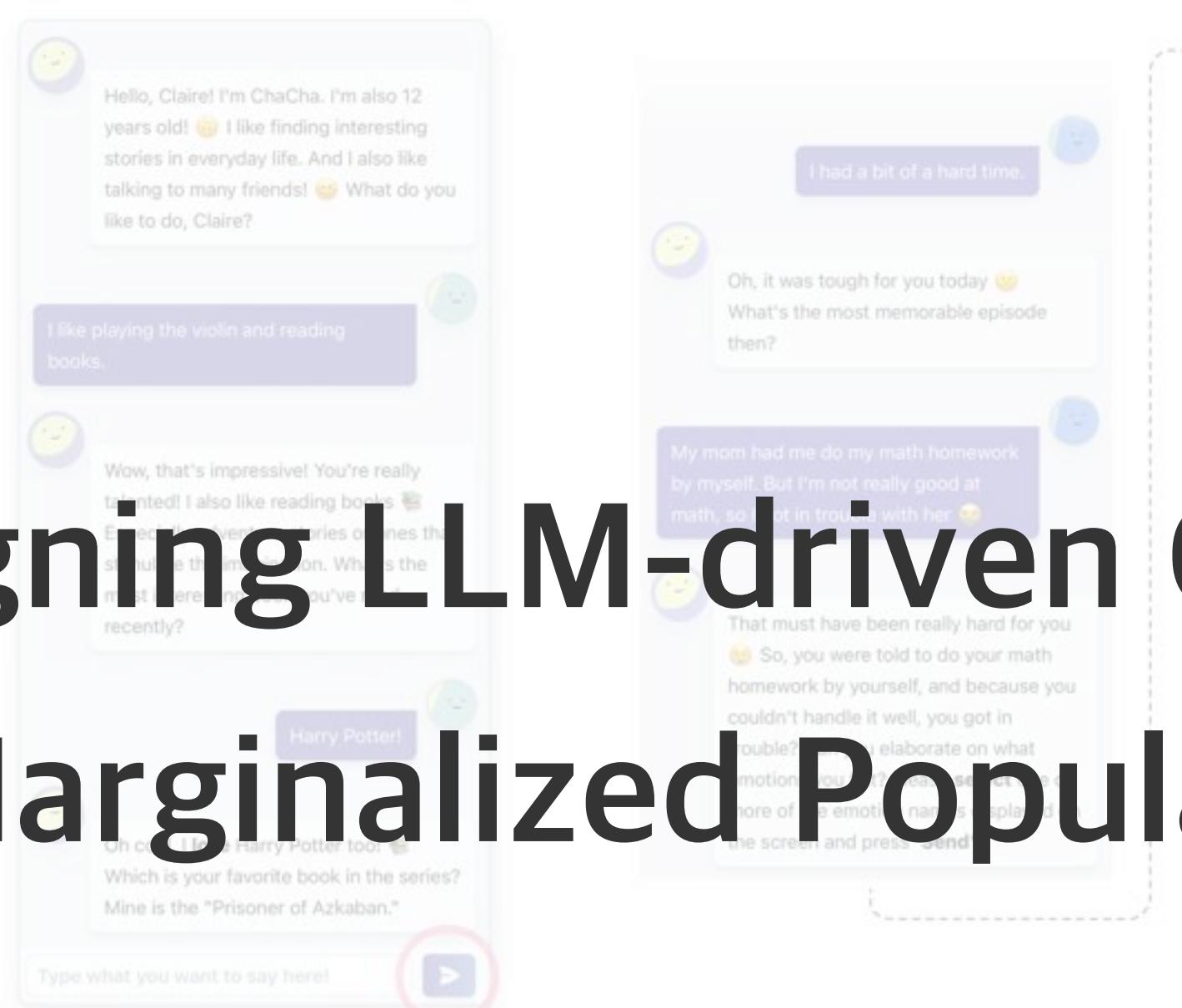
