

A Fine-grained Multilingual Analysis Based on the Appraisal Theory: Application to Arabic and English Videos

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Introduction

AMIS (Access to Multilingual Information and Opinions)

Objective 1: Understanding the main idea of a video by summarizing.

- ▶ Input: A video in Arabic or French.
- ▶ Output: A summary of the input video subtitled in English.

Objective 2: Cross-lingual opinion Analysis

- ▶ Input: An Arabic video will be compared to French or English video.
- ▶ Output: A review concerning the degree of divergence between the two videos .

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AMIS corpus

- ▶ A large corpus of videos is collected by the AMIS consortium.

Table: The number of videos per language

Language	Number of videos
English	1874
Arabic	1503
French	2046

- ▶ Several controversial Hashtags are used to retrieve videos (#Syria, #Animal-rights, #Trump, #Women's-rights, #Homosexual-marriage, ...etc).
- ▶ All the videos have been transcribed by our Arabic and English ASR systems depending on the language of the videos

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Identify comparable videos

- ▶ Dictionary-based approach.
- ▶ Word embedding approach.

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Dictionary-based method

- ▶ This method consists in looking-up into a dictionary if the translation of the words of the source video V_s exist in the target one V_t and vice versa.

$$LG(V_s, V_t) = \frac{\sum_{w \in \{I_s \cap D_s\}} \sigma(w, I_t) + \sum_{w \in \{I_t \cap D_t\}} \sigma(w, I_s)}{|I_s \cap D_s| + |I_t \cap D_t|} \quad (1)$$

- ▶ Where D_s is the source part (English) of the bilingual dictionary, D_t is the target part (Arabic) of the dictionary.
- ▶ I_s and I_t are respectively the list of words of the source and the target video.

$$\sigma(w, I_s) = \begin{cases} 1 & \text{if } T(w) \cap I_s \neq \emptyset \\ 0 & \text{else} \end{cases} \quad (2)$$

Dictionary-based method

- ▶ OMWN (Open Multilingual WordNet)¹ that contains 17,785 Arabic and English pairs.
- ▶ We used translation table of 297,176 pairs of Arabic and English entries.

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¹<http://compling.hss.ntu.edu.sg/omw/>

Word embedding method

- ▶ The idea is to use the semantic information encoded by **words embedding** approach to retrieve the words semantically close to each other in two bilingual documents.

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- ▶ The CBOW method is trained over a large parallel corpus (9 million sentences in English and Arabic).

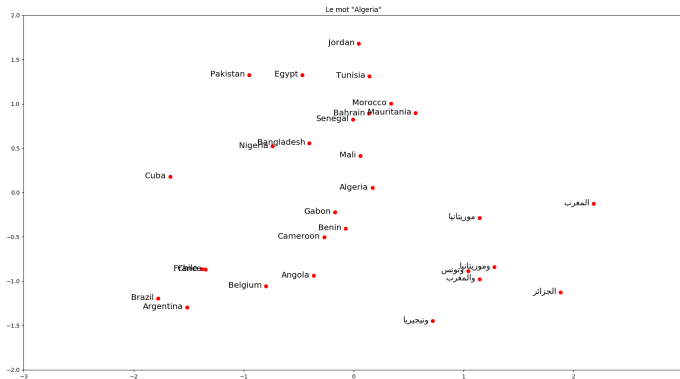


Figure: The correlated words with the entry *Algeria*.

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- To estimate the comparability between an Arabic and English videos.

$$CBOW(V_s, V_t) = \frac{\sum_{w \in \{I_s\}} \sigma(w, I_t) + \sum_{w \in \{I_t\}} \sigma(w, I_s)}{|I_s| + |I_t|} \quad (3)$$

- In this case the function σ that returns 1 if the correlated words of w exist in list of a word of the source video.

$$\sigma(w, I_s) = \begin{cases} 1 & \text{if } CBOW(w) \cap I_s \neq \emptyset \\ 0 & \text{else} \end{cases} \quad (4)$$

Experimentation

- ▶ Test corpus composed of 123 pairs of comparable videos extracted from the Euronews web site.
- ▶ The classical measures in information retrieval topic: Recall (R@1, R@5 and R@10).

$$R@1 = \frac{\text{Number of the videos correctly identified in the position 1}}{\text{Total number of videos}} \quad (5)$$

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Table: The performance of different comparability methods in terms of $R@1$, $R@5$, and $R@10$ on a test corpus.

