Emotions are Events and Events trigger Emotions

Appraisal Theories for Emotion Classification in Text

DFKI, Berlin/Online

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Institute for Natural Language Processing

- Part of computer science department at Uni Stuttgart
- 3 full professors, 3 associate professors/lecturers, 2 independent research groups, 1 assistant professor
- Research across many areas of computational linguistics
- Computational Linguistics B. Sc. and M. Sc. programs
- Contribute to programs in Digital Humanities, Computer Science, Data Science
Emotions and Emotion Analysis

Emotions are Events

Events trigger Emotions

Summary

Chair for Theoretical Computational Linguistics
Current Ph.D. students and project staff

- **Felix Armbrust**
  - financial management

- **Laura Oberländer**
  - role labeling

- **Enrica Troiano**
  - emotion transfer

- **Amelie Wührl**
  - biomedical fact checking

- **Aswathy Velutharambath**
  - style transfer

- **Yarik Menchaca Resendiz**
  - conditional text generation

- **Flor Miriam Plaza Del Arco**
  - zero shot learning
1. Emotions and Emotion Analysis

2. Emotions are Events

3. Events trigger Emotions
   - Cognitive Appraisal
   - Emotion Components

4. Summary, Critical Assessment, Future Work
Emotion Examples

Which emotion is associated with each example?
How did you recognize that?

- “She became angry.”
- “A tear was running down his face.”
- “We will go for a walk.”
- “What was that?”
- “Sometimes I want to run away.”
- “He raised his hand.”

With this exercise, we discussed two things:

- What is an appropriate set of emotions? (what we do next)
- How are they expressed/recognized? (later today)
Emotion Models – Basic Emotions

How to define a categorical system of emotions?

- Distinctive universal signals
- Presence in other primates
- Distinctive physiology
- Distinctive universals in antecedent events
- Coherence among emotional response
- Quick onset
- Brief duration
- Automatic appraisal
- Unbidden occurrence

Emotion Models – Basic Emotions

Are these categories structured?

Emotions and Emotion Analysis

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Emotion Models – Valence-Arousal Model of Affect

- Perhaps predefined emotion categories do not make sense?
- Perhaps mixtures and opposites do not make sense, but there are other ways to explain the relations between emotions?


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Emotion Analysis: What we want to do.

Interesting from different perspectives:

- **Computational linguistics and modelling:**
  - How to represent emotions as they occur in language?

- **Psychology/Social sciences:**
  - Better understand emotions and their effects

- **Applications** ranging from humanities, social sciences over pharmacovigilance to robotics and intelligent agents.
Kim et al., 2017.
Investigating the Relationship between Literary Genres and Emotional Plot Development.

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Happiness in Art and Public: Dodds 2009

How do these emotion models help NLP?

- **Ekman:**
  - Serves as a categorical system for text classification.
  - Introduced the role of events and to study emotions based on observable characteristics (following ideas of Darwin).

- **Plutchik:**
  - Serves as a categorical system for text classification.
  - Models have been proposed which build classifiers that consider the structure of the wheel. (e.g., Suttles/Ide (2013): Distant Supervision for Emotion Classification with Discrete Binary Values. CICLING.)

- **Russel:**
  - Serves as a basis for regression tasks.
Emotions and Events

Emotions and Events are linked in (at least) two ways:

Emotions are events

• “Donald is happy about his birthday present.”

• FrameNet Emotion Directed Frame:
  • Event: “happy”
  • Experiencer: “Donald”
  • Stimulus: “his birthday present”
  • …

⇒ Motivated the task of emotion semantic role labeling (we’ll talk about that now for a bit)

Events cause emotions

• “There is a car on fire.”
  • Relevant event for the speaker, might cause fear.
  • Requires interpretation of events to infer possible emotions.
  • Little previous work
    • Udochukwu/He (2015), Shaikh et al. (2009), Balahur et al. (2011)

• (coming up next)
Outline

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   - Cognitive Appraisal
   - Emotion Components

4. Summary, Critical Assessment, Future Work
When I mentioned the house, he seemed surprised.
Emotions are Events: News

**Emotion:** Anger  
**Intensity:** High  
**Other emotions:** None  
**Reader perception:** Yes  
**Reader emotions:** Annoyance, Negative Surprise, No Emotion

GoodNewsEveryone: A Corpus of News Headlines Annotated with Emotions, Semantic Roles, and Reader Perception

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Emotions and Emotion Analysis

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Emotion Semantic Role Labeling as Sequence Labeling

Example

“[John] [hates] [cars] because they [pollute the environment].”

Corpora

- Tweets with Cue, Stimulus, Experiencer, Target: Mohammad et al. (2014)
- Literature, with Cue, Stimulus, Experiencer, Target: Kim/Klinger (2018)
  with Stimuli: Gao et al. (2017)
- News headlines with Cue, Stimulus, Experiencer, Target: Bostan/Kim/Klinger (2020)
- Blogs with Stimuli: Ghazi et al. (2015)
Emotion Stimulus Detection

Token Sequence Labeling vs. Clause Classification

<table>
<thead>
<tr>
<th>O O O O O B I I I O</th>
</tr>
</thead>
<tbody>
<tr>
<td>John hates cars because they pollute the environment.</td>
</tr>
</tbody>
</table>

No Stimulus
[ John hates cars ]
[ because they pollute the environment. ]

Stimulus

- Clause classification is standard formulation in Mandarin (Gui et al., 2017)
- We showed that token sequence labeling outperforms clause classification in English.
- Clauses are not the appropriate unit for stimuli in English.