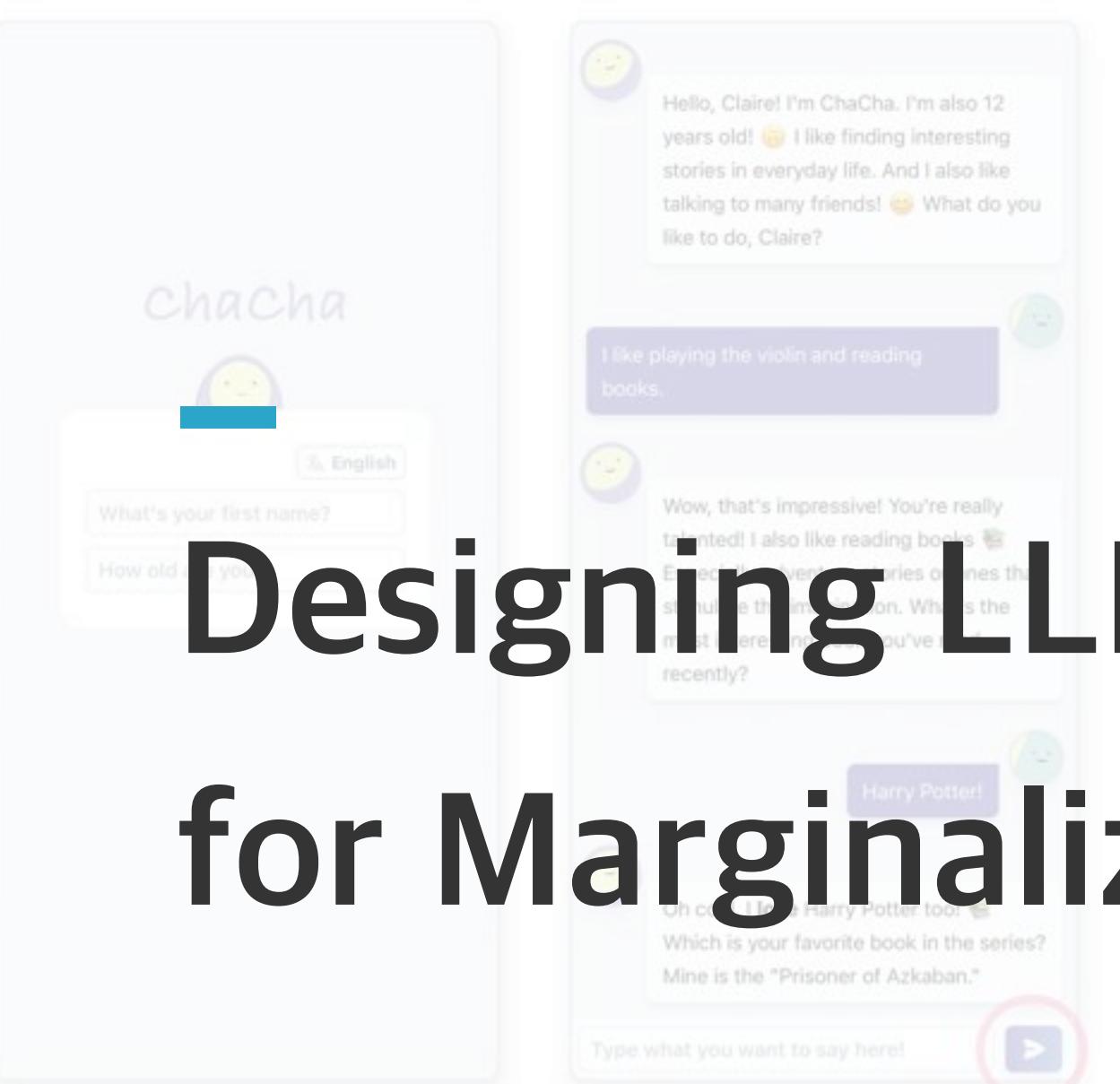


