



University of Stuttgart  
Institute for  
Natural Language Processing

# Emotion Analysis

Stimulus Detection and  
Role Labeling  
Jan 10, 2023

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contains material by Laura Oberländer



# Outline

- 1 Recap
- 2 Motivation
- 3 Resources and Methods
- 4 Evaluation
- 5 Tokens vs. Clauses
- 6 Assignment 4

# Recap and where we are

- Emotion theories  
Fundamental emotions, Valence-Arousal Dominance, Appraisal, Components, Regulation
- Corpus creation (incl. Assignment 1)  
Annotation, quality assessment, crowdsourcing, existing corpora
- Dictionaries  
Classification, applications, creation, existing lexicons
- Cognitive approaches  
OCC model, rules, appraisal annotation, emotinetKB
- Classification (incl. Assignment 2)  
Features, deep learning, weak labeling, transfer/multitask learning
- Intensity prediction  
task definition, intensifiers, intensity annotation, resources, models
- Assignment 3: Outlook/Literature Review
- **Stimulus Detection, Role labeling** (incl. Assignment 4)

# Take Away

- The tasks of [role labeling](#) and [stimulus detection](#)
- Annotated resources
- Computational modelling and evaluation
- Assignment 4

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# Motivation (1)

## Classification:

- Assign values to sentences or documents
- Which downstream questions can be answered with such model? Which applications are enabled?
- Retrieval:  
Find texts with particular emotions, find emotional texts
- Analysis: Analyze change of emotions over time, compare different parts of corpora (e.g., with different keywords)

## Motivation (2)

What cannot be done? Given a corpus, extract the information:

- which entities (persons, organizations) express or experience an emotion.

"I am angry at my husband because he did not bring food."

- which words point to a particular emotion, how emotions are communicated

"I am angry at my husband because he did not bring food."

- if the emotion is directed towards a particular target

"I am angry at my husband because he did not bring food."

- which event/object caused a particular emotion/feeling

"I am angry at my husband because he did not bring food."

# Motivation (3)

Why is that interesting?

- Are there **entities** that receive more **fear**, **anger** or **trust**?
- Are there **stimuli** that are predominantly **scary**?
- Are there differences in perception of the same thing by different **people**? (one person find something **enjoyable**, others **boring**)



# Aspect-based sentiment analysis

These tasks are related to aspect-based sentiment analysis.

Formulation 1:

- Given text and set of aspects, detect which aspect is described and which sentiment polarity it receives.
- “The food was good, but the waiter was unfriendly.  
food → positive; staff → negative.
- e.g., Ganu et al. (2009). “Beyond the Stars: Improving Rating Predictions using Review Text Content.” WebDB.

Formulation 2:

- Given text, detect phrases that describe an aspect.
- Classify these aspects into sentiment polarities.
- Optionally cluster aspect mentions.
- “The food<sup>+</sup> was good, but the waiter<sup>-</sup> was unfriendly.
- e.g., Kessler et al. 2010. The 2010 ICWSM JDP A Sentiment Corpus for the Automotive Domain. ICWSM-DWC

(task of opinion holder extraction is also established)



# Small annotation exercise

Please annotate the following sentences.

(1), decide on the emotion that is experienced

(2), label experiencer, target, cue, stimulus

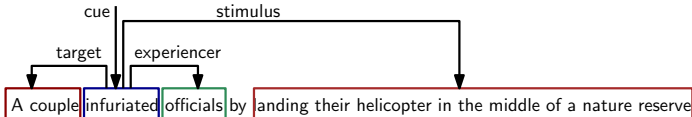
- David Beckham gets six-month driving ban for using phone at wheel
- Don McGahn fires back at Donald Trump
- A couple infuriated officials by landing their helicopter in the middle of a nature reserve.
- He was a professional musician now, still sensitive and happy doing something he loved.
- Holmes is happy having the freedom of the house when we are out.

# Small annotation exercise discussion

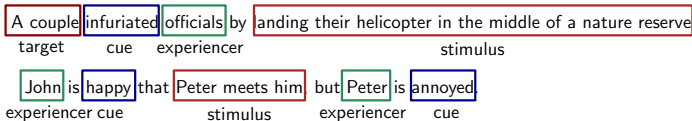
- David Beckham gets six-month driving ban for using phone at wheel
- Don McGahn fires back at Donald Trump
- A couple infuriated officials by landing their helicopter in the middle of a nature reserve.
- He was a professional musician now, still sensitive and happy doing something he loved.
- Holmes is happy having the freedom of the house when we are out.

