

Empathetic Response Generation for Distress Support

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EPFL



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affects 29% of people
in their lifetime



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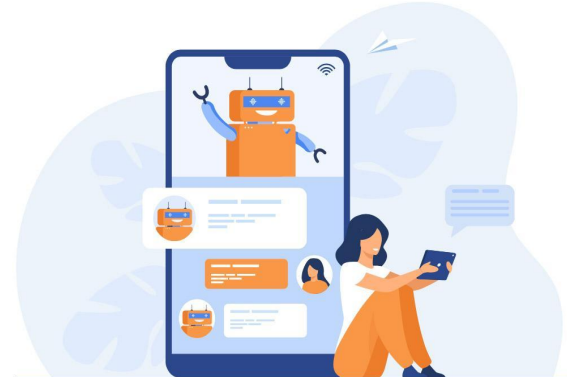
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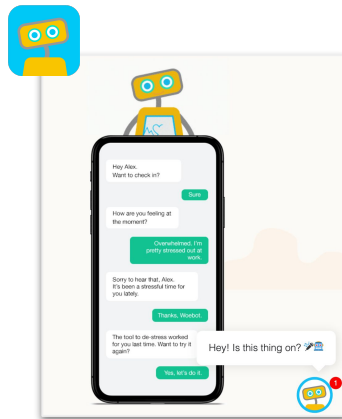
“About 1 billion people globally are affected by mental disorders; a scalable solution such as an AI therapist could be a huge boon.”

- Mary Czerwinski (Microsoft, 2021)

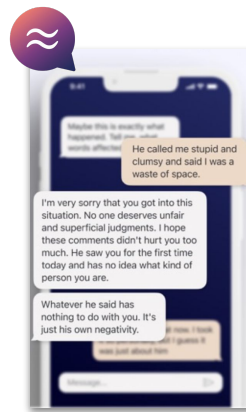
EPFL Existing Work



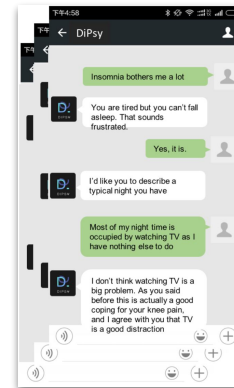
Wysa
(www.wysa.io)



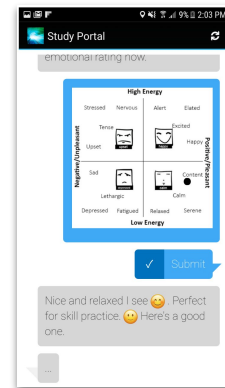
Woebot
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Elomia
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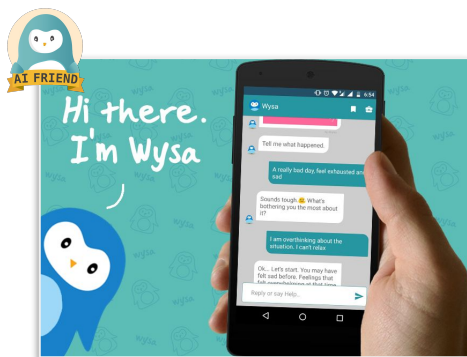


DiPsy
([Xing Xie, 2017](#))

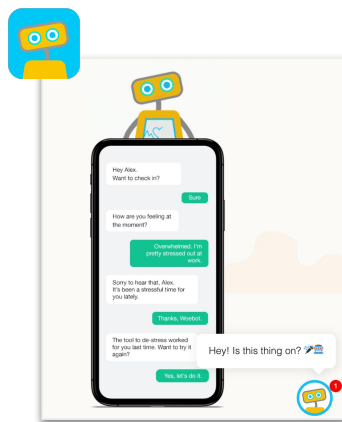


EMMA
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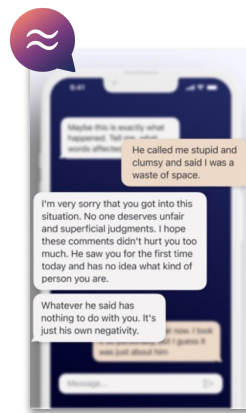
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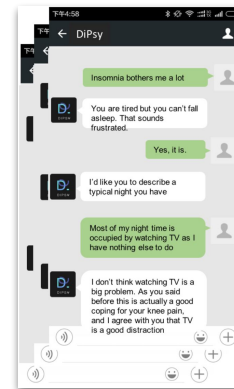
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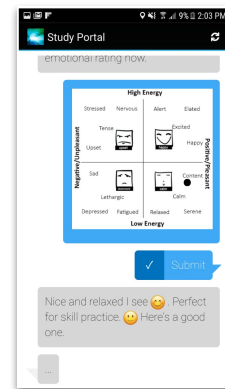
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- Deep neural networks work very effectively in the development of open-domain conversational agents or chatbots (Sutskever et al., 2014; Vinyals and Le, 2015; Wen et al., 2015)

EPFL Limitations

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 - **Not publicly accessible due to privacy and ethical reasons**
 - **Publicly available emotional dialogue datasets:** **EmotionLines** (Hsu et al., 2018); **EmoContext** (Chatterjee et al., 2019); **EmpatheticDialogues** (Rashkin et al., 2018); **ES-Conv** (Liu et al., 2021)
 - **Include only a limited amount of dialogues dealing with distress**

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- **Research and Insights** — Identify patterns, and gain insights into the conversational dynamics of distress

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- **Benchmarking and Comparison**

EPFL Empathy — A Multifaceted Construct

- Two broad aspects of empathy:
Emotion and *Cognition*

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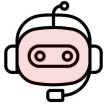
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I'm so sorry to hear that.

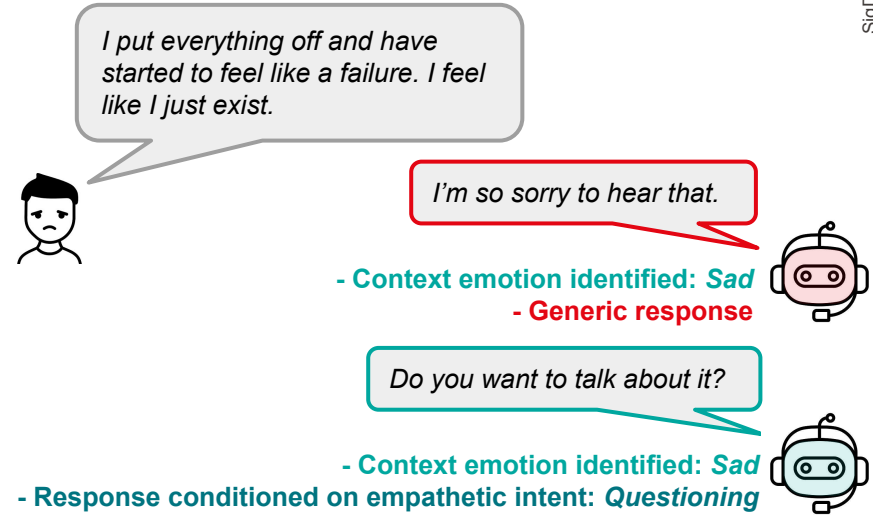
- Context emotion identified: **Sad**
- **Generic response**



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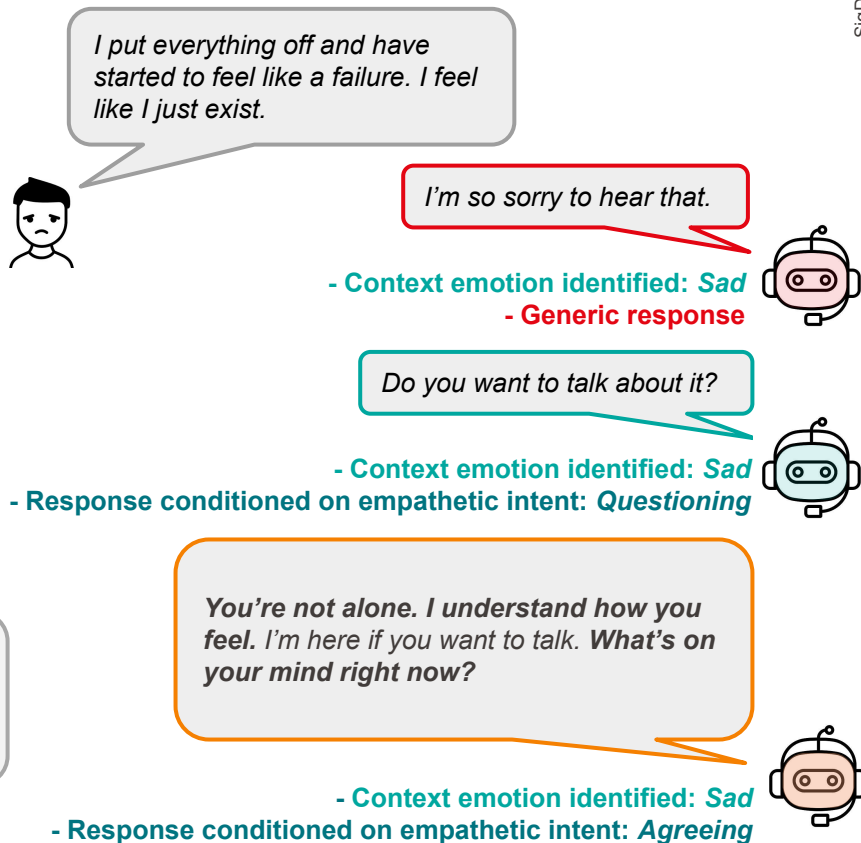