chacha

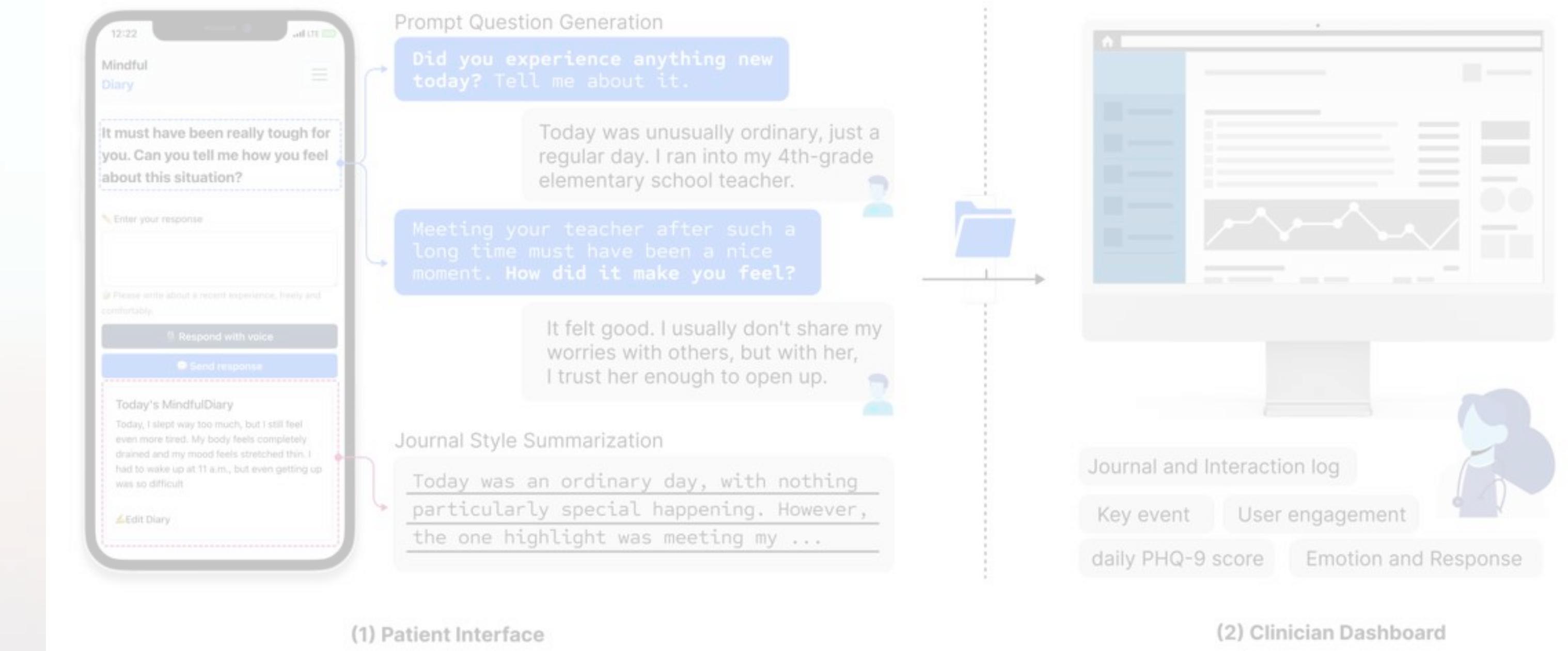
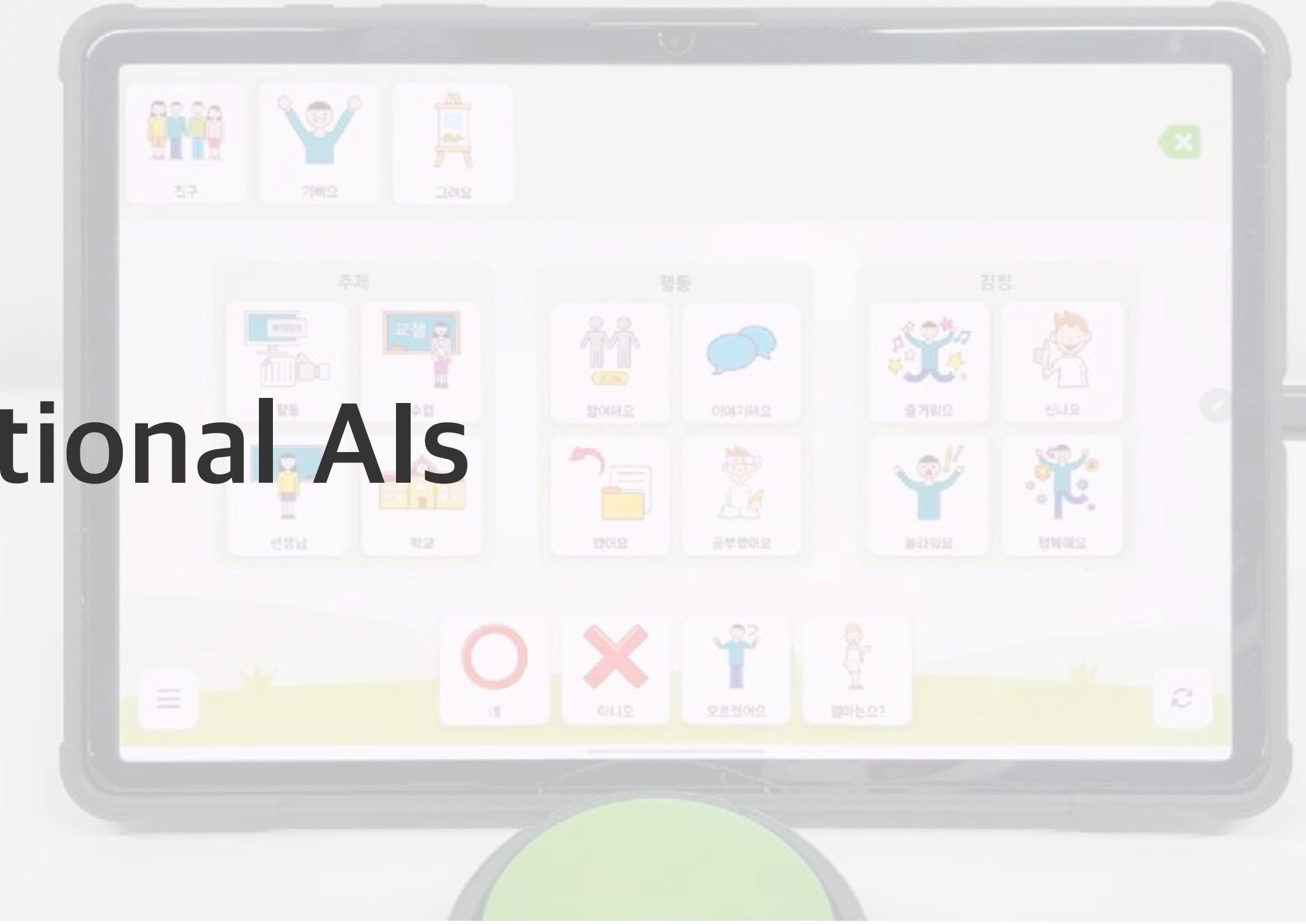


