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Natural Language Processing for Cognitive Analysis of Emotions

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1. Introduction

Emotion analysis in texts suffers from two major limitations: annotated gold-standard corpora are mostly small and homogeneous, and emotion identification is often simplified as a sentence-level classification problem. To address these issues, we introduce a **new annotation scheme for exploring emotions and their causes**, along with **a new French dataset composed of autobiographical accounts of emotional scenes**. The texts were collected by applying the **Cognitive Analysis of Emotions** (CAE) [1] to help people improve on their emotion management. We present a **rule-based approach** to automatically annotate emotions and their semantic roles (e.g. emotion causes). We investigate future directions for emotion analysis using **graph structures**.

2. Cognitive Analysis of Emotions

- A method to help people improve on their emotion management. It studies how primary emotions appear in autobiographical accounts of emotional scenes.
- An emotion arises when we evaluate a situation that invalidates or confirms our model of the world, made up of territories associated with our needs to be satisfied (e.g. physiological, safety, love and belonging needs, etc.). My territories can be: my body, my home, my professional values, my beliefs, my self-image, my time, etc.
- A coach trained in Cognitive Analysis aims to understand emotion causes (e.g. by identifying the territories involved) and suggests corrective actions to better handle situations.

We propose to automate an important step of CAE analysis, namely the identification of emotions and their causes.

3. Limitations in Emotion Analysis

- Emotion analysis in texts rarely considers psychological theories to really understand emotions and their causes.
- It is often simplified as a sentence-level classification problem.
- Annotated corpora are mostly small and limited to a few domains (reviews, social media) and languages (English, Chinese) [2].

4. Annotation scheme for Aspect-Based Emotion Analysis

Goal: Deeply understand a written emotional scene by automatically identifying who feels an emotion, what drives an entity to express an emotion toward a certain aspect and why.

Semantic roles: CUE (a marker indicating the presence of an emotion), EXPERIENCER (the author who feels an emotion), TARGET (an entity or a person targeted by an emotion) and CAUSE (an event that triggers an emotion). These roles are employed by [3] to unify several gold but heterogeneous datasets that contain annotations for both emotions and their semantic roles.

Example: "Gustave loves carnivorous plants because they are beautiful", Gustave (EXPERIENCER) exposes his joy (CUE) towards carnivorous plants (TARGET) because they are beautiful (CAUSE).

5. Extended annotation scheme

Goal: Extend the previous annotation scheme with new semantic roles based on CAE to better understand emotion causes.

Added semantic roles: TERRITORY (corresponding to the notion of territory in CAE), ATTACK (expressions related to the act of attacking or being attacked) and ATTACKER (an entity that attacks a TERRITORY).

Example: "My skills are attacked by Marc", "My skills" are a TERRITORY related to the author's professional values and competent self-image attacked by the ATTACKER "Marc".

The dataset, composed of autobiographical accounts of emotional scenes, will indicate emotions and their semantic roles according to our extended annotation scheme. Note that the annotation process has not yet been performed, nor has the evaluation of our rule-based prototype.

5. Rule-based method

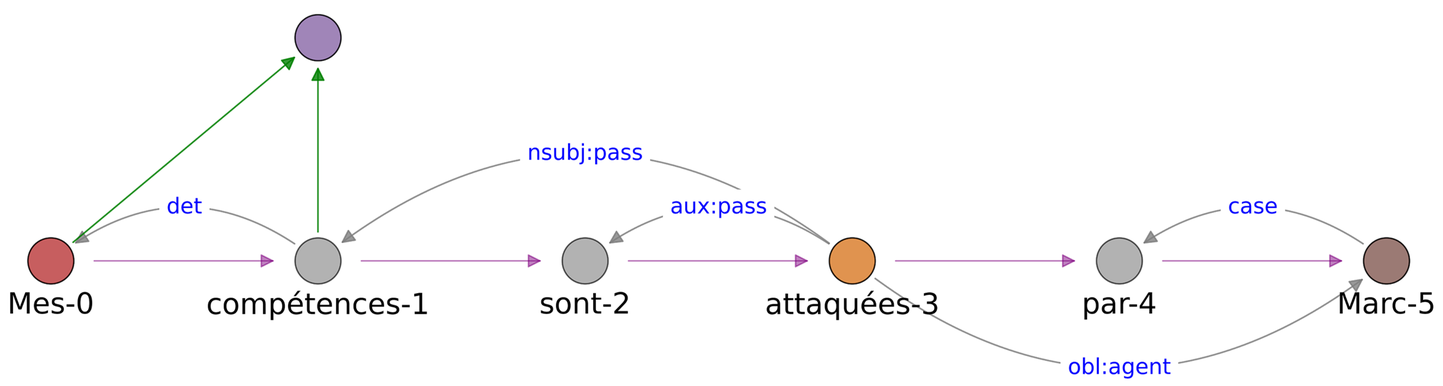
Goal: Manual creation of rules with linguistic features (using dependency parsing, co-reference resolution and part-of-speech tagging) and semantic features (using sentiment and emotion lexicons [4]) to automatically identify emotions and their semantic roles.

Example: TERRITORY is found if it is the subject of an ATTACK in passive voice: "**My skills** are attacked by Marc".

6. Graph structure

Goal: Represent emotion expressions by a graph structure that can be visualized.

A sentence or a whole text corresponds to a graph in which nodes are words and edges indicate relations of various kinds between words. The application can display different levels of text analysis (e.g. dependency parsing, our emotion analysis, etc.) in a single plane.



Visualization of the French sentence: "*Mes compétences sont attaquées par Marc*" (translated "My skills are attacked by Marc"). **Edge colors** indicate different types of relations, e.g. noun chunk membership is in green and sequential relation is in pink. **Node colors** indicate semantic roles, e.g. EXPERIENCER is in red, TERRITORY is in purple, ATTACKER is in brown and ATTACK is in yellow.

7. References

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