DIALOGUE MODEL AND RESPONSE GENERATION FOR EMOTION IMPROVEMENT ELICITATION

Nurul Lubis[1,2], Sakriani Sakti[1, 3], Koichiro Yoshino[1, 3, 4], Satoshi Nakamura[1, 3]

[1] NAIST, Japan, [2] HHU Düsseldorf, Germany, [3] RIKEN, AIP, Japan, [4] PRESTO, JST, Japan

1. OVERVIEW

Chat-based dialogue system has huge potential in affect-sensitive tasks

Goal: User emotional improvement

Task: Response generation in end-to-end dialogue systems

- Processing negative emotion through human-computer interaction

Problem: existing approaches only focus on short-term emotion elicitation

- Only considers next dialogue turn
- No awareness of emotional processes

Example:

System	Hey, what's up?
User	I just got a horrible news. ☹
Resp. 1	"Want to tell me more about it?"
Resp. 2	"Don't worry, it will be fine!"

Which response is better long-term for emotion improvement?

Our contributions:

1. **Dialogue corpus** highlighting negative emotion processing
2. **Dialogue model** of emotion processing
3. Response generator **combining short- and long-term** emotion improvement elicitation

GENERATION EXAMPLES

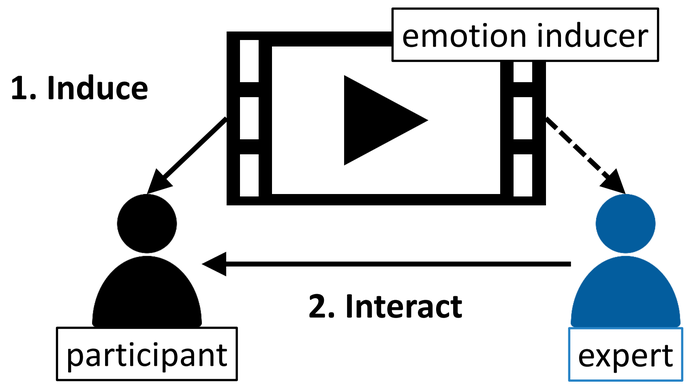
In dialogue

C	...or whether it's his impression that he has to work that long.
P	mm that's true.
C	but somehow I guess I'm sure the society probably has what the company has created that impression.
P	yes yes.
Base.	it's quite interesting to understand that.
Prop.	yes. Do you think there's something that you can do about it?

Different action labels

OP	Small talk	oh thank you. so are you having a good week?
UND	Emo.	it's kind of sad.
	Eve.	yes it's quite a heavy video.
	Exp.	so you feel like it's so important to you.
RES	Brains trm.	do you think that's something that you can do about it?
	Dist.	so you just came here two weeks ago?
	PAS	it's definitely a way to understand.
CLS	Good bye	anyway thank you for telling me about your opinions.

2. CORPUS CONSTRUCTION



A multimodal database that shows

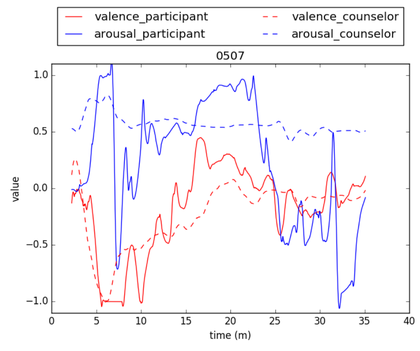
- **Everyday** negative emotion in dialogue
- How an **expert responds** to negative emo.

Emotion annotation

- Valence and Arousal
- Gtrace [Cowie+, 2000]

Speech transcription

- Paid commercial ASR
- Corrected by profess. transcribers

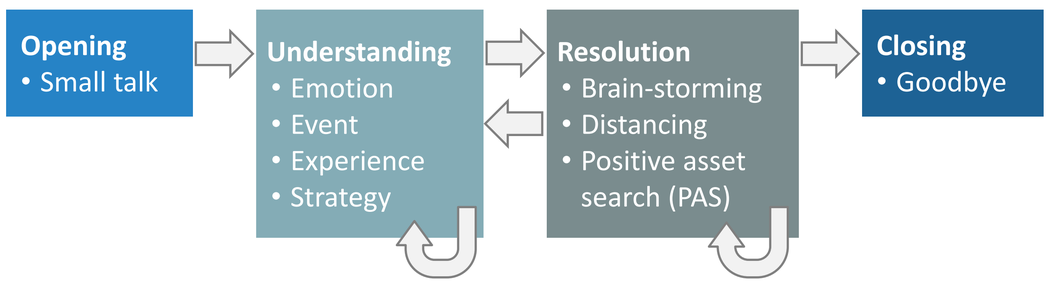


1 expert, **30** participants, **60** dialogues,
20 emotion inducers, **23:41** hours

