

# Opinion Analysis and Argumentation: Identifying and Characterizing the Glue between Evaluative Expressions and Arguments

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**Abstract.** In this paper, we investigate, in opinion analysis, the link between an evaluative expression and an associated argument expressed as a concession or a contrast, in order to identify how it supports or attacks the evaluative expression.

## 1 Aims and Challenges

In (Garcia-Villalba et al 2012), within the framework of opinion analysis, we show that the association of an evaluative expression with a discourse structure such as an elaboration, an illustration, or a reformulation can be interpreted as an argument. These constructions are central to identify the reasons behind the evaluated statement. The major problem that remains is to establish a clear link between the evaluative expression and the argument in order to identify how it supports or attacks the evaluative expression. In most cases, knowledge and various types of inferences are required.

Let us have a look at an example of a contrast relation extracted from our corpus in French:

(1) *Located right in the city center [CONTRAST but quiet]*

The link between the first evaluation and the contrast relation is not completely straightforward. If we interpret central location as an evaluative expression orienting the argumentation towards a positive conclusion, and the adjective quiet also as orienting towards a positive conclusion, then the contrast relation may seem unjustified and yet this sentence appears perfectly natural and understandable to the reader. To understand the felicity of this argumentation, we need to take into account all the inferences that can be drawn from the first conjunct. Indeed, central location does not only imply positive values such as close to tourist attractions, but also potential negative aspects, such as expensive or noisy. The second conjunct therefore selects one of all the possible inferences, in this case a negative one, noisy, which is subsequently denied by quiet, thus justifying the contrast relation. These inferences are the glue between evaluative expressions and arguments.

We propose in this short paper a first attempt at classifying the different types of knowledge and inferences involved, via some examples of general rules or axioms found in our corpus of hotels and politics. Finally, we show how inferences influence the conclusion reached through complex argumentation.

## 2 Related Work: Argumentative Inferences and Connectives

Following (Grice 1975), the notion of lexical inference has emerged, e.g. (Anick and Bergler 1992), occurring between particular text spans or discourse relations in a text. (Mirkin et al. 2009) call this type of inferences 'sub-sentential textual entailment', limiting the scope of an inference to a sub-sentential level, as is the case of the inferences which arise between certain evaluative expressions and their arguments. The importance of establishing a methodology to access these lexical inferences has been highlighted on numerous occasions, e.g. (Kayser 1997), (Wedekind 1996), with an emphasis on incorporating the semantics of discourse connectives. Relevance Theory (see (Sperber and Wilson 1986), (Luscher 1989) and (Moeschler 2003)), LDRT (Spencer and Maier 2009) and the Theory of Argumentation in Language, e.g. (Anscombe and Ducrot 1997), all consider that connectives encode or trigger information which determines the relation holding between text spans. More recently, (Winterstein 2012) analyzes the nature of the argumentative inferences made accessible by the connective 'but' in the light of these inferential approaches. According to him, all these theories agree on the necessity of determining a pivotal inferential element activated by the first conjunct and then denied by the second in a contrast relation.

In the present article, we will refer to that pivotal element as the glue binding an evaluative statement to its arguments, similar to the dialogue glue which logically connects dialogical moves as e.g. in (Reed 2011). In this paper, we provide a more detailed taxonomy of inferences in order to better capture the relation between an evaluative statement and its arguments, focusing on the contrast/concession and consequence relations.

## 3 Argumentative Inferences

### 3.1 The problem

In (Garcia-Villalba et al. 2012) we argue that a number of rhetorical relations, such as a reformulation, an elaboration or a contrast can be understood as argument supports. However, the argumentative link between an evaluative statement and a rhetorical relation is not always straightforward, but rather subject to interpretation. This means that, in order to understand the why behind a particular evaluation, the reader unconsciously processes a certain quantity of implicit information, which needs to be made explicit if we want an automated system to access the structure of the argumentative discourse. Roughly speaking, each evaluative expression activates a number of implicit propositions or inferences in the mind of the reader, only some of which are subsequently selected by the rhetorical relation that complements the evaluation. Understanding the relation between the two is what allows the reader to reach a conclusion. Consider:

(2) *Located in a quiet area but next to a vaporetto stop!*

We observe that (2) has several interpretations, among which:

(2a) isolated, noisy, off-centered, accessible by public transport.