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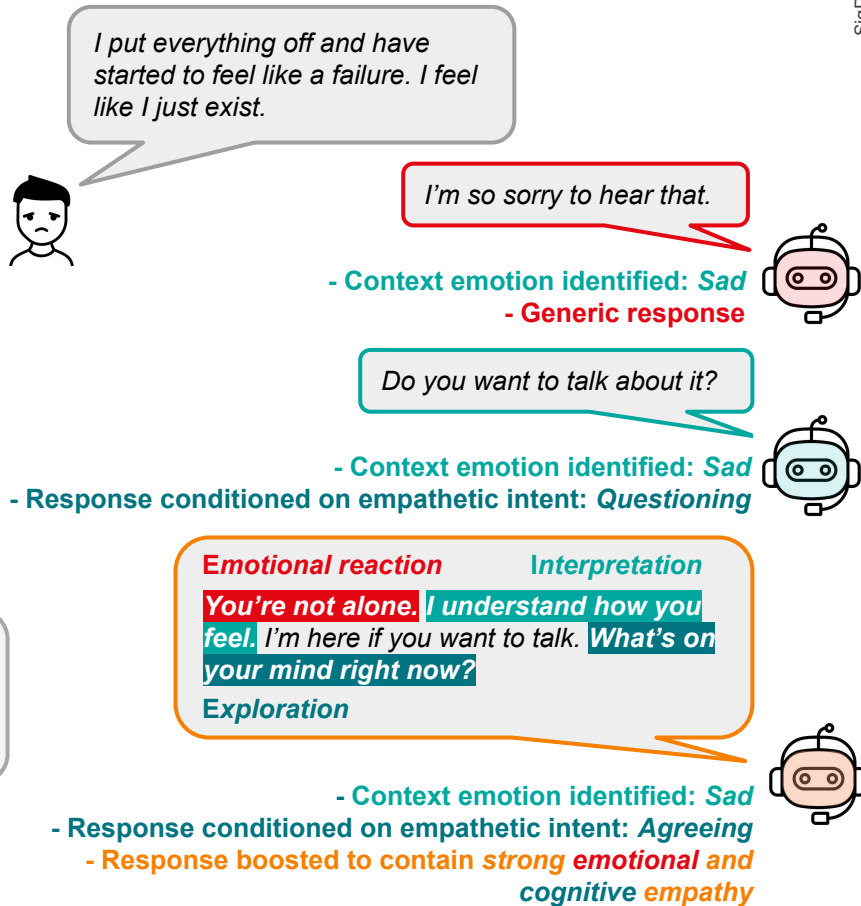
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EPFL Reddit Emotional Distress (RED) Dataset

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Subreddits: *depression*; *depressed*; *Off My Chest*; *SuicideWatch*; *Depression Help*; *sad*; *Anxiety Help*; and *Mental Health Support*



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Web Scraping

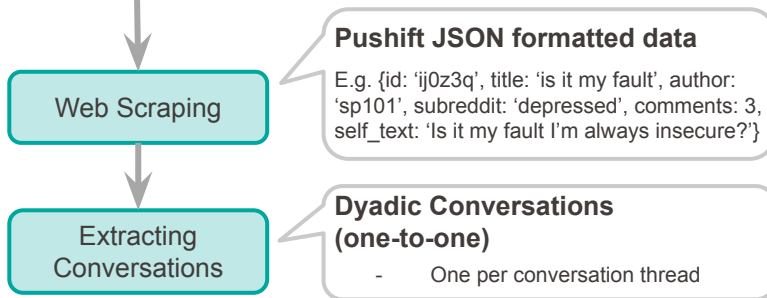
Pushift JSON formatted data

E.g. `{id: 'ij0z3q', title: 'is it my fault', author: 'sp101', subreddit: 'depressed', comments: 3, self_text: 'Is it my fault I'm always insecure?'}`

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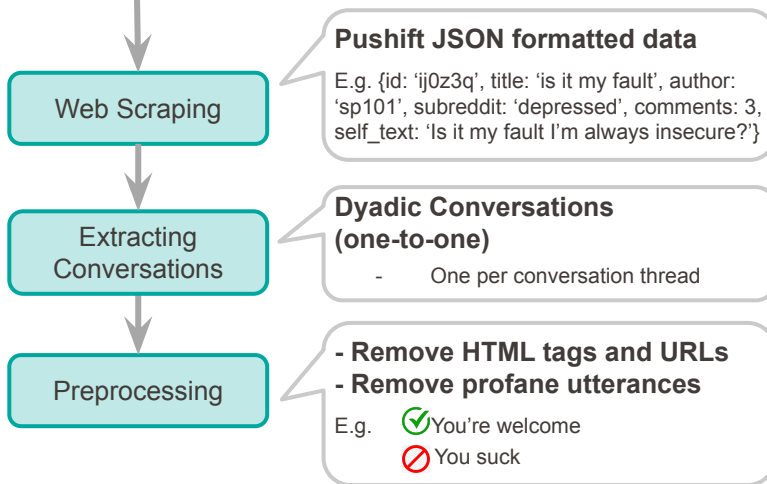


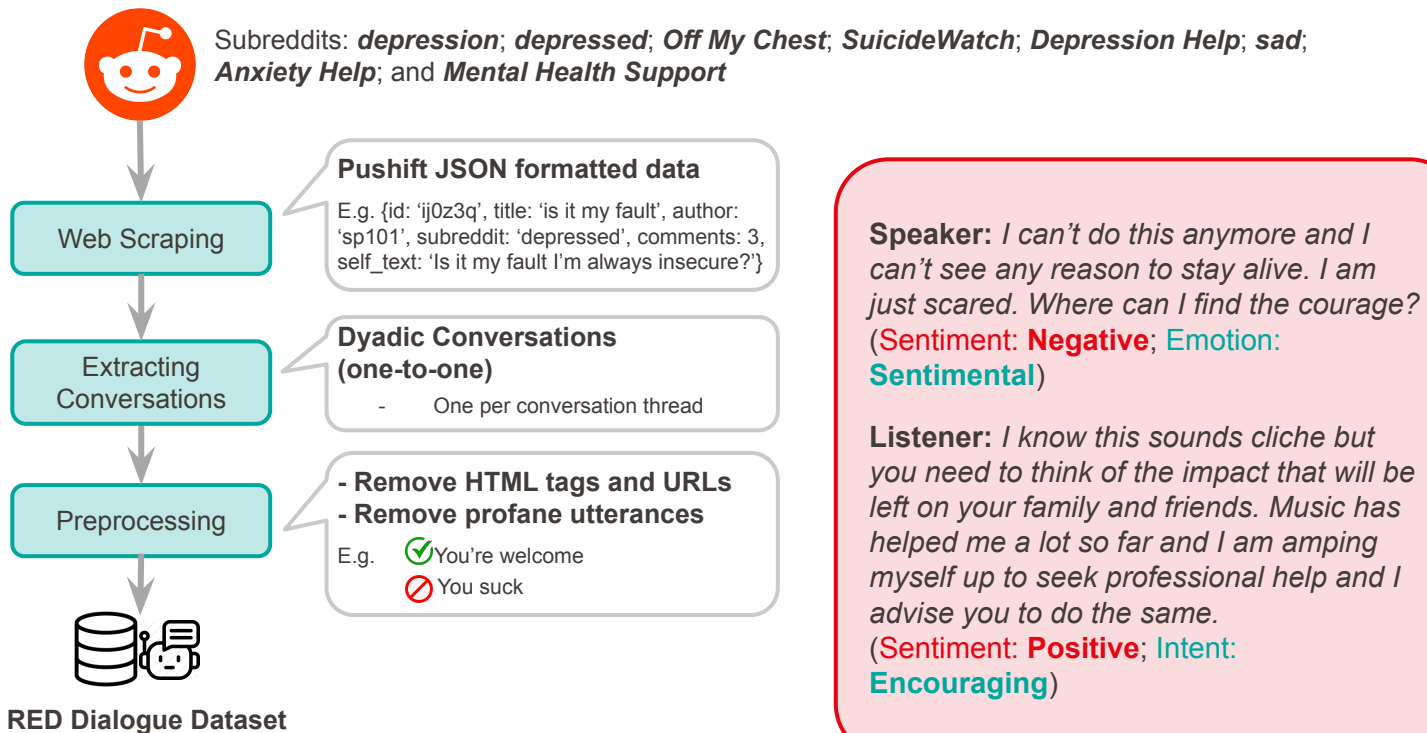
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Subreddit	# Dialogues	# Turns	# Tokens	Avg. # turns per dialog	Avg. # tokens per dialogue	Avg. # tokens per turn
r/depression	510,035	1,396,044	106,967,833	2.74	209.73	76.62
r/depressed	10,892	23,804	1,940,000	2.19	178.11	81.50
r/offmychest	437,737	1,064,467	109,459,738	2.43	250.06	102.83
r/sad	18,827	42,293	3,088,562	2.25	164.05	73.03
r/SuicideWatch	262,469	791,737	59,267,000	3.02	225.81	74.86
r/depression_help	23,678	51,849	5,412,390	2.19	228.58	104.39
r/Anxietyhelp	8,297	18,351	1,428,287	2.21	172.14	77.83
r/MentalHealth Support	3,551	7,931	772,952	2.23	217.67	97.46
All	1,275,486	3,396,476	88,336,762	2.66	226.06	84.89

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EPFL Topic Coverage

Murtagh, F. and Legendre, P. (2014). [Ward's hierarchical agglomerative clustering method: which algorithms implement ward's criterion?](#) *Journal of classification*.