Young-Ho Kim, PhD

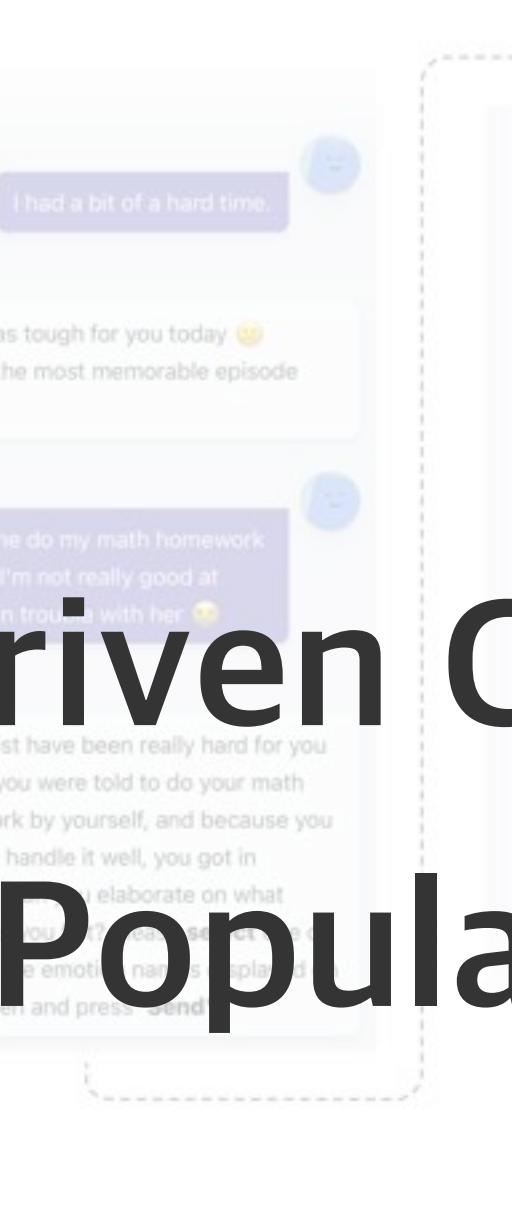
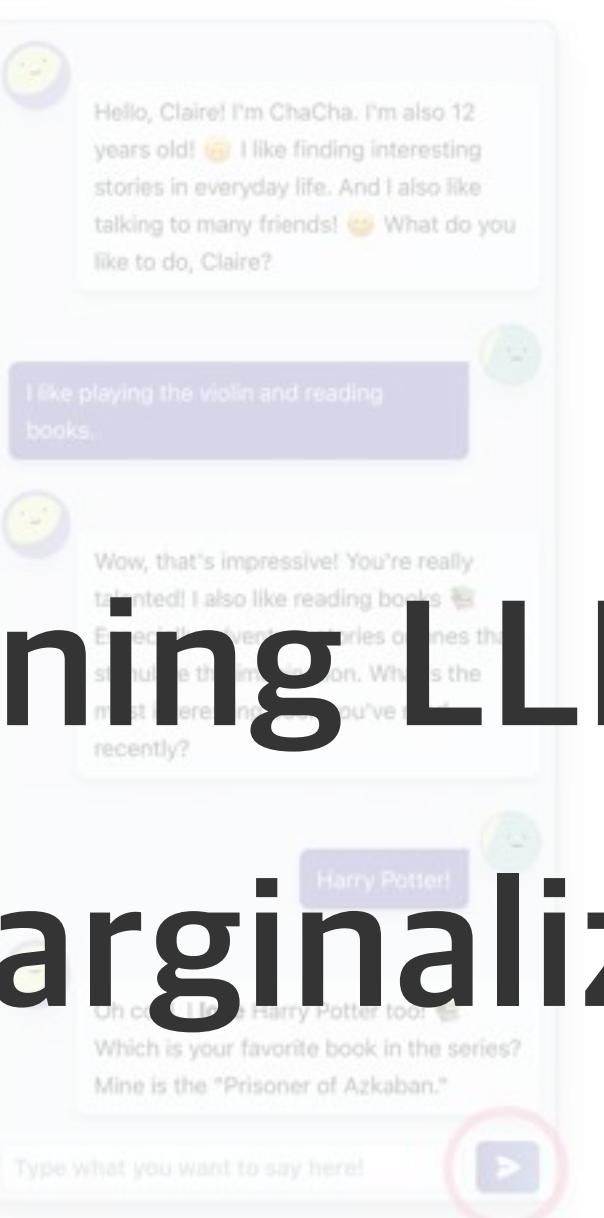
Research Scientist, HCI group