# Task Definition: Relations, spans, or clauses?

- Relation detection:

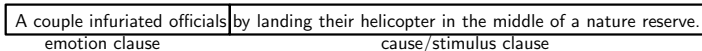


- Sequence labeling:



- trade-off between task complexity and accurateness

- Clause classification:



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# Corpora Update

		Emotion Annotation	Int.	Cue	Exp.	Cause	Target	Size	Source	
Emotion & Intensity Classification	Dataset	Emotion Annotation	Int.	Cue	Exp.	Cause	Target	Size	Source	
		ISEAR	Ekman + {shame, guilt}	x	x	x	x	x	7,665	Scherer et al. (1994)
		Tales	Ekman	x	x	x	x	x	15,302	Alm et al. (2005)
		AffectiveText	Ekman + {valence}	x	x	x	x	x	1,250	Strapparava et al. (2007)
		TEC	Ekman + {±surprise}	x	x	x	x	x	21,051	Mohammad et al. (2015)
		fb-valence-arousal	VA	x	x	x	x	x	2,895	Preoȃiuc-Pietro et al. (2016)
		EmoBank	VAD	x	x	x	x	x	10,548	Buechel and Hahn (2017a)
		DailyDialogs	Ekman	x	x	x	x	x	13,118	Li et al. (2017)
		Grounded-Emotions	Joy & Sadness	x	x	x	x	x	2,585	Liu et al. (2017)
		SSEC	Plutchik	x	x	x	x	x	4,868	Schuff et al. (2017)
		EmoInt	Ekman – {disgust, surprise}	✓	x	x	x	x	7,097	Mohammad et al. (2017)
		Multigenre	Plutchik	x	x	x	x	x	17,321	Tafreshi and Diab (2018)
		The Affect in Tweets	Others	✓	x	x	x	x	11,288	Mohammad (2018)
	Roles	EmoContext	Joy, Sadness, Anger & Others	x	x	x	x	x	30,159	Chatterjee et al. (2019)
MELD		Ekman + Neutral	x	x	x	x	x	13,000	Poria et al. (2019)	
enISEAR		Ekman + {shame, guilt}	x	x	x	x	x	1,001	Troiano et al. (2019)	
Blogs		Ekman + {mixed, noemo}	✓	✓	x	x	x	5,025	Aman et al. (2007)	
Emotion-Stimulus		Ekman + {shame}	x	x	x	✓	x	2,414	Ghazi et al. (2015)	
EmoCues		28 emo categories	x	✓	x	x	x	15,553	Liew et al. (2016)	
Electoral-Tweets		Plutchik	x	✓	✓	✓	✓	4,058	Mohammad et al. (2014)	
REMAN		Plutchik + {other}	x	✓	✓	✓	✓	1,720	Kim and Klinger (2018)	
<b>GoodNewsEveryone</b>		<b>extended Plutchik</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>	<b>5,000</b>	<b>Bostan et. al (2020)</b>	

Bostan/Kim/Klinger (2020): GoodNewsEveryone: A Corpus of News Headlines Annotated with Emotions, Semantic Roles, and Reader Perception. LREC

# Corpora to discuss

Models that are evaluated across multiple of these (English) corpora are scarce, therefore, I do not first introduce resources and then methods, but instead talk about each resource and provide an overview of methods that have been evaluated on each resource.

- Ghazi, D., Inkpen, D., and Szpakowicz, S. (2015). Detecting emotion stimuli in emotion-bearing sentences. CICLing  
[https://link.springer.com/chapter/10.1007/978-3-319-18117-2\\_12](https://link.springer.com/chapter/10.1007/978-3-319-18117-2_12)
- Mohammad, S., Zhu, X., and Martin, J. (2014). Semantic role labeling of emotions in tweets. WASSA  
<https://www.aclweb.org/anthology/W14-2607/>
- Kim, E. and Klinger, R. (2018). Who feels what and why? Annotation of a literature corpus with semantic roles of emotions. COLING  
<https://www.aclweb.org/anthology/C18-1114/>
- Bostan, L, Kim, E., and Klinger, R. (2020). GoodNewsEveryone: A Corpus of News Headlines Annotated with Emotions, Semantic Roles, and Reader Perception. LREC  
<https://www.aclweb.org/anthology/2020.lrec-1.194/>
- Gao, Q., Hu, J. Xu, J, Lin, G, He, Y., Lu, Q., and Wong, K.-F. 2017. Overview of NTCIR-13 ECA task. NTCIR  
<http://research.nii.ac.jp/ntcir/workshop/OnlineProceedings13/pdf/ntcir/01-NTCIR13-0V-ECA-GaoQ.pdf>