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- **Clustering: Agglomerative clustering**
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4,363 clearly identifiable topic clusters

Topics	Keywords Extracted
Suicidal Ideation	<i>commit, killing, death, painless, option</i>
Anxiety Attacks	<i>anxiety, anxious, attacks, social, attack</i>
Weight Gain	<i>eating, weight, eat, lose, fat</i>
Loneliness	<i>lonely, surround, connect, isolated, social</i>
Failing College	<i>study, college, class, semester, failing</i>
Alcoholic	<i>drinking, drink, alcohol, drunk, sober</i>
US Election	<i>trump, president, donald, election, war</i>
Covid-19	<i>covid, 19, pandemic, shambolic, brought</i>

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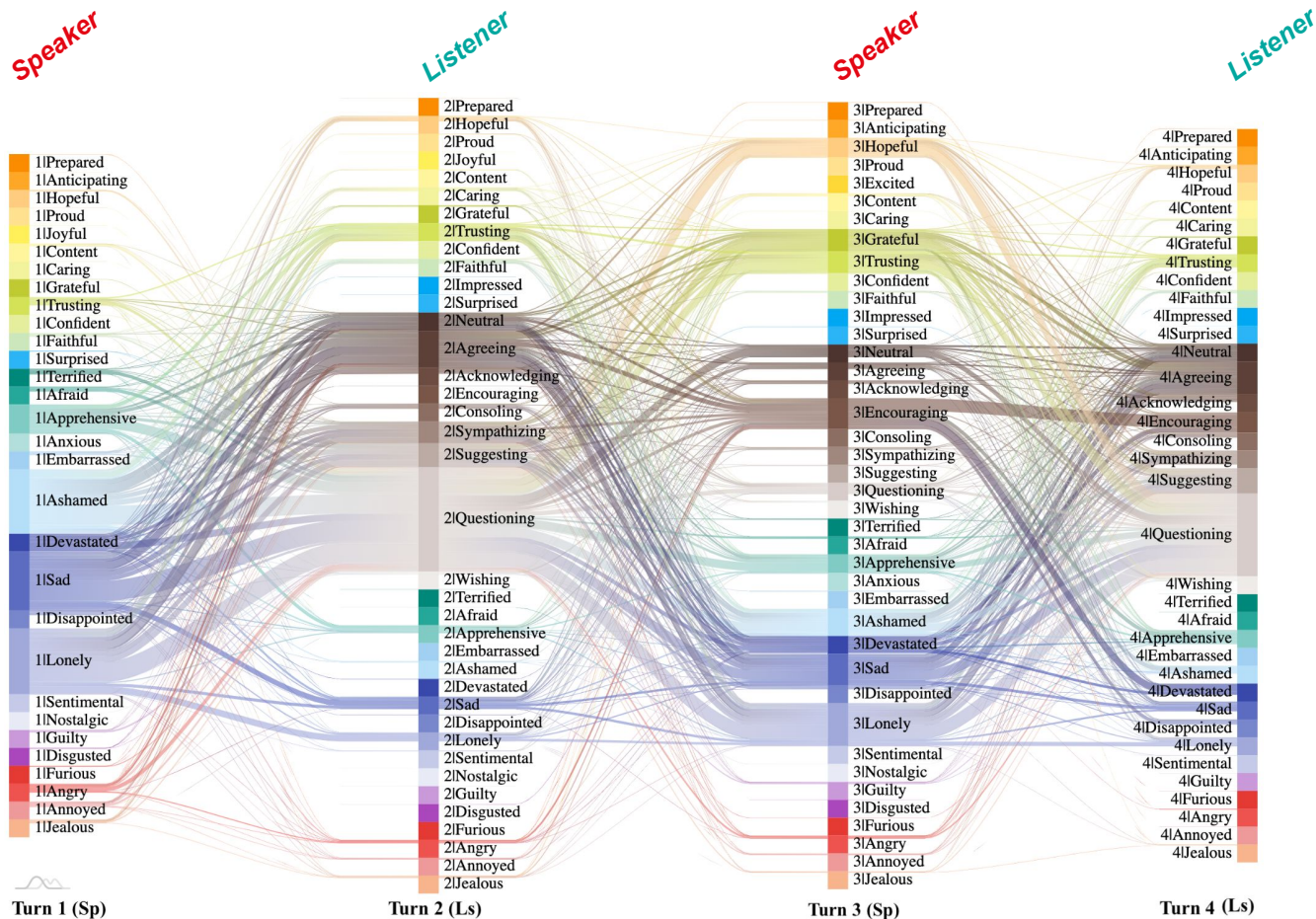
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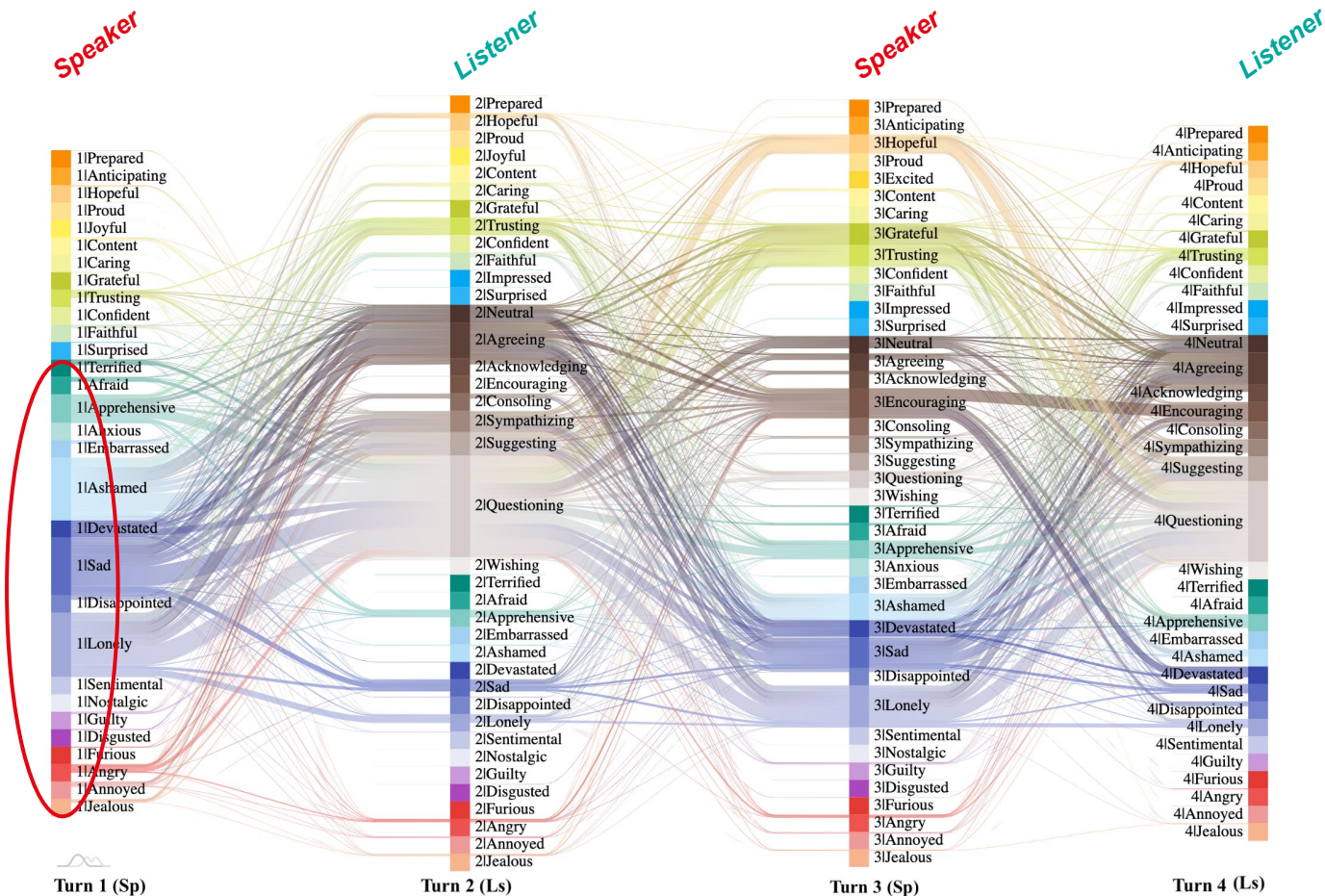
Frequent emotion-intent flow patterns