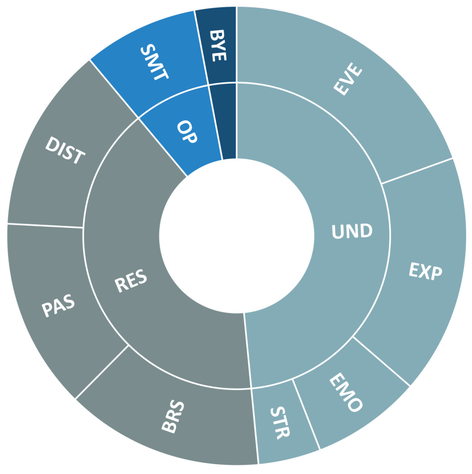
3. DIALOGUE MODELING AND RESPONSE GENERATION

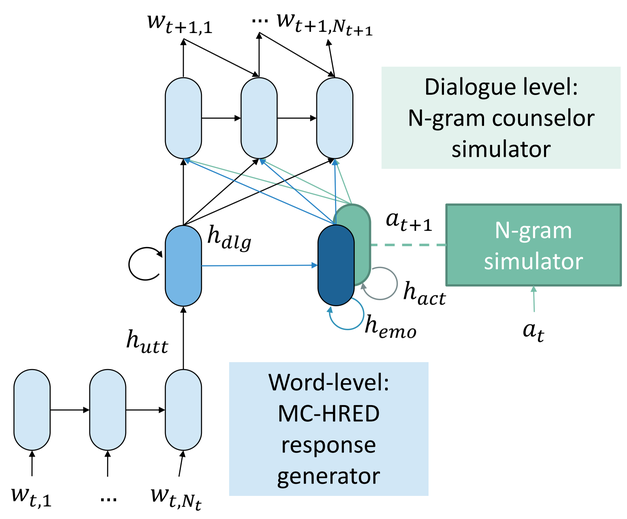
Dialogue model of emotion processing

- Human assessment of dialogue data based on literature on counseling skills and techniques
- Guided by counselor's questions and assessment in dialogue
- Counselor's turns are manually annotated with phase-action labels



Corpus composition





Response generation for emotion processing

- Applying the dialogue model on response generation
- Considers short- and long-term emotion improvement
- **Dialogue level** (long-term)
  - N-gram simulator; N=1, 2, 3
  - Trained on counselor dialogue act
- **Utterance level** (short-term)
  - Pre-training: HRED using SubTle corpus
  - Selective fine-tuning: MC-HRED with counseling data, utt. and dlg. encoders are fixed
  - Testing: MC-HRED using action from N-gram

4. EVALUATION

Objective: Perplexity on test set
Subjective: Human evaluation

- Likert scale 1 to 5 (higher is better)
  - The response **is natural**
  - The response **elicits a positive emotional impact**
- 100 dialogue with 4 turns as context
  - Longer context for better understanding
- 20 human judgements for each

Baseline: Emo-HRED (without dlg. model)
Proposed: MC-HRED using N-gram sim.

Model	Simulator	Ppx.	Nat.	Emo.
Baseline Emo-HRED	n/a	42,60	3,56	3,26
Proposed Hybrid MC-HRED	unigram	49,74	n/a	
	bigram	49,62		
	trigram	49,78	3,77	3,51

The proposed model...

- Has **slightly higher perplexity**
  - No significant perplexity difference across sims.
- Is more natural and emotionally positive
- Elicits **diff. phases** of emotion processing

5. CONCLUSION AND FUTURE WORKS

- Emotion processing in dialogue follows a certain **underlying structure**
- Enforcing structure of emotion processing in response generation **improves human subjective perception** of the system
- Model is able to simulate different phases of emotion processing at appropriate times

Future works

- Comparison with different combination approaches
- WoZ study to investigate differences between HCI and human interactions
- Real user interaction for evaluation