	$R@1$	$R@5$	$R@10$
<i>DicMA</i>	43	65	76
<i>DicTT</i>	70	90	92
<i>CBOW</i>	39	62	75

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Multilingual Fine-granularity sentiment analysis

- ▶ The methods devoted to sentiment analysis concern the polarity of text (positive, negative).
- ▶ In some other methods use fine-grained categories:
 - ▶ By using emotions (anger, disgust, fear, joy, sadness, and surprise)
 - ▶ By adopting a linguistic theory such as appraisal

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The appraisal theory

- ▶ The appraisal approach has been developed by White and Martin ².

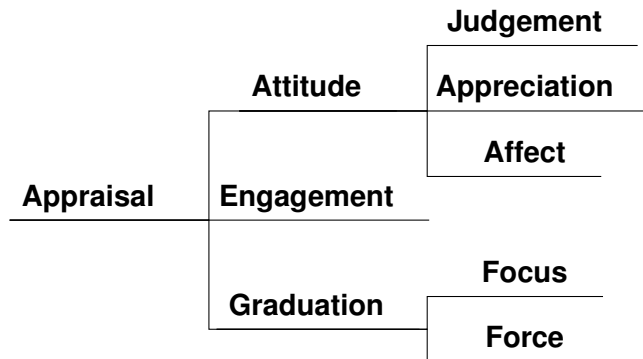


Figure: Appraisal taxonomy

²Martin, J. R. and White, P. R. R., "The language of evaluation : appraisal in English", 2005

Attitude category

The category Attitude gives the type of appraisal being expressed. It has multiple subcategories:

- ▶ **Affect.** describes the emotional reactions (happy, miserable, angry, etc.).
- ▶ **Appreciation.** It concerns the opinion that a person has about the inner or outer qualities of an object (beautiful, innovative, amazing, etc.).
- ▶ **Judgment.** describes the behaviour of somebody in a social context (lucky, brave, famous, etc.).

Graduation category

- ▶ The Graduation describes the intensity of appraisal. It has two sub-category: focus and force.
- ▶ The graduation is globally expressed via modifiers.

Word: " intelligent "

Polarity: positive

Attitude category : judgement

Force: neutral

Text: " **Very**+ intelligent "

Polarity: positive

Attitude category: judgement

Force : Intensify

Building appraisal lexicon

- ▶ To build the appraisal lexicon, we started from an English opinion lexicon composed of 4,913 negative words and 2,718 positive words developed by Minqing Hu and Bing Liu.
- ▶ We created a list of 363 (MW363) words with their appraisal categories inspired from the examples of Martin and White's book.

Table: Few examples of words with appraisal and polarity opinions

Word	Attitude sub-category	Polarity
Lucky	Judgment	Positive
Obscure	Judgment	Negative
Confident	Affect	Positive
Love	Affect	Positive
Helpful	Appreciation	Positive

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Building appraisal lexicon

- ▶ We assigned for each entry of the Minqing Hu and Bing Liu lexicon the corresponding appraisal Attitude category (word embedding, MW363).
- ▶ For each word X from Minqing Hu and Bing Liu lexicon, we find its top-n closest words to MW363.
- ▶ Then, we assign to X the sub-category which is dominant in this latter list.