Empathetic Response Generation for Distress Support



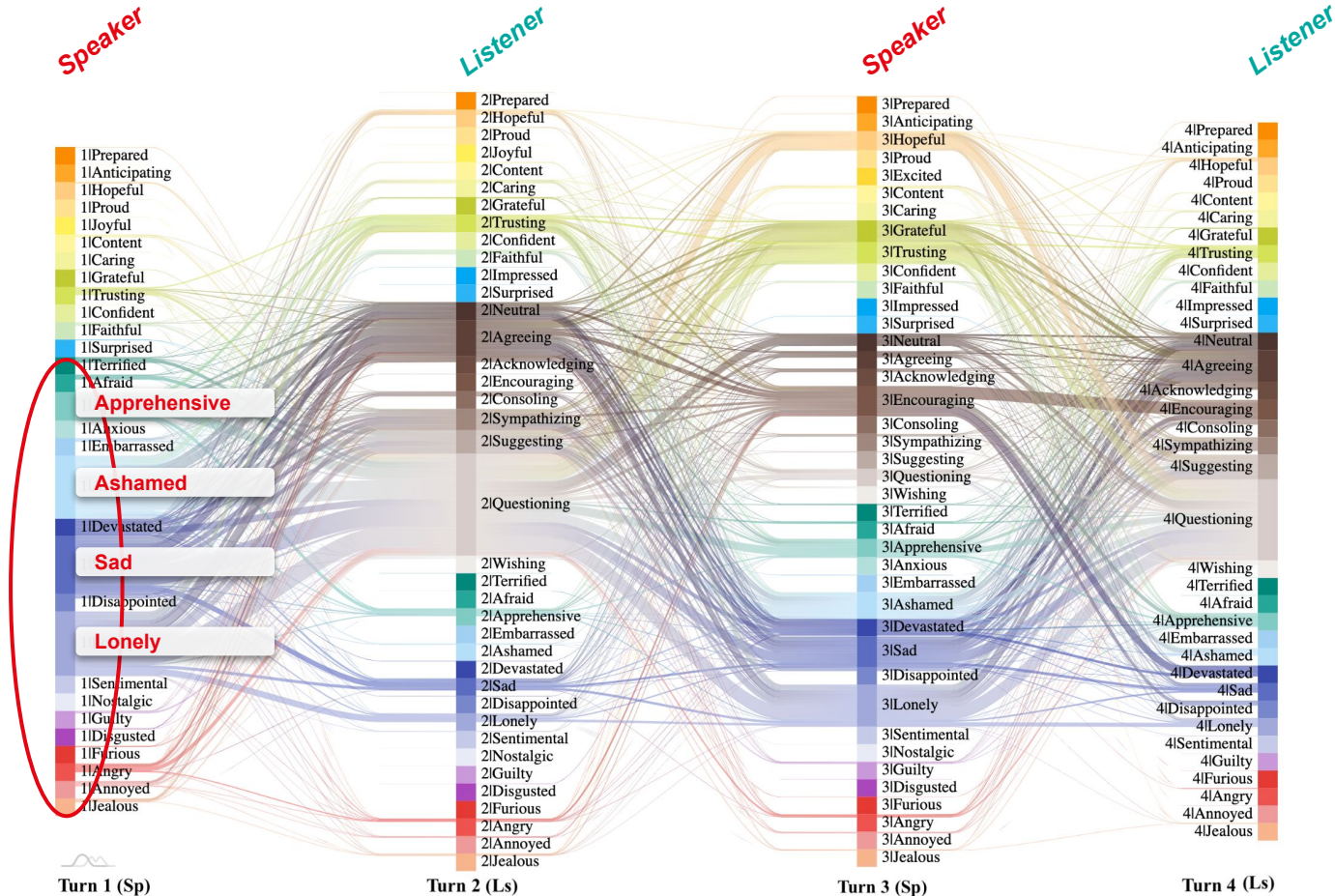
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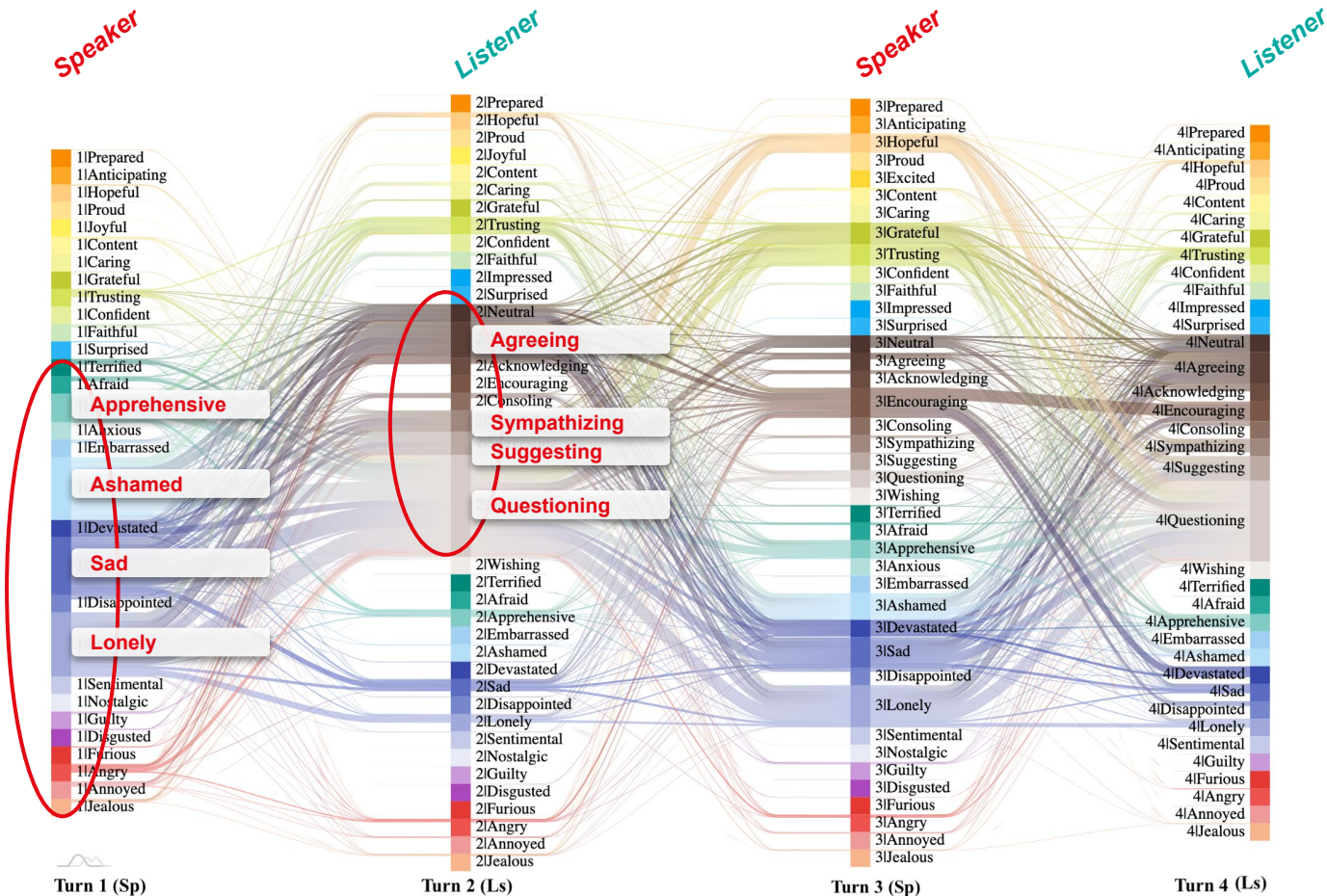
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Turn 1 (Sp)