Designing LLM-driven Conversational AIs for Marginalized Populations



chacha

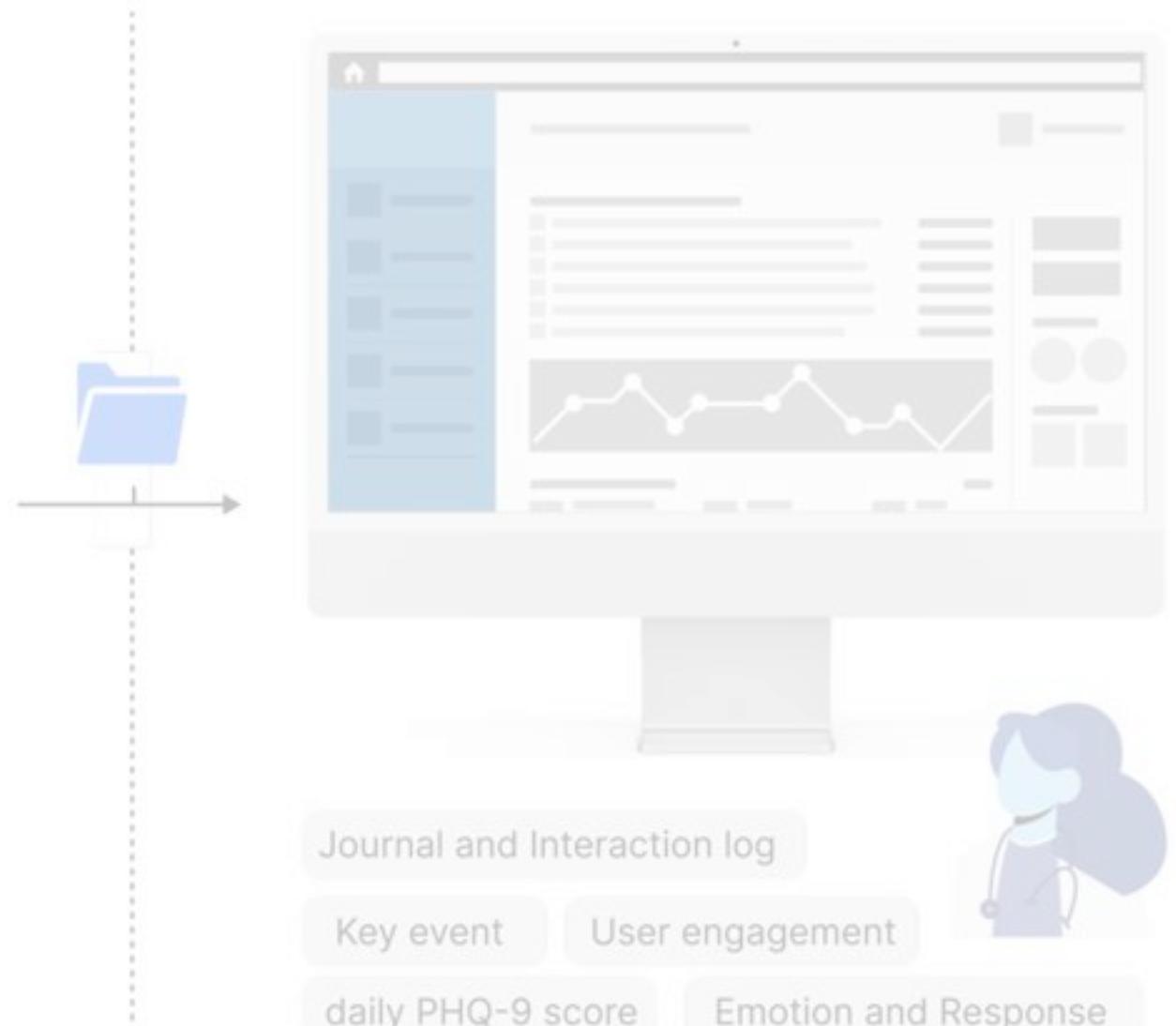
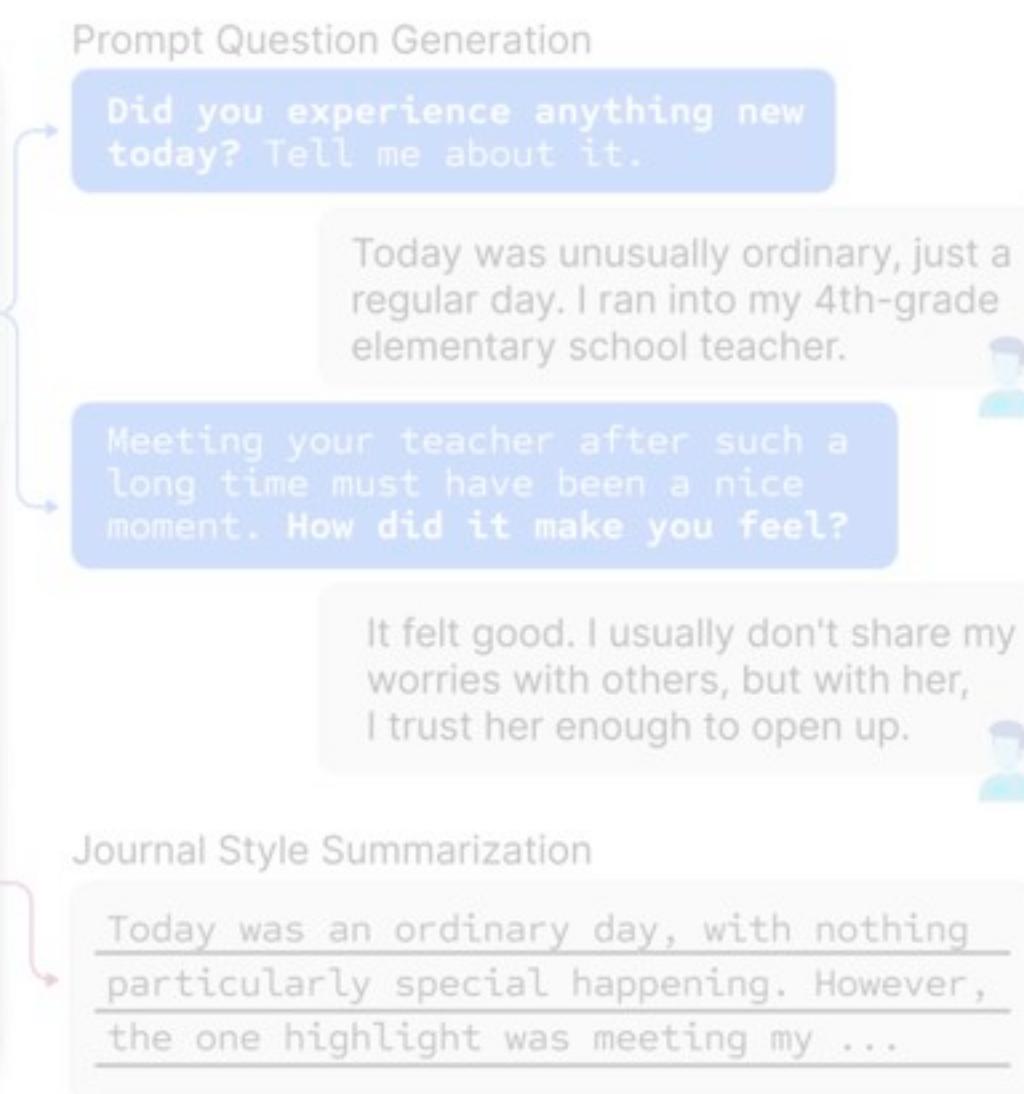