Annotators interpreted this sentence in different ways: (1) putting the emphasis on the fact that being close to a vaporetto stop can be noisy, thus leading to a negative conclusion, or (2) highlighting the quietness and the convenience of public transportation and therefore implying a positive conclusion.

A similar difficulty arises in the case of semantically complex evaluations which make it difficult for the reader to select among all the possible inferences, or even to identify the intention of the reviewer, leading to incongruous or even shallow argumentations. This is more often the case of opinions about politicians, where the boundaries between attributes are extremely fuzzy and there is little or no agreement on the values that can be attached to a certain attribute: (3) *Hollande represents the novelty, the unknown*, (= change is good but something to be afraid of)

*but he is also the kitchen wallpaper we have grown accustomed to.* (= in the tradition).

In (3), up to three conflicting rules arise: (1) that novelty is usually welcome in the domain of politics, (2) that novelty can also generate a fair amount of fear or confusion, and (3) that old habits die hard and can be reassuring. Moreover, the presence of the additive adverb also suggests that the final conclusion must be reached through a combination of the three inferences, rather than a contrast.

### 3.2 The experiment

In relatively stable domains such as the hotel domain, where attributes are clearly defined and reviewers are given writing guidelines, we find relatively high inter-agreement. In order to identify and characterize the types of inferences, we extracted evaluations involving contrast and concession. Our study of inferences in the contrast / concession relation focuses on a certain number of linguistic markers or connectives in French (*mais, par contre, en revanche, bien que, même si, pourtant, alors que*) and on an important argumentative relation, consequence (focusing mainly on the French connectives *donc* and *alors*). Approximately 200 evaluations were annotated for the domain of hotels and restaurants and politics.

The first step in the analysis is the identification of recurrent structures in the extracted evaluations and their formalization. Then, possible inferences were developed for each of the extracted evaluations by three annotators. A deeper analysis of these inferences is necessary in order to draw conclusions with regards to the possible categories of knowledge required to understand the argumentation in these opinions.

### 3.3 Lexical knowledge

This category includes all the linguistic constituents in the sentence other than linguistic markers that contribute to the identification of the argumentation, such as quantifiers which, according to (Winterstein 2012), play the role of information foci and mechanically affect the content of the proposition. Our analysis focuses

on the identification of the conceptual information encoded in open-class words such as adjectives or nouns, their lexical meaning and the possible connotations which trigger particular inferences:

(4) *The design is modern, but cozy.*

modern: → functional, simple, high-tech, cold. cozy: → warm,

(5) *Hollande is distant, but close.*

distant: → cold, not friendly, not solicitous. close: → friendly.

In (4) and (5), the inferences activated by these sentences are purely lexical but not totally straightforward. In (4), the adjective *modern* applied to the attribute interior design belonging to the rooms of a hotel activates a number of properties, many of which seem to orientate the first conjunct to a positive conclusion, such as functional or high-tech. The reviewer knows, though, that modern design might also lead some readers to picture a room with a simple decoration or a cold style. The adjective *cozy* in the second conjunct therefore selects this last property and cancels it out. At first sight, (5) may seem a paradox, but if we understand *close* as selecting only one of the properties which can be inferred from *distant*, then the statement does no longer appear as entirely infelicitous. The inference of this type of knowledge bears some similarity with Grice's generalized implicatures in so far as these examples do not require any specific domain or context knowledge in order to be understood.

### 3.4 Domain and general purpose knowledge

These inferences also concern the knowledge of the particular domain of the product or event reviewed. Since evaluations and the evaluative expressions used in them are generally domain-dependent, this has also an impact on the inferences which can be made. Domain knowledge can be characterized in the form of general rules that are generally shared among speakers by convention and they can be divided into three types:

**Knowledge of specific attributes:** this knowledge involves the specific attributes defined for a given domain:

(6) *I received a warm welcome even though I arrived very late (11 pm!)*

In (6), for instance, the inference being made and cancelled out by the concession is the general rule that hotel staff can be less qualified or available during the night shift.