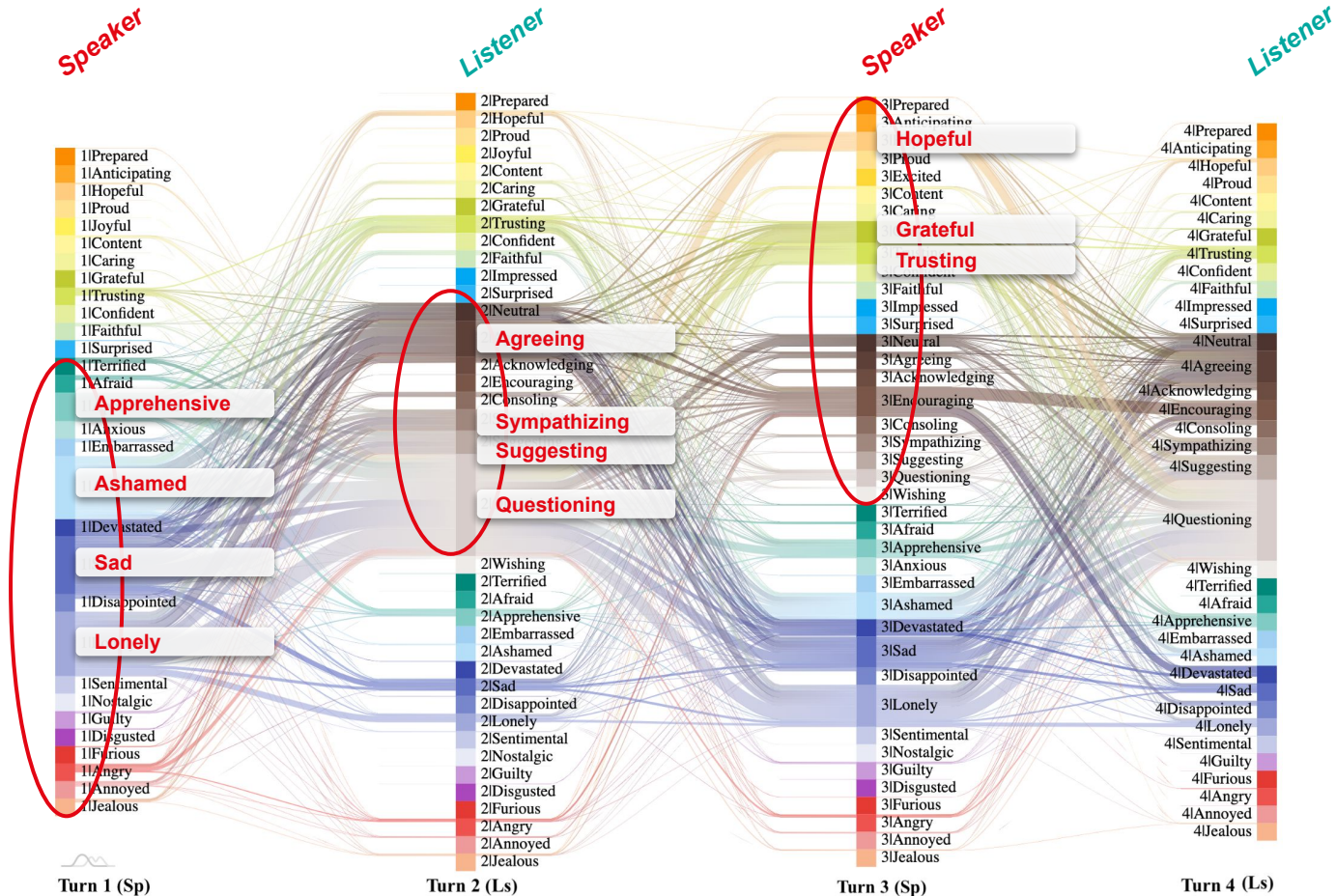
Turn 2 (Ls)

Turn 3 (Sp)

Turn 4 (Ls)

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Conversational Baselines



Speaker (U_1): *I think about suicide often. But I don't want to kill myself. Is this something I should be concerned about?*

Listener (U_2): *That's a hard question. Plan to live. Plan to survive. Plan to be strong. Best wishes, friend.*

Speaker (U_3): *Thank you, that was helpful to me.*

Listener (ground-truth): *That's kind of you to say. I'm glad to hear it. You don't know it, but the world needs you.*

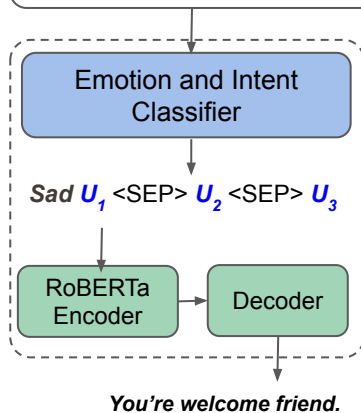


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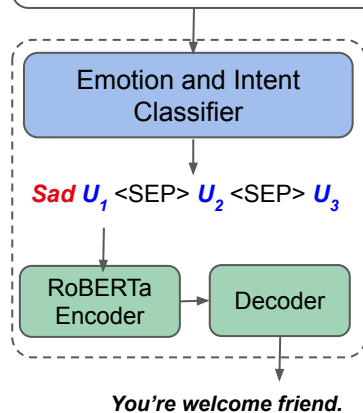


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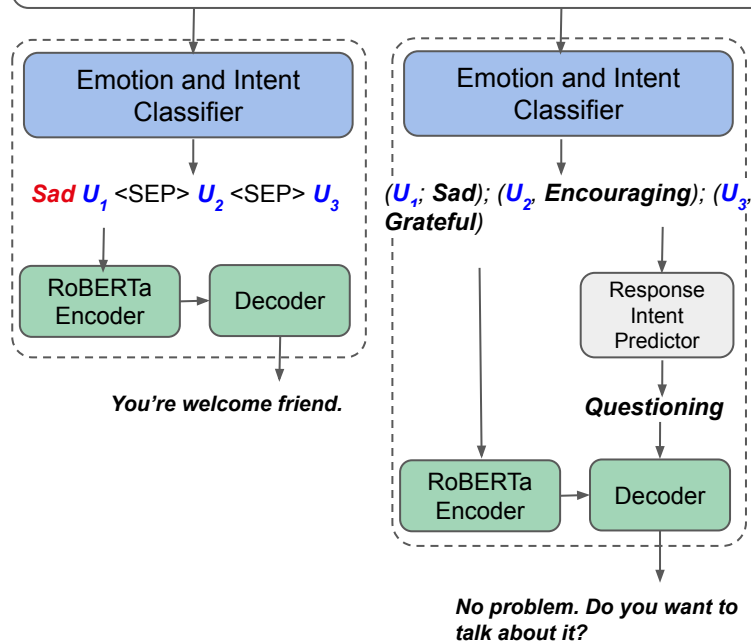


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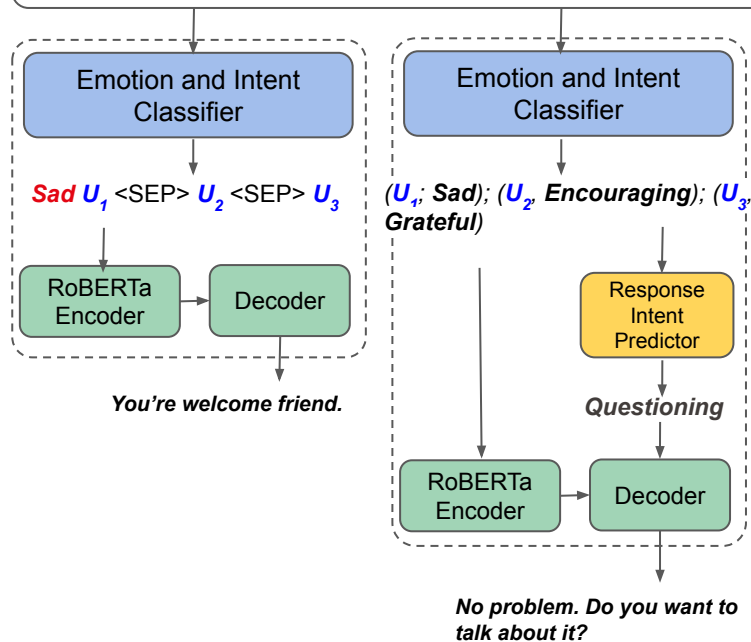


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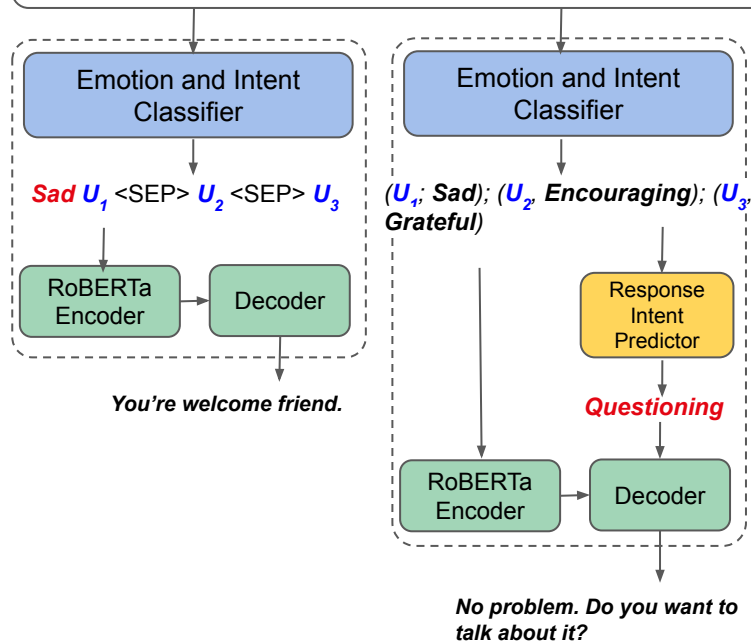


