

ItVENSES - A Symbolic System for Aspect-Based Sentiment Analysis

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Abstract

English. ItVENSES is a system for syntactic and semantic processing that is based on the parser for Italian called ItGetaruns to analyse each sentence. ItVenses receives the output of ItGetaruns and decides which terms may be used as keywords or features for aspect identification. This is done at first by a simple lookup in a list created on the basis of a quantitative analysis of the training corpus. The result is sifted by activating a set of syntactic and semantic SIEVES that act upon the output constituency structure, the lemmatized and classified list of words, the predicate-argument structure(s) of the sentence. After this step, the aspect(s) associated to each sentence are enriched by the sentiment and polarity components computed on the output of ItGetaruns. Finally negation, factuality and subjectivity are considered in relation to each aspect. Results have been at first fairly low – 61% F1-score -, but after a series of ablation experiments two components of the algorithm have been reduced and the evaluation has suddenly soared reaching 83% F1-score, a value close to the one obtained for training data.

Italiano. *ItVENSES è un sistema per analisi sintattico-semantico basato sul parser per l'italiano chiamato ItGetaruns per analizzare ogni frase. ItVenses riceve l'output di ItGetaruns e decide quali termini possono essere usati come feature o semi per identificare l'aspetto. Questo passo viene compiuto dapprima con una semplice operazione di lookup in una lista creata precedentemente sulla base di un'analisi quantitativa del corpus di*

training. Il risultato viene quindi vagliato attivando un insieme di filtri che agiscono sulla costituenza sintattica, la lista lemmatizzata e classificata delle parole e le strutture predicato-argomentali della frase. Dopo questo passaggio, l'aspetto associato a ciascuna frase viene arricchito dalle componenti di polarità e sentiment calcolate sull'output di ItGetaruns. Infine, vengono considerate negazione, fattualità e soggettività in relazione a ciascun aspetto. I risultati sono stati dapprima alquanto bassi – attorno al 61% di F1, ma successivamente, dopo aver eseguito una serie di esperimenti di sottrazione in cui sono stati ridotti due componenti dell'algoritmo, la valutazione ha improvvisamente avuto un'impennata raggiungendo l'83% di F1, valore simile a quello ottenuto per il training corpus.

1 Introduction

In this paper we present work carried out to analyze aspect and polarity in a corpus of Italian tweets collected and annotated at the University of Turin (Basile et al. (2018)). The final system produced is fully symbolic, is made up by different modules and takes advantage of previous work for similar challenges presented at Clic-It 2014 (Delmonte (2014b)). In particular, the underlying parser for the semantic analysis of each text provides a full processing pipeline including tokenization, multiwords creation, morpho-syntactic analysis, POS tagging, Named Entity Detection, chunking and finally, extraction of dependency relations such as subject, object and modifiers. It also provides for pronominal binding and coreference resolution, and propositional level semantics related to negation, factuality and subjectivity. In the sections below we present in detail the method

used in the main modules, the general features of the dataset and the problems with some of its inconsistencies, the results.

2 The System and the Modules

One important step in the creation of the system ItVenses has been adaptation and contextualization which has acted on ItGetaruns – the semantic parser - at almost all levels of analysis. ItGetarun receives as input a string – the sentence to be analysed - which is then tokenized into a list. The list is then fully tagged, disambiguated and chunked. Chunks are then put together into a full sentence structure which is passed to the Island-Based predicate-argument structure (hence PAS) analyzer.

One important part of the adaptation of the system ItGetarun has been constituted by all requirements imposed by the domain at lexical, tagging, syntactic and semantic levels. Reviews on holiday resorts, hotels, touristic places have a specialized vocabulary which requires certain choices to be imposed by the components of the parser already from the start. In particular, we imposed a specific tag – here a Noun - to a set of otherwise lexically ambiguous words, as for instance in the following set of examples:

(1) torta, tavolo, fermata, pianta, insegna

where, each word could be tagged both as Noun and as PastParticiple or simply as Verb¹. A certain number of multiwords have been created in order again to reduce ambiguity of a set of words. In ItGetarun, the creation of multiwords is carried out during tokenization, thus before tagging takes place. Here are some examples,

(2) deposito bagagli, camera da letto, presa di corrente, ricevuta fiscale, sala colazione, centro storico

where again each first component could be analyzed as noun but also as verb or pastParticiple. Finally, since a great number of texts are simple fragments, made up of a list of nouns and adjectives and no verbs, we introduced a dummy verb

¹Tagging is very important to tell apart homographs like "personale" in this example, which would be wrongly classified by a bag-of-words approach: 1240342728,"L unico difetto è che, a differenza di altri ostelli, l armadietto personale è molto piccolo."

ESSERE and marked the first noun phrase as Subject to be able to compute propositional level semantics. At semantic and pragmatic level, specific words acquire a meaning determined by the context: consider the adjective "piccolo" which is only used to mark negative polarity when predicative and as a modifier when attributive, together with a number of downtoners like "poco", as in the example below:

(3) 1240348699;1;1;0;1;0;1;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;"Stanza piccola ma pulita."