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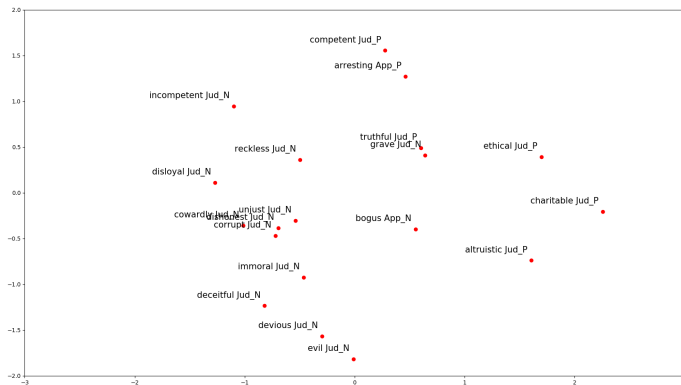


Figure: The correlated appraisal words of the MW363 with the entry *criminal*.

Example

- ▶ This word is close to : 11 judgment negative words, 6 positive judgment words, one positive appreciation and one negative appreciation.

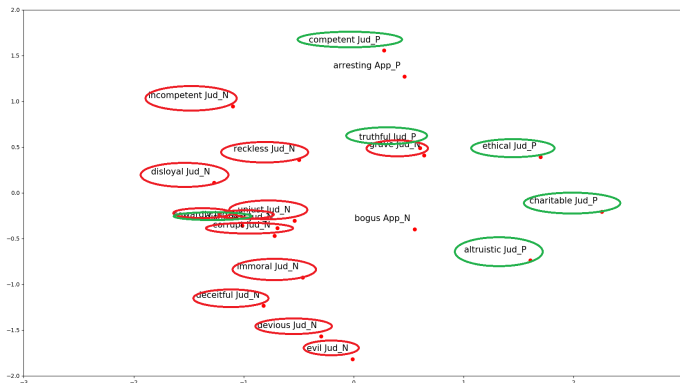


Figure: The correlated appraisal words of the MW363 with the entry *criminal*.

Building appraisal lexicon

$$S_{App}(X) = \frac{1}{d_n} \sum_{i=1}^{d_n} \text{cosine}(X, W_i) * P_{W_i} \quad (6)$$

Where:

- ▶ d_n : The number of words in the dominant sub-category in the list of the n closest words with X .
- ▶ W_i : A word belonging to the list of the dominant attitude sub-category.
- ▶ X : A word of Bing Liu's sentiment lexicon.
- ▶ $P_{W_i} = \begin{cases} +1 & \text{if } W_i \text{ is positive} \\ -1 & \text{otherwise.} \end{cases}$

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Table: Few examples of BingApp.

English word	Arabic trans	App-cat /Sub-cat	S_{App}	Pol
Criminal	مجرم	Attitude/Judgment	-0.45	N
Attentive	منتبه	Attitude/Judgment	0.41	P
Worried	قلق	Attitude/Affect	-0.45	N
Satisfied	راض	Attitude/Affect	0.24	P
Harmonious	متناغم	Attitude/Appreciation	0.63	P

- In order to work with the same material in Arabic and in English, we translated BingApp into Arabic.

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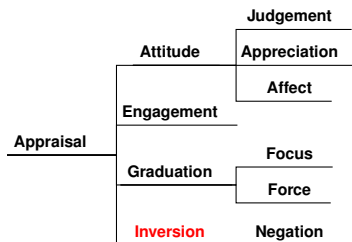
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Dealing with the Negation

- We added to BingApp, the negation words (*Not, No, Neither, Nor, etc.*) and assigned them to the *Inversion* category.



- During the analysis step, if the *Inversion* category is identified in an utterance, then the polarity of the word following the negation item is inverted.

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Dealing with the Force

- ▶ We added to the dictionary BingApp several modifier words that we assigned to the sub-category *Force* of the category *Graduation*.
- ▶ We shared these modifiers through 4 classes. Each class indicates the intensity of the modifier and it is assigned a score proportional to its capacity to intensify a word.