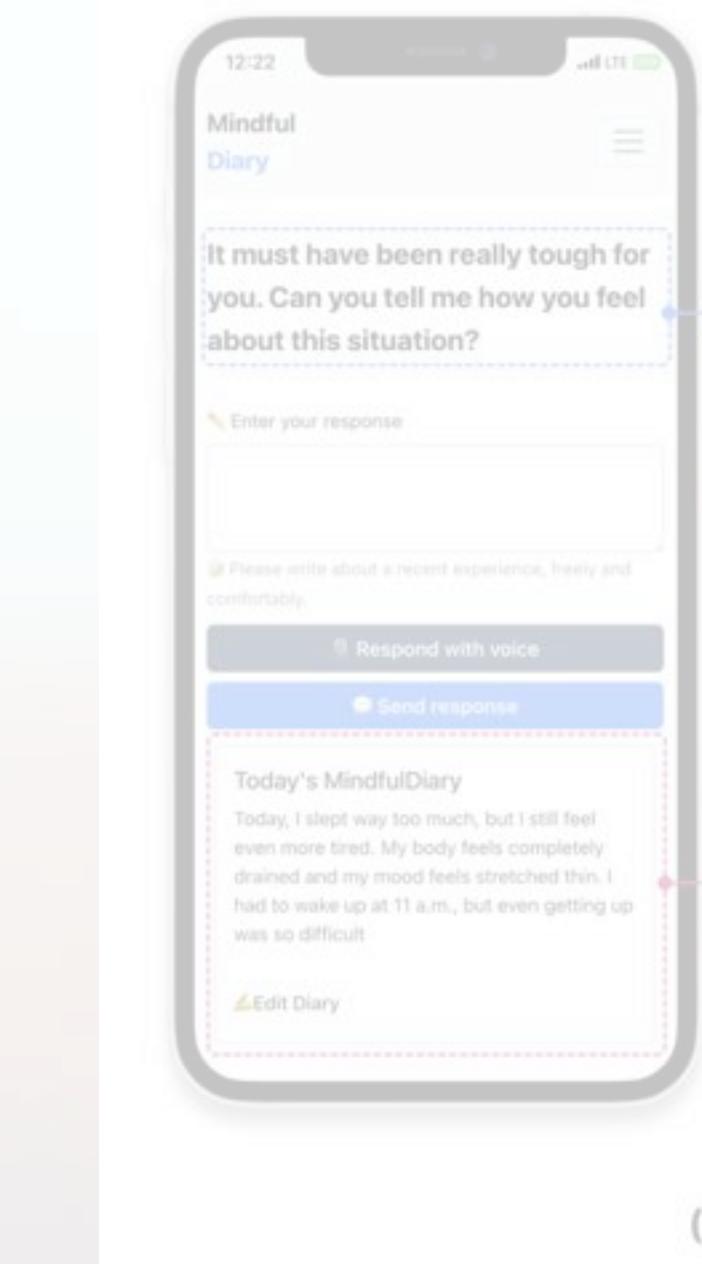
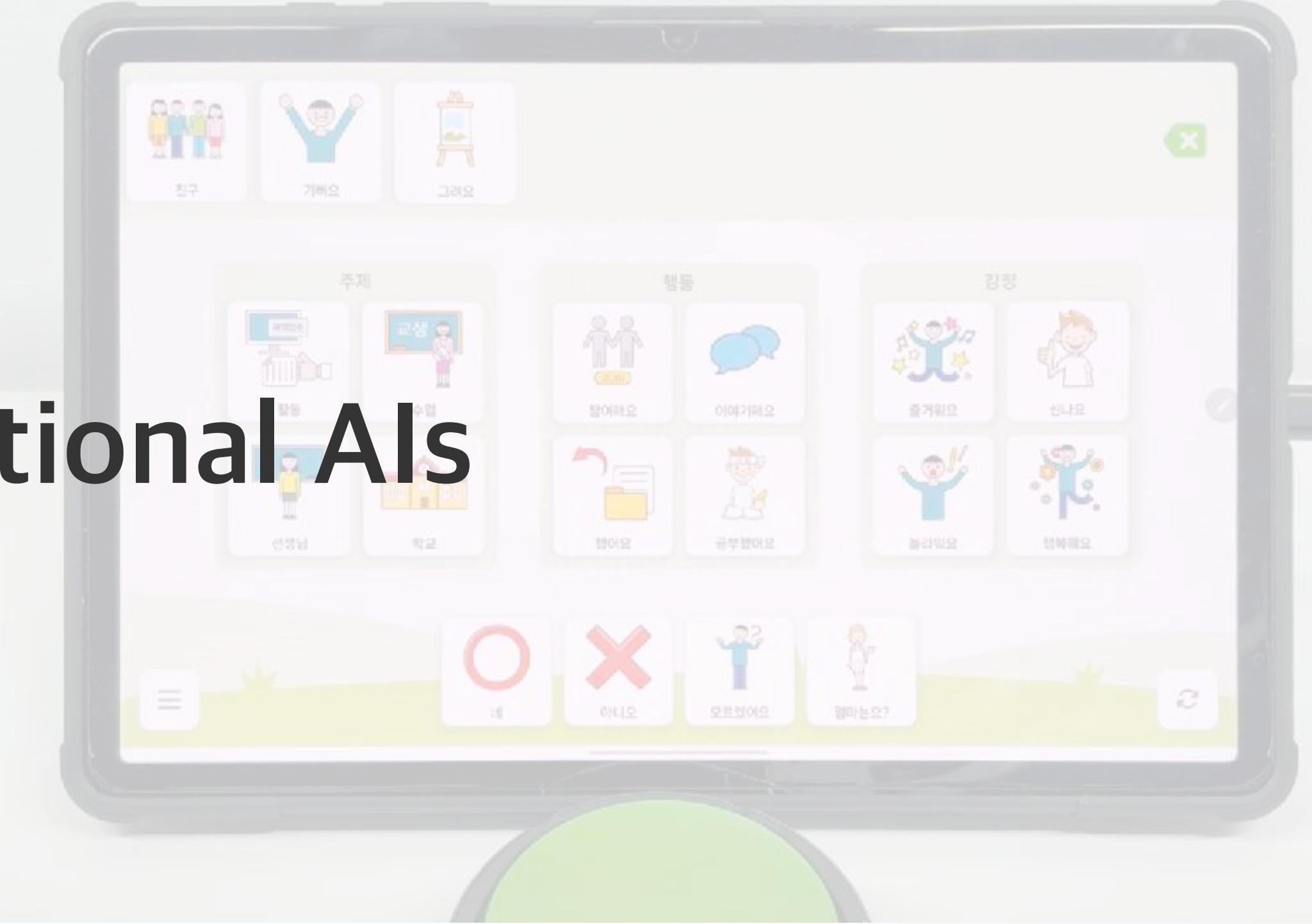