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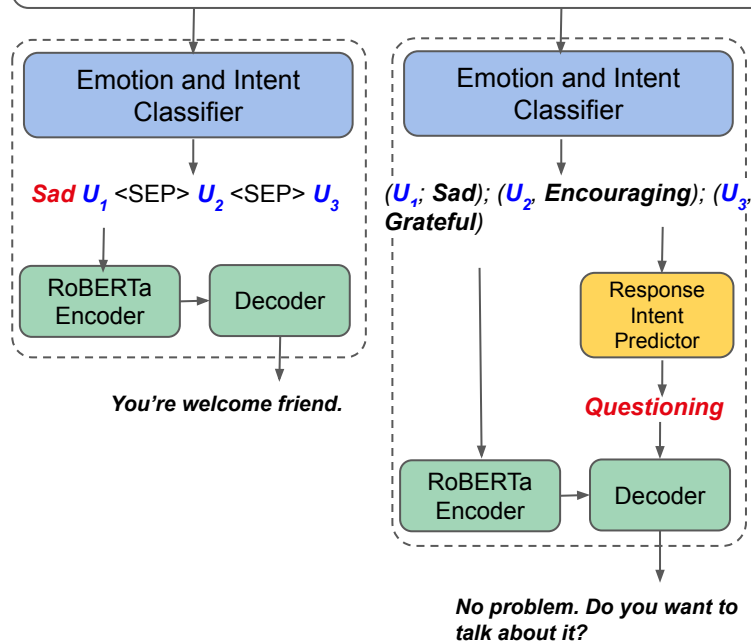


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EPITOME (Sharma et al., 2020)

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 - E.g.
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 - *I really hope things would improve.* **Strong communication — 2**

Cognitive Empathy

Interpretations

- Communicating an understanding of the inferred feelings and experiences
 - E.g.
 - *I realize how you feel.* **Weak communication — 1**
 - *If that happened to me, I would feel really isolated.* **Strong communication — 2**

Explorations

- Improving understanding of the distressed person by exploring the feelings and experiences not explicitly stated
 - E.g.
 - *Everything'll be fine.* **Weak communication — 1**
 - *I really hope things would improve.* **Strong communication — 2**

Conversational Baselines

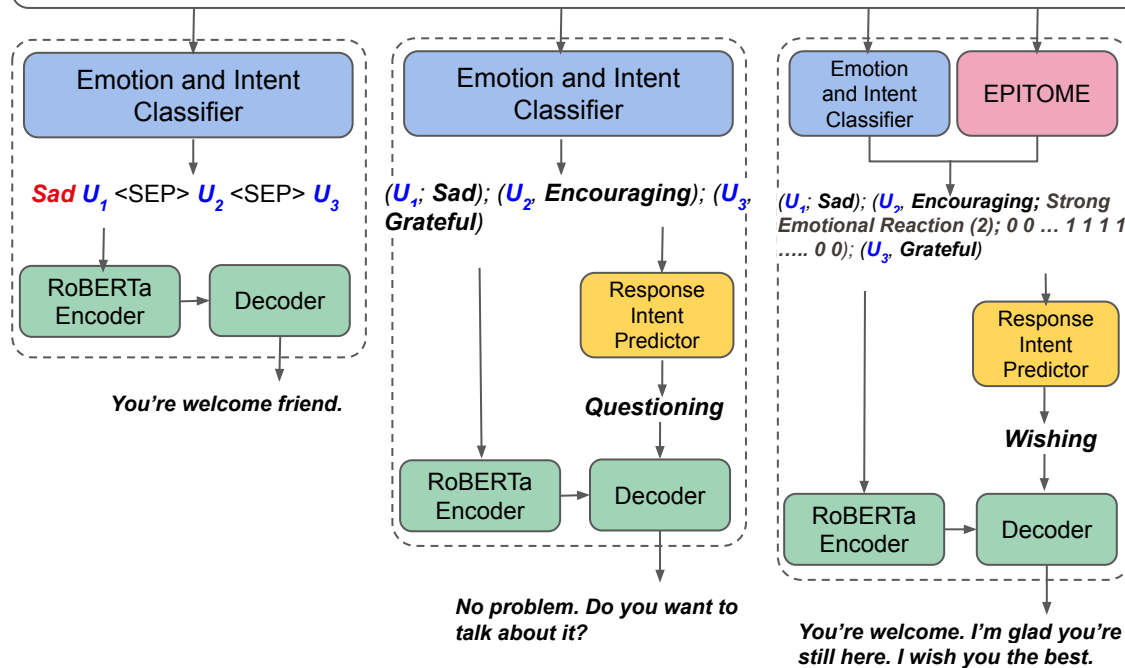


Speaker (U_1): *I think about suicide often. But I don't want to kill myself. Is this something I should be concerned about?*

Listener (U_2): *That's a hard question. Plan to live. Plan to survive. Plan to be strong. Best wishes, friend.*

Speaker (U_3): *Thank you, that was helpful to me.*

Listener (ground-truth): *That's kind of you to say. I'm glad to hear it. You don't know it, but the world needs you.*