The problem in this case is represented by the implicit presence of "stanza" in the elliptical portion of the text preceded by the adversative marker "ma" which allows exclusive reference. Consider also example (4),

(4) 1240350017;0;0;0;0;0;0;0;1;0;1;1;1;0;0;0;0;0;0;0;0;0;"Qualche difficoltà col parcheggio nonostante la disponibilità del personale"

where aspect feature terms are not the most relevant items, syntactically and semantically speaking, but are included as modifiers in a noun phrase ("del personale") or are treated as adjuncts prepositional phrases ("col parcheggio"). Inclusive semantic interpretation is associated to examples like (5) below,

(5) 1240347398;0;"La posizione della struttura è un po' fuori dal centro, ma in compenso è vicina al capolinea degli autobus"

There are also idiomatic expressions which are taken into consideration and computed from PAS, as for instance "lasciare a desiderare", meaning "being insufficient" rather than its literal meaning "leave to desire"².

(6) 1240347831;1;0;1;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;"La pulizia lascia a desiderare per un hotel da 4 stelle."

²or in the example below where, however, the annotated aspect has been wrongly marked as "other" in slot 8: as will be shown in a section below, "palazzo", "struttura" and "hotel" have both been usually associated to location, slot 7. (7) 1240351211;0;"il palazzo dove è posta la struttura e l'accesso dalla via lascia un po' a desiderare; tutto sembra ma non un hotel."

synonym search for both aspect feature items and polarity items we discovered that a fully different result has been obtained and from the evaluation algorithm it was by far the best result – see Table 5 - in line with what we obtained in training data, which we report here below in Table 4.

Tasks/Results	ACD	ACP
Macro-Precis	0.8414	0.7705
Macro-Recall	0.8493	0.7916
Macro-F1score	0.8453	0.7809
Micro-Precis	0.8074	0.7076
Micro-Recall	0.8290	0.7766
Micro-F1score	0.8181	0.7405

Table 3: Results for Training Dataset

We discovered later on that that was due to a redundancy at a semantic level caused by polysemous synonyms present in our dictionary and used to enrich the list derived from training data. In developing the system with training data, we extracted synonym lists in order to adapt and contextualize them to the domain. Consider an important and frequent seed like POSIZIONE: it has a set of five different meanings in IWN (ItalianWordNet), (see Roventini et al. (2000)) which are then reflected in the extension of synonym lists covering all of them. So what we did was creating sublists adapted and limited to our domain. However, when we turned to analyse test data we decided to tune the seeds we regarded semantically unique, to the synonym lists without any previous adjustment. The result was a dramatic drop in performance when compared to training data.

Tasks /Results	ACD Run1	ACP Run1	ACD Run2	ACP Run2
Macro-P	0.5887	0.5277	0.5856	0.5241
Macro-R	0.6089	0.5661	0.6140	0.5699
Macro-F1	0.5986	0.5463	0.5994	0.5461
Micro-P	0.6232	0.5209	0.6164	0.5144
Micro-R	0.6093	0.5659	0.6134	0.5692
Micro-F1	0.6162	0.5425	0.6149	0.5404

Table 4: Published Results for Test Dataset

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Tasks /Results	ACD Run1	ACP Run1	ACD Run2	ACP Run2
Macro-P	0.8222	0.7590	0.8258	0.7603
Macro-R	0.8458	0.7932	0.8564	0.8009
Macro-F1	0.8339	0.7757	0.8408	0.7801
Micro-P	0.7975	0.7033	0.7951	0.6986
Micro-R	0.8348	0.7880	0.8430	0.7938
Micro-F1	0.8157	0.7432	0.8183	0.7431

Table 5: Results for Test Dataset after Ablation Experiments

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APPENDIX

English Translation of all Italian examples in the paper

- (1) cake/twisted, table, stop, plant, teaches/sign
- (2) luggage storage, bed room, socket, fiscal receipt, breakfast room, historical center
- (3) Small room but clean
- (4) Some difficulties with parking notwithstanding staff helpfulness
- (5) The position of the structure is a little out of the center, but in return it is close to the main bus stops
- (6) Cleaning has a lot to be desired for a 4 star hotel
- (7) In the bathroom only 1 schampoo and only 1 shower gel for 2 people
- (8) Clean, spacious and what's more functional
- (9) Many steps 93 lift small
- (10) nothing to complain; all perfect
- (11) all very nice and professional
- (12) I liked practically all
- (13) I liked all
- (14) There is nothing that I didn't like
- (15) However, a shuttle service for the city center would be convenient especially in the evening
- (16) Great position, hotel in remaking this is why there's care for modernizing, great breakfast, fabulous wifi internet I made a video call with no problems and I was in my room, room and bath very spacious, gentle staff
- (17) The large room and the comfortable bath, the WIFI service and the pleasant breakfast
 - (i) Definitely better the deluxe one that I have already taken other times and at lower costs
 - (ii) At 9 45 breakfast was rather scarce for the price of 15 Euros