# Corpora

	Whole Instance		Stimulus	
Dataset	#	avg. len	#	avg. len
ES, Ghazi2015	2414	20.60	820	7.29
ET, Mohammad2014	4056	19.14	2427	6.25
GNE, Bostan2020	5000	13.00	4798	7.29
REMAN, Kim2018	1720	72.03	609	9.33
ECA, Gao2017	2558	62.24	2485	9.52

	Cue		Target		Exp.	
Dataset	#	avg. len	#	avg. len	#	avg. len
ET	2930	5.08	2824	1.71	29	1.76
GNE	4736	1.60	4474	4.86	3458	2.03
REMAN	1720	3.82	706	5.35	1050	2.04

Oberlaender et al. (2020), Experiencers, Stimuli, or Targets: Which Semantic Roles Enable Machine Learning to Infer the Emotions? PEOPLES

# Electoral Tweets

Mohammad, S., Zhu, X., and Martin, J. (2014). Semantic role labeling of emotions in tweets. WASSA

<https://www.aclweb.org/anthology/W14-2607/>

<http://saifmohammad.com/WebDocs/ElectoralTweetsData.zip>

- **Motivation:** Early model of semantic roles of emotions, defined carefully based on FrameNet
- **Domain/Data:** Tweets during the Obama/Biden election
- **Labels/Structure:** Experiencer (often the tweet author), target/stimulus (span+entity classes), cue
- **Annotation Procedure:** Crowdsourcing
- **Models:** Stimulus as classification of a closed set

# Electoral Tweets – Annotation Process

### Questionnaire 1: Emotions in the US election tweets

**Tweet:** Mitt Romney is arrogant as hell.

Q1. Which of the following best describes the emotions in this tweet?

- This tweet expresses or suggests an emotional attitude or response to something.
- This tweet expresses or suggests two or more contrasting emotional attitudes or responses.
- This tweet has no emotional content.
- There is some emotion here, but the tweet does not give enough context to determine which emotion it is.
- It is not possible to decide which of the above options is appropriate.

Q2. Is this tweet about US politics and elections?

- Yes, this tweet is about US politics and elections.
- No, this tweet has nothing to do with US politics or anybody involved in it.

### Questionnaire 2: Who is feeling what, and towards whom?

**Tweet:** Mitt Romney is arrogant as hell.

Q1. Who is feeling or who felt an emotion?

Q2. What emotion? Choose one of the options from below that best represents the emotion.

- anger or annoyance or hostility or fury
- anticipation or expectancy or interest
- disgust or dislike
- fear or apprehension or panic or terror
- joy or happiness or elation
- sadness or gloominess or grief or sorrow
- surprise
- trust or like

# Electoral Tweets – Data Set Statistics

Emotion	Percentage of tweets
anger	7.41
anticipation	5.01
disgust	<b>47.75</b>
fear	1.98
joy	6.58
sadness	0.83
surprise	6.37
trust	24.03
all	100.00

Whom	Percentage of tweets
Barack Obama and/or Joe Biden	<b>29.90</b>
Mitt Romney and/or Paul Ryan	24.87
Some other individual	5.03
Democratic party, democrats, or DNC	2.46
Republican party, republicans, or RNC	8.42
Some other institution	1.23
Election campaign or process	4.93
The target is not specified in the tweet	1.95
None of the above	21.17
all	100.00

	P	R	F
random baseline	16.45	20.87	18.39
majority baseline	34.45	38.00	36.14
automatic rule-based system	43.47	55.15	48.62
automatic SVM system	57.30	59.32	58.30
upper bound	82.87	81.36	82.11

# Electoral Tweets – Instance Examples

- I'm a #Republican, but if I have to hear my mom talk about #Romney one more time, I'm going to stab myself with my bayonet.
- So disgusted with both political parties. Both Obama and Mitt make me sick.
- Anyone that believes Romney's presidency will be much different than Obama's presidency is simply delusional..
- If your a republican you Fail at Life. #Democrats 2012 #Obama2012 #Forward X #Change