(a) EmoPrepend

(b) MEED

(c) EPIMEED

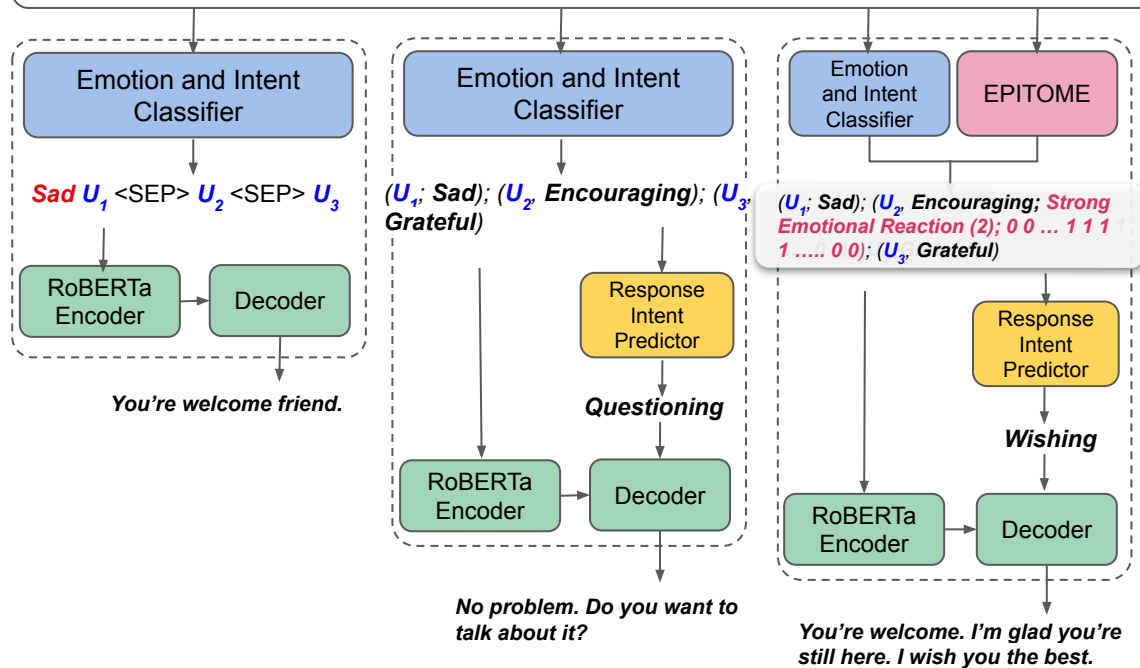


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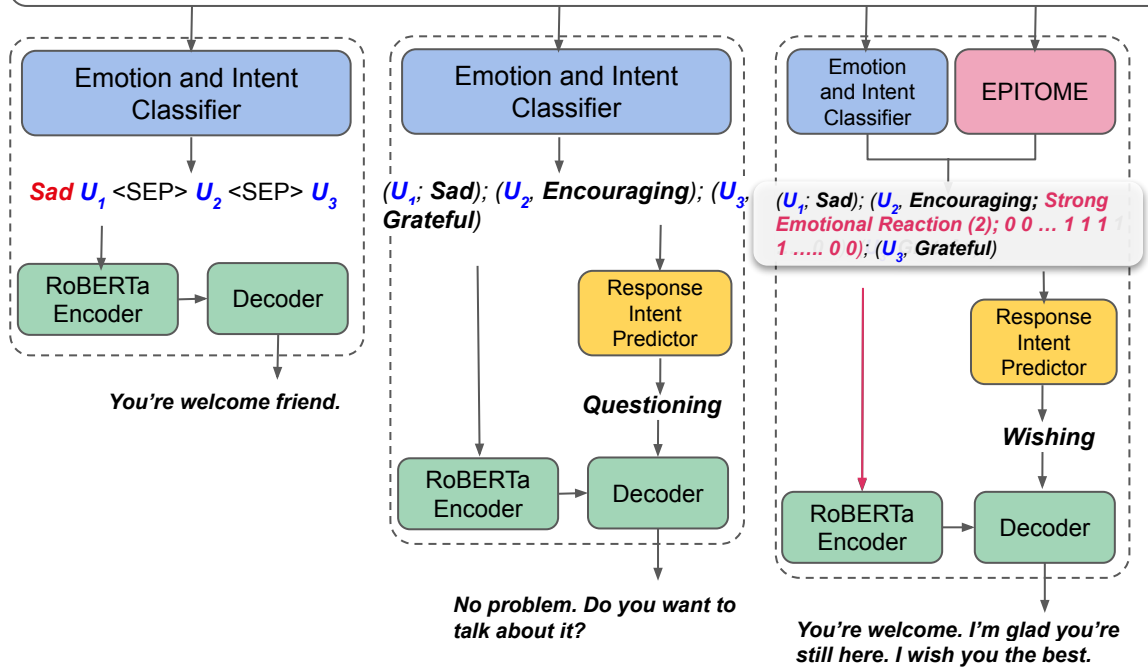
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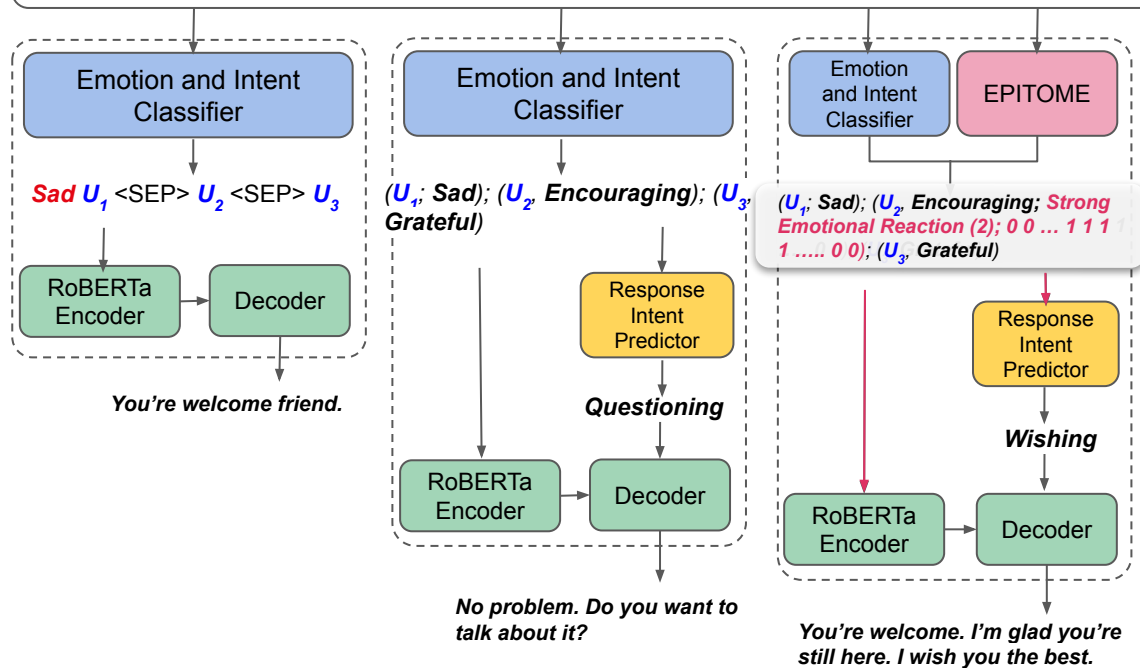


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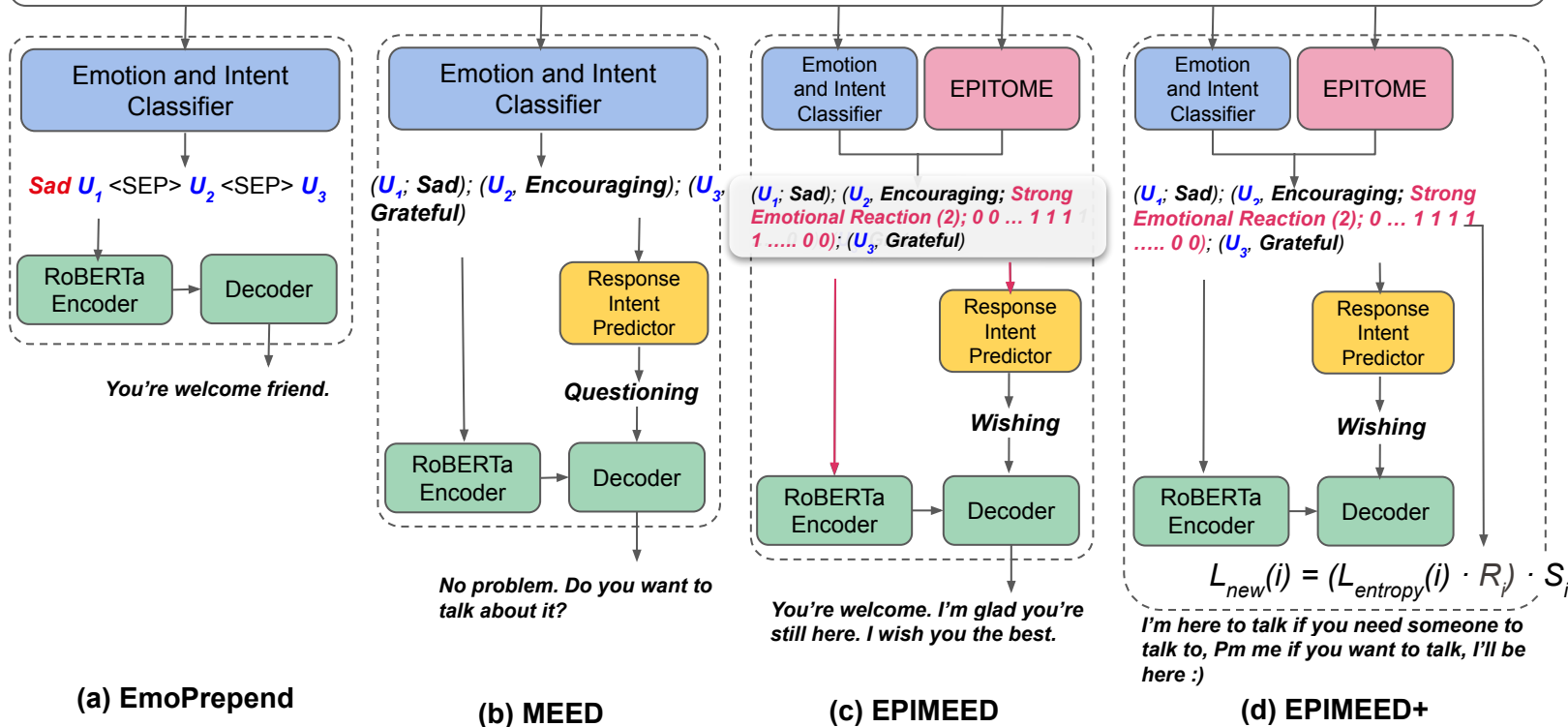
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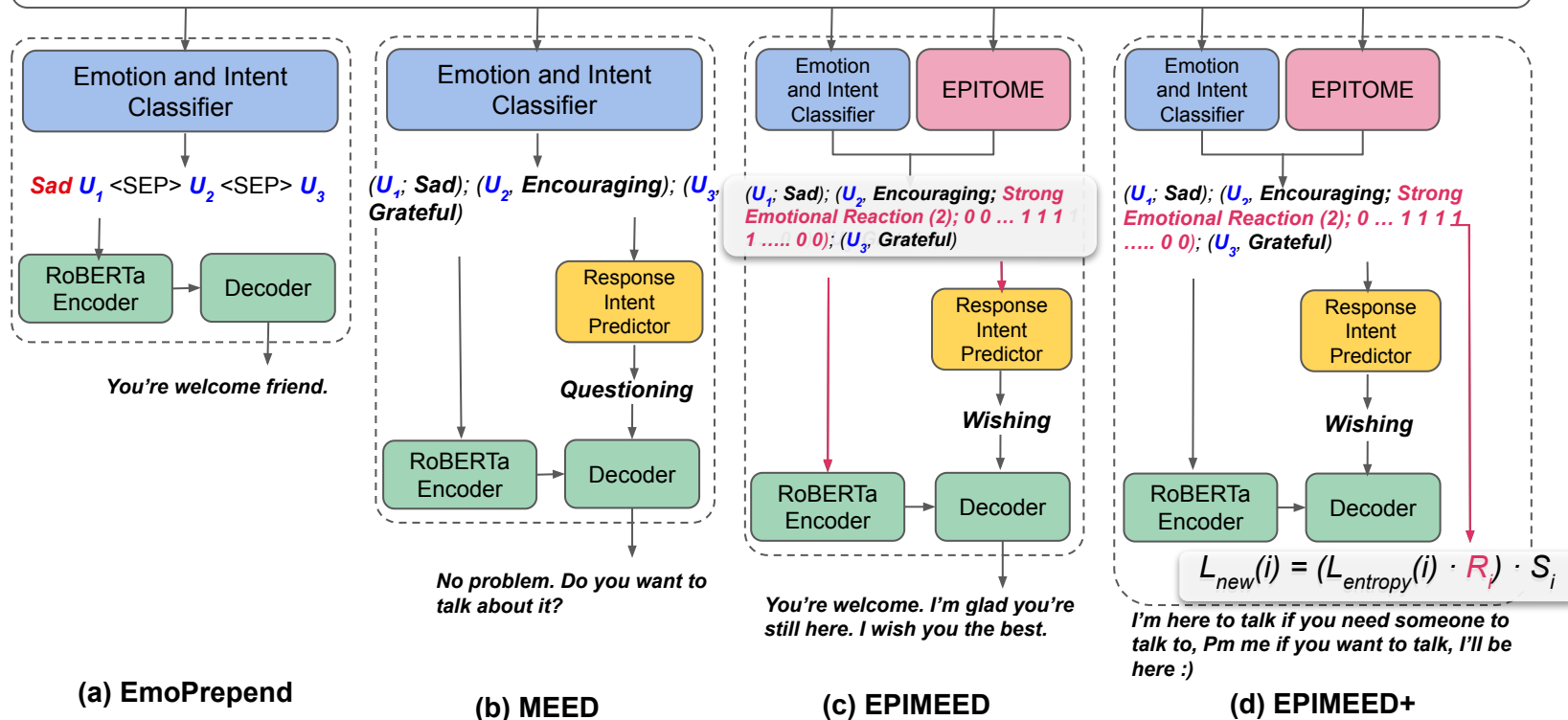


