurevych. Cross-topic argument mining from heterogeneous sources. In Ellen Riloff, David Chiang, Julia Hockenmaier, and Jun'ichi Tsujii, editors, *Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing*, pages 3664–3674, Brussels, Belgium, October–November 2018. Association for Computational Linguistics.
- [34] Francesca Toni. A tutorial on assumption-based argumentation. *Argument & Computation*, 5(1):89–117, 2014.
- [35] Stephen Toulmin. *The uses of argument*. 1958.
- [36] Michiel van der Meer, Piek Vossen, Catholijn M Jonker, and Pradeep K Murukannaiah. Do differences in values influence disagreements in on-line discussions? *arXiv preprint arXiv:2310.15757*, 2023.
- [37] Jean Wagemans. Constructing a periodic table of arguments. In *Argumentation, objectivity, and bias: Proceedings of the 11th international conference of the Ontario Society for the Study of Argumentation (OSSA)*, Windsor, ON: OSSA, pages 1–12, 2016.
- [38] D. Walton. *Argumentation Schemes for Presumptive Reasoning*. Routledge, 1996.



- [39] D. Walton, C. Reed, and F. Macagno. *Argumentation Schemes*. Cambridge University Press, 2008.
- [40] Douglas Walton, Christopher Reed, and Fabrizio Macagno. *Argumentation schemes*. Cambridge University Press, 2008.