# Electoral Tweets – One Data Set Entry (Q2)

```

234318622      12/17/2012 064206      FALSE  774432561      BLANK
12/17/2012 063248      FALSE  amt    0.9048  14559725
USA      CA      Long Beach
Im tired of all of the barack obama and mitt romney commercials
Tweeter dislike
BLANK
BLANK
the emotion is being expressed with a low intensity
barack obama mitt romney
Im tired
commercials
About the election process, election publicity, or election campaign
BLANK
to point out hypocrisy, to disagree, to ridicule, to criticize, or to vent
BLANK  BLANK  BLANK  BLANK

```

# Emotion Stimulus (ES)

Ghazi, D., Inkpen, D., and Szpakowicz, S. (2015). Detecting emotion stimuli in emotion-bearing sentences. CILing  
[https://link.springer.com/chapter/10.1007/978-3-319-18117-2\\_12](https://link.springer.com/chapter/10.1007/978-3-319-18117-2_12)  
[http://www.site.uottawa.ca/~diana/resources/emotion\\_stimulus\\_data/](http://www.site.uottawa.ca/~diana/resources/emotion_stimulus_data/)

- **Motivation:** First English span-focused annotated corpus for stimuli, strongly motivated by FrameNet
- **Domain/Data:** Sentences from FrameNet annotations
- **Labels/Structure:**  
Stimuli as spans, emotions mapped to Ekman
- **Annotation Procedure:** With trained experts, data is mixture of sentences that include an emotion word and those marked with a FrameNet stimulus

# Emotion Stimulus – Examples

- **happy**: I suppose I am happy **being so ' tiny'** ; it means I am able to surprise people with what is generally seen as my confident and outgoing personality .
- **sad**: Anne was sad **at the death of the Misses Dolan** but too much was happening for her to dwell on it .
- **anger**: I was very very angry **to read Batty 's comments about Leeds** .



# Emotion Stimulus – One Data Set Entry

<happy>I must say I was not totally happy <cause>about her going on at Yeo Davis<\cause> , with me in the government . <\happy>

# Emotion Stimulus – Modelling

Linear Chain Conditional Random Field with following features:

- Verbs recognized with OpenNLP POS Tagger
- Nominal and verbal events with Evita
- Chunks which contain verbs
- Bag of words
- Clauses

# Emotion Stimulus – CRF Results

	Token Precision	Token Recall	Token F-measure	Span Precision	Span Recall	Span F-measure
Corpus-Based	0.7460	0.7017	0.7232	0.5658	0.5402	0.5527
Corpus-Based + Event	0.766	0.756	0.761	0.567	0.561	0.5644
Corpus-Based + Chunker	0.776	0.761	0.7688	0.564	0.556	0.5603
Corpus-Based + Clause	0.809	0.731	0.768	0.623	0.564	0.592
Corpus-Based + Event + Chunker + Clause	0.811	0.746	0.777	0.666	0.593	0.6280

# REMAN

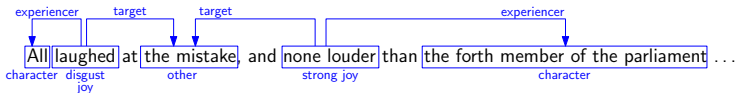
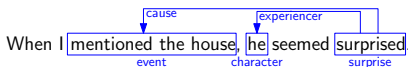
Kim, E. and Klinger, R. (2018). Who feels what and why? annotation of a literature corpus with semantic roles of emotions. COLING

<https://www.aclweb.org/anthology/C18-1114/>

<http://www.ims.uni-stuttgart.de/data/reman>

- **Motivation:** Role labeling in literature
- **Domain/Data:** Project Gutenberg, sentence triples, in which the middle sentence contains an emotion word
- **Labels/Structure:** relational structures of events, characters, emotions and their relation as experiencer and target
- **Annotation Procedure:** Expert-based with WebAnno