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EmoPrepend	0.0317	0.1178	0.0513	0.0157	0.0662	0.0434	0.4842	0.7346	16.55
MEED	0.0618	0.2889	0.0283	0.0123	0.0690	0.0331	0.4874	0.7408	9.68
EPIMEED	0.0487	0.1912	0.0271	0.0110	0.0746	0.0365	0.4911	0.7285	10.30
EPIMEED+	0.0039	0.0181	0.0543	0.0191	0.0559	0.0637	0.4268	0.7650	40.82

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- Evaluate the *“Empathetic Appropriateness”*

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Dialog 1/10

hi, i feel so lonely sometimes because all my friends live in a different country

Drag and drop the below responses into "Good", "Okay", and "Bad" according to your judgement on how empathetically appropriate they are to the earlier dialogue.

Good:

Okay:

Bad:

Drag and drop

Why is that?

i 'm sorry to hear that . do you have any friends that you can hang out with ?

I feel you.

I know what it feels like to be lonely.

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EPFL Case Study



My cat died today, and I can't get it out of my mind. I keep think of him running on a sunny hill but that only makes me cry more

I'm so sorry you're going through this



EmoPrepend

I'm sorry for your loss. (Sympathizing)



MEED

I'm so sorry for your loss. (Sympathizing)



EPIMEED

I'm so sorry for what you're going through. I hope you'll be able to reach out to someone who's going through something similar. Have you looked into getting help? (Sympathizing)



EPIMEED

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School is almost over. Things still haven't fixed with my best friend. I want to talk to her about it but I fear it'll just make my situation worse than it already is.

I'm so sorry you're going through this



EmoPrepend

I'm so sorry you're going through this. I hope things get better for you soon.



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I'm sorry for your loss. (Sympathizing)



MEED

How long have you been together? (Questioning)



MEED

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EPIMEED

Do you want to talk about it? (Questioning)



EPIMEED

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EPIMEED

Wanna talk about it? I'm here if you want to talk about it. I'm here to listen if you need someone to talk to. You're not alone. (Questioning)



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EPIMEED

EPFL Conclusion

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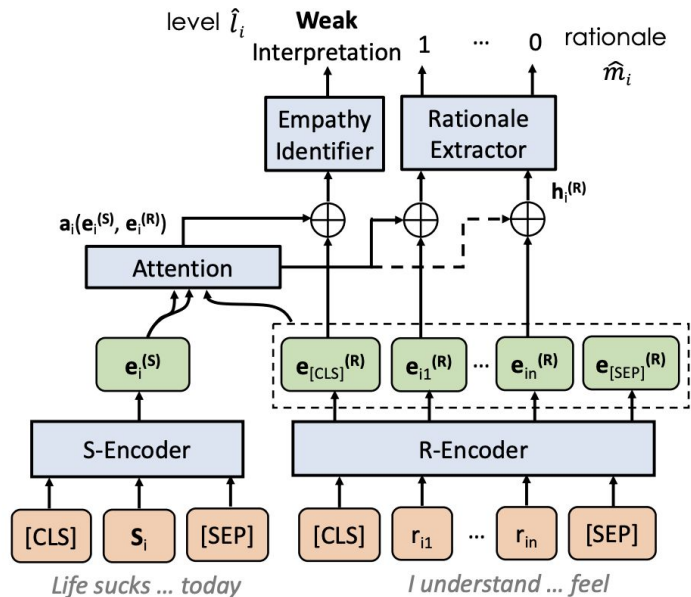
Thank You

Our code and dataset available at: <https://github.com/yehchunhung/EPIMEED>



Appendices

- Scraping conversational data from peer support platform, Reddit
- **Why Reddit?**
 - Anonymity on Reddit encourages open discussion of often stigmatized psychological concerns and personal distress (De Choudhury and De, 2014; Sharma et al., 2017)
 - Dialogues are publicly available in abundance, allows scraping through web APIs
 - Contain higher empathic concern as many peers share similar distressful experiences (Hodges et al., 2010)



$$e_i^{(S)} = \text{S-Encoder}([CLS], \mathbf{S}_i, [SEP])$$

$$e_i^{(R)} = \text{R-Encoder}([CLS], \mathbf{R}_i, [SEP])$$

Figure 2: We use two independently pre-trained RoBERTa-based encoders for encoding seeker post and response post respectively. We leverage attention between them for generating seeker-context aware representation of the response post, used to perform the two tasks of empathy identification and rationale extraction.

Speaker: *Back then I used to be all cheery, and went through my day. Now I just sit at my chair, looking down on myself, and sleeping days away. I reflect on myself no matter what, especially how I am around other people. I just lost all drive to do anything. I just want to lay down, and wish death.*

EmoPrepend *I'm so sorry you're going through this. You talked to anyone in your life about any of the stuff you're going through?*

MEED *What kind of stuff is making you feel this way? (Questioning)*

EPIMEED *Do you want to talk about it? (Questioning)*

EPIMEED+ *I've been in a similar situation. You're not alone. Did you tell anyone what you're going through or looked into getting help? (Questioning)*

Speaker: *I want out. I want to shoot someone, I want to be shot. I don't know what the fuck I want, I know exactly what I want. I want someone to shoot me, I don't want a new prescription doc, I want to be f**ing shot.*

EmoPrepend *What country do you live in?*

MEED *Why do you want to do this? (Questioning)*

EPIMEED *Why would you want to do this? (Questioning)*

EPIMEED+ *What's going on in your life? I'm here to talk if you want to talk. PM me if you need someone to talk to. (Questioning)*

Speaker: *I don't have one friend, when my family come into this house all they do is look threw me. No one talks to me unless it's something perverted online. I feel terrible.*

EmoPrepend *I'm sorry you're going through this.*

MEED *How old are you? (Questioning)*

EPIMEED *I'm here if you want to talk. What's going on? (Questioning)*

EPIMEED+ *What's making you feel this way? I'm here if you need someone to talk to. (Questioning)*

Speaker: *I'm dealing with severe anxiety. I feel like I'm failing my fiance. Sorry for rambling but I just feel like giving up. I just feel like I can't win.*

Listener: *I'm going through a similar situation. I also feel like I'm failing at life.*

Speaker: *Well, I guess we can at least go down swinging. At least I'm not alone.*

EmoPrepend *I'm sorry you're going through this.*

MEED *You're not alone. (Agreeing)*

EPIMEED *That's a good point. (Acknowledging)*

EPIMEED+ *You're not alone. I'm in the same boat. I can relate to this. I wish you'd be happy to talk to me if you want to talk about it. (Acknowledging)*

Speaker: *I just want to be dead, I don't want to live in this shitty world, I want to be released. I'm planning to kill myself later in life. Nobody will notice about my success.*

EmoPrepend *I'm so sorry you're going through this. I hope things get better for you soon.*

MEED *Why do you want to die? (Questioning)*

EPIMEED *Please don't. Why do you feel this way? (Questioning)*

EPIMEED+ *Why do you want to kill yourself? Why do you feel like you want to do this? Have you told anyone what you're going through or looked into getting help? If you want to talk I'm here. (Questioning)*

Speaker: *They say one person eventually gets attached, Funny how it's always me..*

Listener: *How did it become that?*

Speaker: *Cos I'm a very emotional person who gets attached very easily. I eventually become some side pet in any relationship.*

EmoPrepend *I'm so sorry you're going through this.*

MEED *Are you in an open relationship? (Questioning)*

EPIMEED *That's why I don't want any relationship. (Neutral)*

EPIMEED+ *I'm sure you're not the only one. I'm here to talk if you need to talk. (Neutral)*