**Knowledge of specific values:** those refer to the values which can be applied to an attribute or the specific connotations that a value can take in a particular domain:

(7) *The rooms are spacious, because they are old (anciennes), but comfortable.*

In (7), the French original *anciennes* conveys a positive sense of antique but includes also the pejorative connotation of old. Notice that whereas in (6), the domain knowledge applies to the attribute hotel staff, in (7) the inference is made via the adjective or value attached to the attribute rooms. If furniture in the room is antique, this may also imply that it is uncomfortable, and this is precisely the inference selected and cancelled out by the contrast.

**Specific realizations:** this type of knowledge involves occurrences of certain attributes or values in the domain, which possess special properties which are not necessarily paradigmatic, but which can be considered the result of contextual information:

(8) *Hollande doesn't like rich people, but I hate hypocrites.*

In order to understand the contrast in (8), we need to know about the statement Hollande made in a TV show during the 2007 presidential campaign: I don't like rich people. Hollande's quote could be understood in a positive way, representing his socialist ideas, but the speaker introduces a contrast which reverses this positive evaluation, suggesting Hollande's hypocrisy lies in the fact that he himself is rich. These inferences are not only domain-dependent, but also specific to the particular circumstances at the moment when the review was written. Notice that domain knowledge is closest to Grice's particularized implicatures, in particular the last subtype, specific realizations, for they are entirely context dependent.

### 3.5 Other logical inference mechanisms

This category includes a number of recurrent mechanisms used by reviewers in order to logically imply information by association of ideas. They can also be considered as higher-order world knowledge, since they are ways of reasoning generally accepted by convention. Here are samples of logical inference mechanisms found in our corpus:

**Generalization:**

(9) *Even though it was a brand name hotel, I received a warm welcome and the quality of the room and the breakfast was excellent.*

By generalization, the reader might infer that brand name hotels tend to standardize their services, but this generalization is refuted here.

**Relativization:**

(10) *There are many stairs, a steep and spiral staircase, but in the long run, you get used to it.*

By relativization (here, the action of time), the problem is no longer seen as a real obstacle.

**Elimination:**

(11) *Aubry and Hollande have no charisma whatsoever and their ideas are outdated. Marine is completely out of the game. So, by default, Nicolas Sarkozy.*

The reviewer implies that Sarkozy is the only worthy candidate by elimination.

**Cause and effect:**

(12) *In the evening, they are short in staff, so if you want to take a beer at the bar, you should be patient.*

The lack of staff logically results in a slow service at the bar.

**Part for the whole:**

(13) *Nice and clean room. The hotel, however, is really in need of a makeover.*

If the rooms are ok, we may infer that the rest of the hotel is ok too, but this implied idea is refuted by the contrast here.

We suggest that, in order to improve the characterization of arguments in opinion analysis, the next step in our approach would be a more thorough study of domain-dependent inferences in relatively stable domains, such as the domain of hotels and restaurants, or the domain of audio and video products, since this type of knowledge enables the access to a lot of relevant information which proves useful in understanding the reasoning behind the evaluation.

## 4 Elements of a model

Very briefly, let us consider an evaluative proposition  $P$  associated with a consequence, a concession or a contrast  $Q$ . Depending on the type of connector used and some focus aspects,  $P$  may appear before or after  $Q$ , e.g.  $Q$  although  $P$ . As explained above,  $P$  triggers a number of inferences resulting in various types of inferred information  $I$ .  $Q$  is in general more focussed towards a property or a value  $t$  in  $I$ :

$$P \rightarrow t \wedge Q \rightarrow \neg t.$$

The consequence, contrast or concession then supports or attacks  $P$  in a certain way depending on the semantics of the connector (Winterstein 2012).  $R$  is the result of the confrontation between  $P$  and  $Q$  introduced by the connector, its form depends on the connector. To be consistent,  $R$  is everything in  $I$  except  $t$  augmented by either  $\neg t$ , a consequence  $C(t)$  of the property associated with  $t$  (e.g. 3.5), or  $W(t)$  where  $W$  is a weight in the case  $t$  is related to a scalar attribute and the inference generates a compromise between  $P$  and  $Q$ . For example, (cleanliness: dirty-clean) may result in rather clean.

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