



INAUGURATION

THE NoRDF PROJECT

MODELING AND EXTRACTING COMPLEX INFORMATION
FROM NATURAL LANGUAGE TEXT

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Application à l'analyse des sentiments



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Focus on sentiment analysis within the NoRDF project

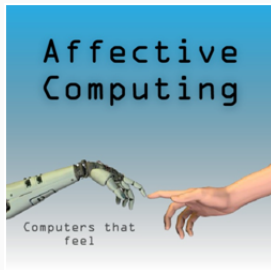
Chloe Clavel, <https://clavel.wp.mines-telecom.fr/>

LTCI Telecom-Paris, Social Computing Topic

Social/Affective Computing : scope and challenges

Some history : from Affective Computing to Social Computing

1997, MIT: Affective Computing



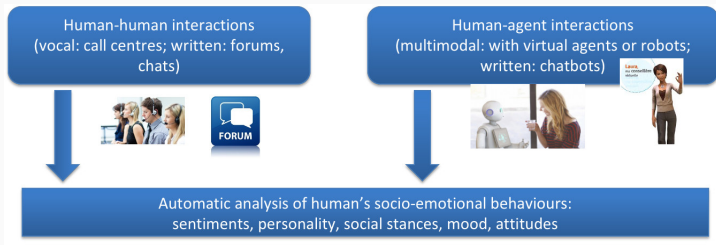
Now

From emotions to social signals and opinions

Also called **Social Computing / Emotion AI**

Social Computing - My Research scope

Natural language processing for the analysis of *socio-emotional behaviours*¹ in interactions



↔ Projects of the team : H2020 ITN Pierre et Marie Curie Animatas, Chaire Data Science and Artificial Intelligence for Digitalized Industry and Services, ANR JCJC MAOI,

¹socio-emotional behaviours : sentiments, emotions, moods, social stances, etc.

General challenges of sentiment analysis

Define sentiment/opinion-related phenomena

Emotion? opinion? mood? personality traits?

phenomena that are often intertwined in their expressive realisation and that are complex to annotate and subjective

↔ requires to leverage social sciences and humanities to obtain meaningful labels for supervision and computational models

- ex : generic definition given by Appraisal theory [Martin and White, 2005]:
 - an appraisal of a target by a source and can be expressed through Affect/Judgment/appreciations
 - ex: hateful speech : appraisal through affect of a certain type of person by the author of the tweet

General challenges of sentiment analysis

*This film **should be brilliant**. It **sounds like a great plot**, the actors are **first grade**, and the supporting cast is **good** as well, and Stallone **is attempting to deliver a performance**. **However, it can't hold up**.*

↪ more complex than a simple positive vs. negative word counts.

- conditional tense
- discourse markers
- negation processing (*I don't like this movie*)
- modifiers and intensifiers (*the plot is not very good*)
- dealing with metaphors (global warming vs. climate change [Ahmad et al., 2011])
- dealing with noisy inputs (call-centre transcripts, customer inputs)

↪ requires advanced information extraction/machine learning models

Challenges of user's sentiment analysis in human-agent interactions

- user's expressions of sentiments are triggered by agent's utterances
- requires a specific modelling of interaction processes in information extraction/machine learning models



© C. Langlet's presentation at AII 2015

Clavel, C.; **Callejas, Z.**, *Sentiment analysis: from opinion mining to human-agent interaction*, IEEE Transactions on Affective Computing (2016)

Social Computing and symbolic AI

Symbolic AI for sentiment analysis

Principles

Formal models integrating knowledge from:

- psycholinguistics
- small corpus observation

Advantages

- useful when problems are still not correctly stated (functions of inputs/outputs)
- useful when we don't have a sufficient quantity of data with relevant labels
- useful when there is a strong need for model interpretability

Social Computing and symbolic AI

Example of research on symbolic AI :

- Formal grammars for the detection of user's sentiment in human-agent interaction

C. Langlet and C. Clavel, *Improving social relationships in face-to-face human-agent interactions: when the agent wants to know user's likes and dislikes* , in ACL 2015

Grammars for the detection of user's likes in human-agent interaction

1/Focus on a certain type of user's sentiment: user's likes and dislikes

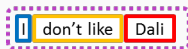
Choice driven by literature in psychology :

- ↪ Heider theory [Heider, 1982]: the quality of an inter-personal relationship depends on a balance between the **likes and dislikes** of each person for different entities.