Token Sequence Labeling vs. Clause Classification for English Emotion Stimulus Detection

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Application Example: Automatic Relation Extraction for Network Analysis
Knowledge of Emotion Roles helps Emotion Classification

We can tell a BERT classifier of emotion categories about the position of roles.
Definition of emotions and their linguistic realizations

Emotion (Scherer, 2005)

Emotions are “an episode of interrelated, synchronized changes in the states of [...] five organismic subsystems in response to the evaluation of a [...] stimulus-event …”
Appraisal-based Emotion Classification

Feeler: “I”
Cue: “so happy”
Cause: “passed my habilitation”

Category: Joy
Pleasantness: High
Responsibility: High
Certainty: High
Sit. Control: Low
Expected Effort: Low
Attention: Medium

Appraisal Theories for Emotion Classification in Text

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Appraisal Annotation

Most probably, at the time when the event happened, the writer...

- ...wanted to devote further attention to the event. (Attention)
- ...was certain about what was happening. (Certainty)
- ...had to expend mental or physical effort to deal with the situation. (Effort)
- ...found that the event was pleasant. (Pleasantness)
- ...was responsible for the situation. (Responsibility)
- ...found that he/she was in control of the situation. (Control)
- ...found that the event could not have been changed/influenced by anyone. (Circumstance)

(following concepts by Smith/Ellsworth, 1985)
Corpus Selection

- Reannotation of event-centered corpus: Troiano/Padó/Klinger, 2019
  - “Remember an event which triggered [emotion] and describe it: ‘I felt [emotion word], when…’ ”
  - 1001 event descriptions, stratified by emotion (anger, disgust, fear, guilt, joy, shame, sadness)

Examples

- I felt [sadness] when I saw a homeless cat on the street.
- I felt [shame] when someone commented that I was looking very untidy.
- I felt [anger] when the police did not update me on a crime.
Annotation Results
Machine Learning Models
Modelling Results

How well can we predict appraisal dimensions from text?

![Bar chart showing F1 scores for various appraisal dimensions.](chart.png)
Modelling Results

Can this approach improve emotion classification?

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Emotion Components

Feeler: “I”
Cue: “so happy”
Cause: “passed my habilitation”

Report of subjective feeling
Vocal Expression
Event appraisal
(No report of bodily symptoms, action tendencies)

Semantic Role Labeling
Component Process Model

Pleasantness: High  Expected Effort: Low  Attention: Medium
Responsibility: High  Certainty: High  Sit. Control: Low

Category: Joy
Does Component Knowledge help Emotion Classification?

- **Annotation** of two corpora: TEC (Tweets) and REMAN (literature) for components
- **Labels of TEC** (one-of): anger, disgust, fear, joy, sadness, surprise
- **Labels of REMAN** (many-of): anger, disgust, joy, sadness, fear, surprise, trust, anticipation, other, neutral
- 2041 Tweets, 1000 sentence triples from Project Gutenberg
**Does Component Knowledge help Emotion Classification?**

### Examples

**Cognitive**
- I can’t stop.
- found my old lava lamp!

**Bodily Reaction**
- She did not know; she trembled.
- Apparently i might have alcohol poisoning. #stupidgirl

**Subjective**
- Woman–woman–I love thee!
- bad day

**Motivation**
- We’re going out tonight.
- Sometimes I wanna take your head and ram it into mirrors.

**Expression**
- An expression of annoyance appeared on the emperor’s face.
- Finals tomorrow… ugh
Corpus Statistics

TEC/Twitter

Cognitive

Subjective

Expression

Action

Physiological

REMAN/Literature

Cognitive

Subjective

Expression

Action

Physiological
Machine Learning models
How well can we predict components?

![Graph showing F1 Measure for different components with REMAN and TEC comparison.](image)
Does Component Prediction help Emotion Categorization?

![Graph showing F1 Measure for different conditions: Text, Text/Comp., Text/Gold-Comp., Joint. The y-axis represents the F1 Measure ranging from 20 to 70, and the x-axis represents different conditions. The graph compares REMAN-MacAvg, REMAN-MicAvg, TEC-MacAvg, and TEC-MicAvg for each condition.]
Emotions and Emotion Analysis

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Summary, Critical Assessment, Future Work
Summary

- We presented the first work that combines
  - emotion component process model,
  - appraisal classification
  with emotion classification
- Emotion component prediction helps to improve emotion classification
- Appraisal prediction has potential to improve emotion classification
Check out our whole lecture on emotion analysis!

www.emotionanalysis.de
Thank you for your attention.
Questions? Remarks?

Thanks to
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