# REMAN – Examples



# REMAN – One Data Set Entry

```
<document author="Glasgow Ellen" author_death_year="1945" book_title="The Battle Ground" doc_id="6872"
  genre="Historical fiction" url="http://www.gutenberg.org/ebooks/6872">
  <text>In loving me, my darling?" "In loving you like that." "Nonsense.</text>
  <adjudicated>
  <spans>
    <span annotation_id="51002" annotatorId="B"
      cbegin="17" cend="24" type="character">darling</span>
    <span annotation_id="49637" annotatorId="A"
      cbegin="31" cend="37" type="joy">loving</span>
    <span annotation_id="49644" annotatorId="A"
      cbegin="31" cend="37" type="trust">loving</span>
    <span annotation_id="50015" annotatorId="B|A"
      cbegin="38" cend="41" type="character">you</span>
  </spans>
  <relations>
    <relation annotatorId="B" left="17" right="37" relation_id="51009" source_annotation_id="49637"
      target_annotation_id="51002" type="experiencer">darling[CHARACTER]...loving[JOY]</relation>
    <relation annotatorId="B|A" left="31" right="41" source_annotation_id="49637"
      target_annotation_id="50015" type="target">loving[JOY]...you[CHARACTER]</relation>
  </relations>
</adjudicated>
<other>
  <spans>
    <span altTo="49644" annotation_id="49581" annotatorId="C" cbegin="31" cend="37"
      type="other-emotion">loving</span>
  </spans>
  <relations />
</other>
</document>
```

# REMAN – Statistics

Relation	Total	Adjudicated	Emotion that triggered the relation									Entities involved			
			anger	anticip.	disgust	fear	joy	other	sadness	surprise	trust	char.	event	other	
experiencer	2113	1717 48%	137	164	130	173	309	210	216	171	207	1704			
cause	1261	840 24%	48	45	70	95	174	74	134	125	75	87	398	343	
target	1244	1017 28%	106	129	125	96	135	121	62	80	163	444	315	257	
overall relations	4618	3574 77%	291	338	325	364	618	405	412	376	445	2238	717	601	

# REMAN – Modelling

Sequence labeling after mapping relations to spans:

Category	Annotations	Exp	Model	Features	Strict			Fuzzy		
					P	R	F <sub>1</sub>	P	R	F <sub>1</sub>
Emotion	1925	1	Rule-based	dictionary	19	83	31			
		1	MLP	BOW	55	21	31			
		2	CRF	all + dictionary	56	6	11	56	6	11
		3	CRF	all + dictionary + experiencer	55	9	16	69	12	20
Experiencer	1717	2	biLSTM-CRF	embeddings	57	35	43	62	39	48
		2	CRF	all + person	50	2	4	50	2	4
		3	CRF	all + person + emotion	74	15	24	78	15	26
Target	1017	2	biLSTM-CRF	embeddings	49	21	30	49	21	30
		3	CRF	all + emotion	50	3	6	50	3	6

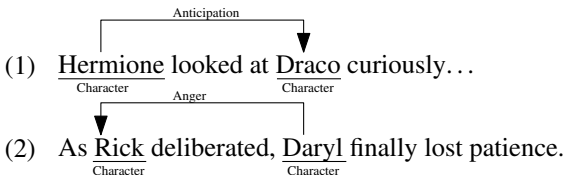
Table 4: Results in % for the baseline experiments. F<sub>1</sub> for *cause* with CRF and biLSTM-CRF and for *target* with biLSTM-CRF is zero and therefore not shown here. The column Exp refers to the experimental settings described in Section 6.1.



# Relations

- The corpus is annotated with relations, but the relations are not modelled at all.
- This is different in this fan-fiction corpus:  
Kim, E. and Klinger, R. (2019). Frowning Frodo, Wincing Leia, and a Seriously Great Friendship: Learning to Classify Emotional Relationships of Fictional Characters. NAACL  
<https://www.aclweb.org/anthology/N19-1067>
- Setting: Given two entities, decide which emotion is between them.

# Fan Fiction Relations



# GoodNewsEveryone (GNE)

Bostan, L., Kim, E., and Klinger, R. (2020). GoodNewsEveryone: A Corpus of News Headlines Annotated with Emotions, Semantic Roles, and Reader Perception. LREC

<https://www.aclweb.org/anthology/2020.lrec-1.194/>

<http://www.ims.uni-stuttgart.de/data/goodnewseveryone>

- **Motivation:** Develop large corpus via crowdsourcing
- **Domain/Data:**  
News headlines from a wide political spectrum
- **Labels/Structure:** Span-based experiencer, target, stimulus; emotions in text and of reader
- **Annotation Procedure:** Multistep crowdsourcing annotation