Representation of user's likes and dislikes according to Appraisal theory [Martin and White, 2005]:

User's Attitude features

source = user
target = Dali
polarity = neg



Grammars for the detection of user's likes in human-agent interaction

2/Modelling interaction process

- based on psycholinguistic theory [Clark and Schaefer, 1989] we identified **the adjacency pair** (agent utterance, user utterance) as unit for the analysis

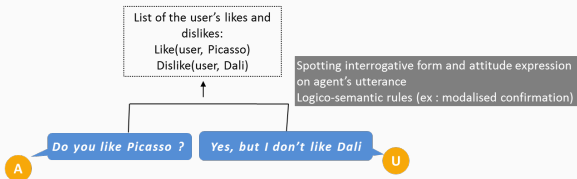


© C. Langlet's presentation at ACHI 2015

Grammars for the detection of user's likes in human-agent interaction

Formal model: patterns and rules within the adjacency pair

based on psycholinguistic theories for modelling the appraisal process within the interaction



Two appraisals : (dislike, Dali) and (like, Picasso)

C. Langlet and C. Clavel, *Improving social relationships in face-to-face human-agent interactions: when the agent wants to know user's likes and dislikes*, in ACL 2015

Grammars for the detection of user's likes in human-agent interaction

Evaluation method

Annotation of a corpus of human-agent interaction

Development of an annotation guide within a crowdsourcing platform for the annotation of opinions in interactions

Langlet, C., Duplessis, G.D. and Clavel, C., 2017. A Web-Based Platform for Annotating Sentiment-Related Phenomena in Human-Agent Conversations. In International Conference on Intelligent Virtual Agents (pp. 239-242). Springer, Cham.

Machine learning for Social Computing

Challenge: How to model interactive processes for the detection of user's sentiment using deep learning?

- Using recurrent Neural Networks for utterance classification:
 - good to model the sequential nature of video, audio or text
 - can be extended to model the conversation sequentiality
- and seq2seq approaches in particular:

Pierre Colombo and Emile Chapuis and Matteo Manica and Emmanuel Vignon and Giovanna Varni and Chloe Clavel, Guiding attention in Sequence-to-sequence models for Dialogue Act prediction, AAI 2020

Seq2seq approaches for utterance classification in dialogue

widely used by Neural Machine Translation to model the strong dependencies that exist between units composing:

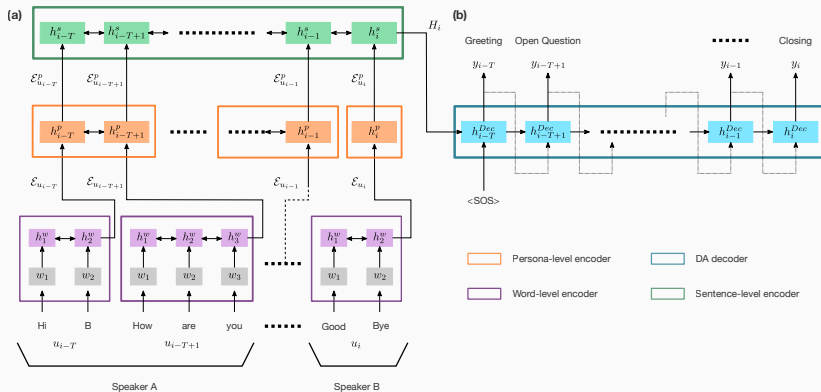
- the input sequences (sequences of words in a language)
- the output sequences (sequences of words in another language in NMT → the sequence of labels for utterance classification)

Here, seq2seq is used to model two types of dynamics:

- the dynamics between the labels to predict for each utterance
- the dynamics between the contents of the utterances

Pierre Colombo and Emile Chapuis and Matteo Manica and Emmanuel Vignon and Giovanna Varni and Chloe Clavel, Guiding attention in Sequence-to-sequence models for Dialogue Act prediction, AAAI 2020

Seq2seq approaches for utterance classification in dialogue



The proposed architecture relies on the encoder-decoder architecture of seq2seq with:

- A hierarchical RNN encoder (word and utterance levels)
- A RNN decoder
- Attention mechanisms





Conclusion

The NoRDF project's research lines related to the Social Computing topic

Using neuro-symbolic approaches for helping different tasks specific to Social Computing...

- Predict links between source, target and evaluation components of a sentiment expression ("I think this movie is not a good one")
- Identify different expressions referring to a same target or to a same source
- Adapt methods for the understanding of user's utterance in the context of a dialogue (complex referring expressions, modelling of dialogue dynamics)

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