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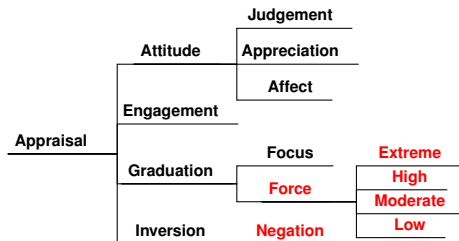
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Frame Title

Table: The four classes of the intensity modifiers.

Force classes	Modifiers
Extreme	hardly, scarcely, barely, very, greatly, etc.
High	large, less, distant, more, etc.
Moderate	somewhat, relatively, rather, reasonably, many, etc.
Low	slightly, least, small, etc.



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- ▶ We used the publicly available collection of movie reviews which consists of 1,000 positive and 1,000 negative reviews.

Table: Comparison of Bing Liu's lexicon and BingApp on a test Review corpus

Method	Recall	Precision
Bing Liu's	69.0	68.8
BingApp	70.9	71.0

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Evaluation on AMIS videos

- ▶ Quantitative evaluation
- ▶ Qualitative evaluation

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Qualitative evaluation

- A qualitative evaluation in which we summarize the expressed opinion in the video by using a template of the opinion review.

The sentiment of the video is positive with a score $[X_p]$ and negative with a score $[X_n]$. $X_{aff}\%$ of the video concerns emotional reactions. $X_{Jug}\%$ of the video concerns the human behaviour according to social norms and $1 - (X_{aff} + X_{Jug})\%$ of the video is about the appreciation of no human being entities.

Figure: The template used to generate the qualitative evaluation

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Score positif = 1,56, Score négatif = -2,15

The sentiment of the video is positive with a score **1.461** and negative with a score **-2.15**. **50%** of the video concerns the human behaviour according to social norms and **50%** of the video is about the appreciation of no human being entities.



What will Trump's presidency mean for the Iran nuclear deal?

For what I will demand Trump's presidency neither the Iran deal nor the caricatured pockets taken agreed with the a.s.s and several global powers on a visit to pragmatize a foreign minister said he expected the new administration to accept the agreement it has been implementing it's part of the bargain unfortunately a the united states even during the current administration has not fully implemented it's part of the bargain but we believe that jayceon will implement it's part of the bargain and we will support it's part of the bargain and we do not have other options the deal remove sanctions on iran to return for carbs on its suspected drive to develop nuclear weapons it was opposed by republicans and during the campaign trump called a disastrous too soft ironic the agreement already it is a few days after all worst hails i've ever seen negotiated at any level by august the presidential candidate attempers his rhetoric saying he wouldn't flip up the deal that would forcefully police it but with

Score positif = 1,42, Score négatif = -3,275

The sentiment of the video is positive with a score **1.425** and negative with a score **-3.275**. **7.14%** of the video concerns emotional reactions. **78.57%** of the video concerns the human behaviour according to social norms and **14.29%** of the video is about the appreciation of no human being entities.

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Multilingual Fine-granularity sentiment analysis

Conclusion

In this work the objective was twofold:

- ▶ **Identify comparable videos :**
 - ▶ We tested three methods and compared them.
 - ▶ The best one has been used to align the whole database of AMIS.
- ▶ **Multilingual Fine-granularity sentiment analysis :**
 - ▶ We used a new method based on the appraisal approach allowing to have a fine-grained opinion analysis.
 - ▶ We created a new lexicon which contains words with their appraisal category.
 - ▶ This lexicon served to evaluate quantitatively and qualitatively the content of videos.

A Fine-grained
Multilingual
Analysis Based on
the Appraisal
Theory:
Application to
Arabic and English
Videos

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AMIS corpus

Identifying
comparable videos

Multilingual
Fine-granularity
sentiment analysis

Conclusion

Thank You

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Quantitative evaluation

$$S = \sum_{i=1}^N \alpha(w_{i-k}^{j-1}) * S_{App}(w_i) \quad (7)$$

- ▶ Where N is the size of the video in terms of number of words.
- ▶ α is a weight depending on the *Inverted* or the *Force* sub-category of the k words preceding the word w_i (k is set to 2)

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