# Good News Everyone – Annotation

**Headline:** *A couple infuriated officials by landing their helicopter in the middle of a nature reserve.*

phase 1

**Emotion:** Anger, Anger, Disgust  
**Reader Perception:** Yes, No, Yes

phase 2

**Emotion:** Anger, Anger, Disgust  
**Intensity:** Medium, High, High  
**Other emotions:** None, None, None  
**Reader emotions:** Annoyance, Negative Surprise, No Emotion

**Experiencer:** A couple infuriated officials by landing their helicopter in the middle of a nature reserve.

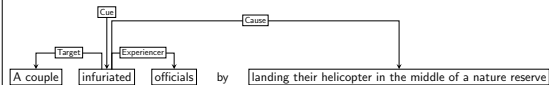
**Cue:** A couple infuriated officials by landing their helicopter in the middle of a nature reserve.

**Cause:** A couple infuriated officials by landing their helicopter in the middle of a nature reserve.

**Target:** A couple infuriated officials by landing their helicopter in the middle of a nature reserve.

aggregated

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

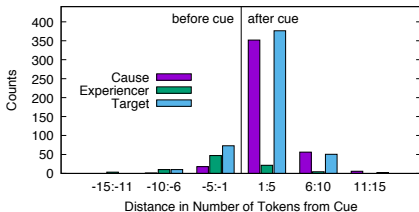


# Good News Everyone – Annotation

	Question	Type	Variable	Codes
Phase 1	1. Which emotion is most dominant in the given headline?	closed, single	Emotion	Emotions + None
	2. Do you think the headline would stir up an emotion in readers?	closed, single	Emotion	Yes, No
Phase 2	1. Which emotion is most dominant in the given headline?	closed, single	Emotion	Emotions
	2. How intensely is the emotion expressed?	closed, single	Intensity	Low, Med., High
	3. Which words helped you in identifying the emotion?	open	Cue	String
	4. Is the experiencer of the emotion mentioned?	close	Experiencer	Yes, No
	5. Who is the experiencer of the emotion?	open	Experiencer	String
	6. Who or what is the emotion directed at?	open	Target	String
	7. Select the words that explain what happened that caused the expressed emotion.	open	Cause	String
	8. Which other emotions are expressed in the given headline?	closed, multiple	Other Emotions	Emotions
	9. Which emotion(s) did you feel while reading this headline?	closed, multiple	Reader Emotions	Emotions

# Good News Everyone – Results

Role	Dominant Emotion															Anno.		
	Anger	Annoyance	Disgust	Fear	Guilt	Joy	Love	Pessimism	Neg. Surprise	Optimism	Pos. Surprise	Pride	Sadness	Shame	Trust	Total	Mean Tok.	Std. Dev Tok.
Experiencer	371	214	292	294	144	176	39	231	628	212	391	52	238	89	95	3466	1.96	1.00
Cue	454	342	371	410	175	256	62	315	873	307	569	60	383	117	120	4814	1.45	1.10
Cause	449	341	375	408	171	260	58	315	871	310	562	65	376	118	119	4798	7.21	3.81
Target	428	319	356	383	164	227	54	297	805	289	529	60	338	111	117	4477	4.67	3.56
Overall	1702	1216	1394	1495	654	919	213	1158	3177	1118	2051	237	1335	435	451	17555	3.94	3.64



# Good News Everyone – Examples

- Cops in One Village Have Been Convicted of 70 Crimes. Here's What They Had to Say About It
- DIY penis enlargements are a 'nationwide problem' in Papua New Guinea
- Dam breaking: New Epstein accuser comes forward

# Good News Everyone – Modelling

## Baseline Results with BiLSTM-CRF

Category	P	R	F <sub>1</sub>
Experiencer	0.44	0.53	0.48
Cue	0.39	0.35	0.37
Cause	0.19	0.11	0.14
Target	0.10	0.08	0.09



# Emotion Cause Analysis (ECA) and Emotion-Cause Pair Analysis

Gao, Q., Hu, J. Xu, J. Lin, G. He, Y. Lu, Q., and Wong, K.-F. 2017. Overview of NTCIR-13 ECA task. NTCIR  
<http://research.nii.ac.jp/ntcir/workshop/OnlineProceedings13/pdf/ntcir/01-NTCIR13-0V-ECA-GaoQ.pdf>  
Xia, Ding (2019) Emotion-Cause Pair Extraction: A New Task to Emotion Analysis in Texts. ACL  
<https://www.aclweb.org/anthology/P19-1096/>  
[https://github.com/NUSTM/ECPE/raw/master/data\\_combine/all\\_data\\_pair.txt](https://github.com/NUSTM/ECPE/raw/master/data_combine/all_data_pair.txt)

- **Motivation:**  
Stimulus (cause) detection as clause classification
- **Domain/Data:** Chinese Mandarin News
- **Labels/Structure:**  
Annotation of clauses for emotions and cause

# ECPE and ECA

## Document

Yesterday morning, a policeman visited the old man with the lost money, and told him that the thief was caught. The old man was very happy, and deposited the money in the bank.

### Emotion Cause Extraction (ECE)

happy → a policeman visited the old man with the lost money

happy → and told him that the thief was caught

### Emotion-Cause Pair Extraction (ECPE)

(The old man was very happy, a policeman visited the old man with the lost money)

(The old man was very happy, and told him that the thief was caught)

# ECPE – Instance Example

```
1,null,null,2002 年 6 月 3 日 上午
2,null,null,当值的 曾友蔚 接报
3,null,null,狮山镇 小塘 走马 营村 一 树林 里 有 一名 年仅 2 岁 多 的 小 男 孩 躺
4,null,null,无人认领
5,null,null,曾友蔚 立即 赶到 现场 处置
6,null,null,只见 林中的 草地 上
7,null,null,小 男 孩 被 包 在 一 条 毛 巾 里
8,null,null,很 孱 弱
9,null,null,不 哭 也 不 闹
10,null,null,小 眼 珠 子 静 静 地 望 着 眼 前 的 警 察 叔 叔
11,null,null,曾友蔚 打 开 包 裹 着 的 围 巾
12,sadness,心疼,小 男 孩 胸 口 蔫 瘦 得 让 人 心 疼
13,null,null,贴 身 处 有 一 张 写 着 出 生 年 月 的 纸 条 和 一 封 利 是
14,null,null,曾友蔚 意 识 到
15,null,null,这 可 能 是 个 因 病 被 弃 的 孩 子
4 12
(12,9), (12,10), (12,11)
```

# ECPE – Modelling

- Attracted a lot of attention
- Often two steps:
  - (1) detect emotion (clauses) and cause clauses separately
  - (2) pair emotion and cause
- Example for one approach which does end-to-end modelling:

Wei, Zhao, Mao. 2020. Effective Inter-Clause Modeling for End-to-End Emotion-Cause Pair Extraction. ACL.

- Also annotated English corpus, but did not publish results (see later today).

# Linguistically Informed Approaches

- All of the above focused on statistical modelling
- There are also valuable methods that focus on rules!
- Lee et al, 2010: A Text-driven Rule-based System for Emotion Cause Detection.  
<https://www.aclweb.org/anthology/W10-0206.pdf>
- Lee et al, 2010: Emotion Cause Events: Corpus Construction and Analysis [http://www.lrec-conf.org/proceedings/lrec2010/pdf/322\\_Paper.pdf](http://www.lrec-conf.org/proceedings/lrec2010/pdf/322_Paper.pdf)



## Evaluation of Spans (2)

What makes a true positive?

- As in NER, one option are exact matches (1 TP):



- In tasks with longer spans (quotation detection, subjective language detection), partial matches could additionally be evaluated (2 TP, not 3!):



- An alternative could be to only accept left-exact or right-exact matches to learn more about the task structure:



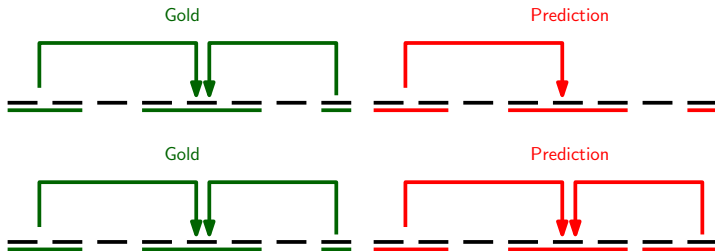
# Evaluation of Spans (3)

- **What about IOB-classification decisions?**
  - Not too helpful. What is the difference between I and B?
- **Ok, what about mapping I/B (IO classification decisions)**
  - Technically ok, but I find that hard to interpret/to learn something from such numbers.
  - A TP in this task is not a token, it is a span.
  - Longer spans should have more impact on the result than shorter ones.
- **Any other alternatives?**
  - Yes, that is an active research area.  
(see e.g. <http://ceur-ws.org/Vol-2276/paper2.pdf>)



# Evaluation of Graphs

How many TP for spans? How many for relations?



⇒ Error propagation during evaluation.

# Evaluation of Graphs



- Error propagation during evaluation.
- Not a big deal when relation classifier is independent of span detector (evaluate span prediction, evaluate relation detection on gold spans, evaluate relation detection with predicted spans)
- Challenging in end-to-end models
- Common: Evaluate span prediction and relation detection separately, accept relation also when span is not correctly found
- See some discussion in Kim et al 2009: Overview of BioNLP'09 Shared Task on Event Extraction

(<https://www.aclweb.org/anthology/W09-1401.pdf>)

# Evaluation of Classification Decisions

- Easy, we can check for TP, FP (and FN), and calculate precision, recall, and  $F_1$ .

# Outline

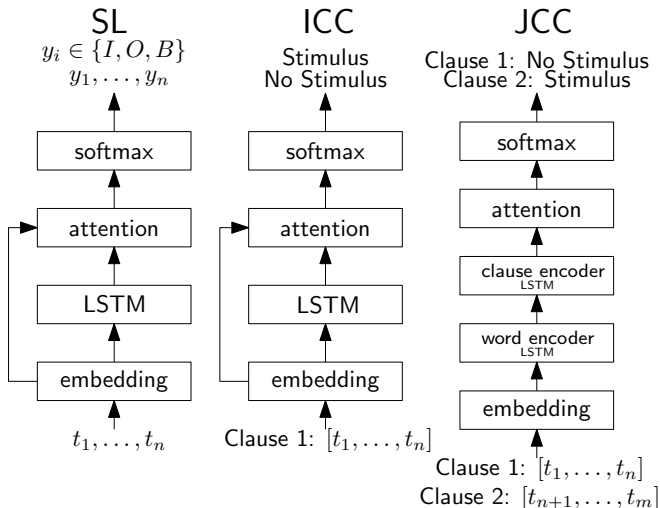
- 1 Recap
- 2 Motivation
- 3 Resources and Methods
- 4 Evaluation
- 5 Tokens vs. Clauses**
- 6 Assignment 4







# Stimulus Detection





# Mapping between Task Formulations

## Token Sequence Labeling → Clause Classification

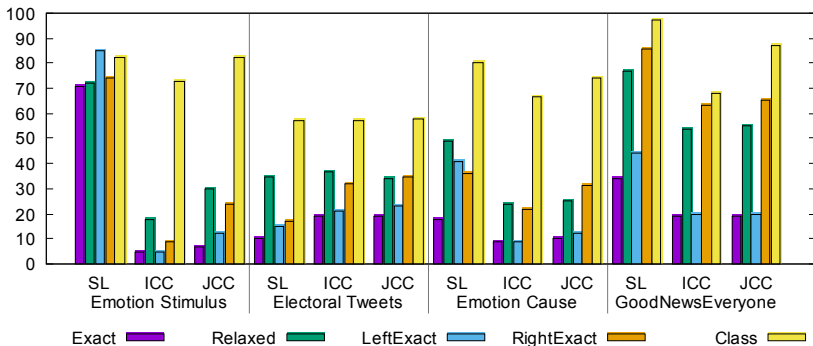
- 1 Extract clauses
- 2 Project the token annotations

0	0	0	0	0	0	0	B	I	I
[	People	do	a	happy	dance]	[	to	celebrate	Biden 's win]
			No	Stim.			Stim.		

## Clause Classification → Token Sequence Labeling

No Stimulus	Stimulus
[ People do a happy dance ]	[ to celebrate Biden's win ]
all 0	BII...

# Which of the modeling approaches performs best on English data?



# Assignment 4

In Assignment 4 (hands on roles and stimuli) you can choose between two tasks:

## Corpus Creation

- Similar to assignment 1: choose a domain of your choice
- Develop annotation procedure, choose annotation environment
- Annotate with two (or more) annotators, and evaluate annotation quality and discuss

⇒ Details in the assignment paper

## Stimulus Detection

- Similar to assignment 2: Use one of the corpora that we discussed today
- Access corpora on Ilias (or via <http://www.ims.uni-stuttgart.de/data/emotion-classification-roles>, future work)
- Implement one simple and one advanced method and compare results.

# Take Away

- The tasks of **role labeling** and **stimulus detection**
- Annotated resources
- Computational modelling and evaluation
- Assignment 4