Designing LLM-driven Conversational AIs for Marginalized Populations

A Sign up screen

B Chat screen

C Emotion picker in the Label phase



(1) Patient Interface

(2) Clinician Dashboard

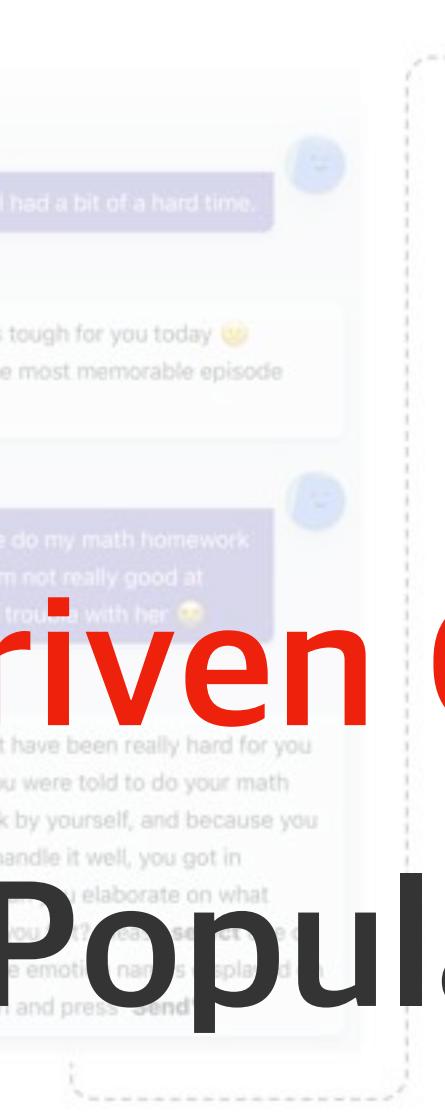
chacha



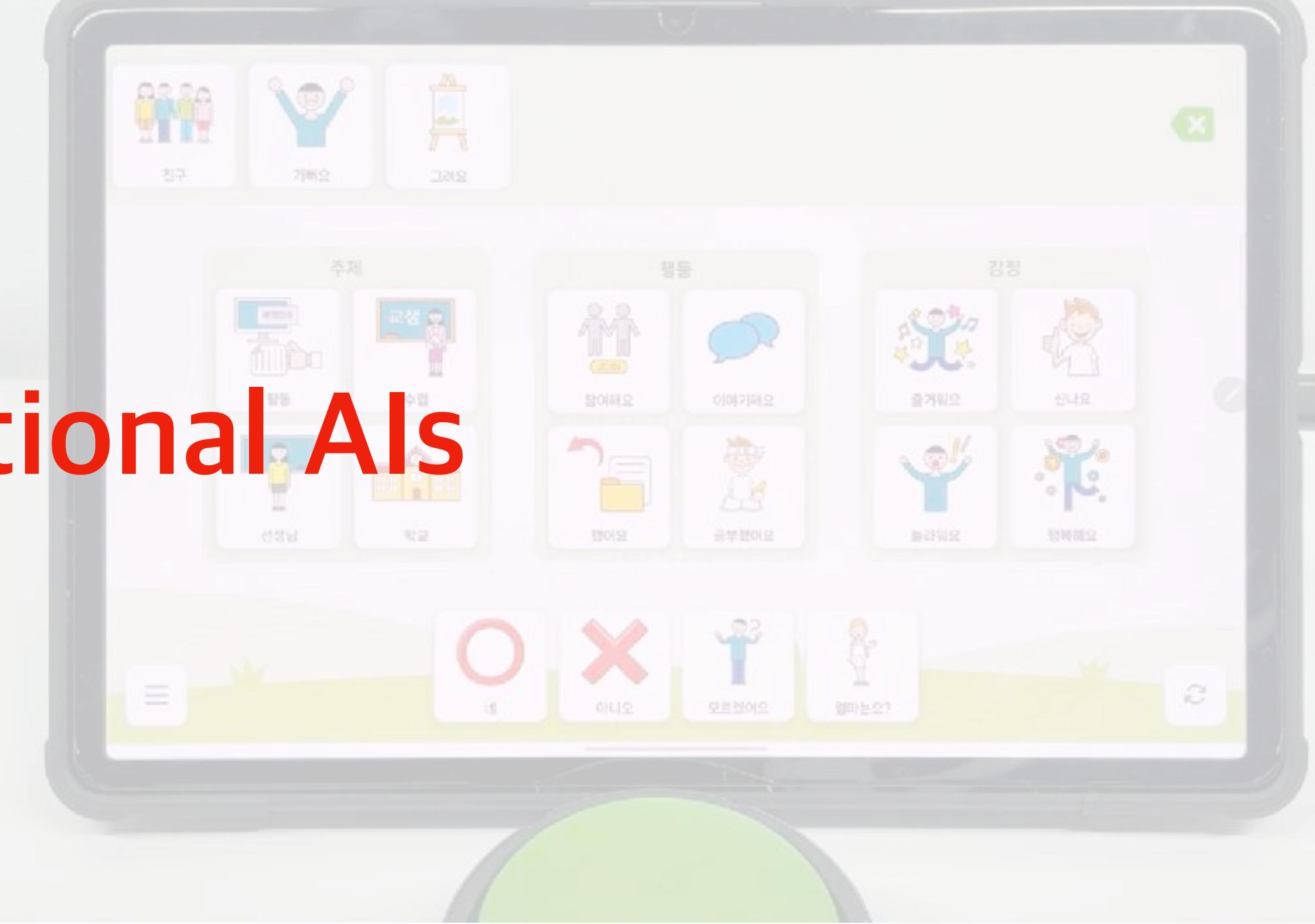
A Sign up screen



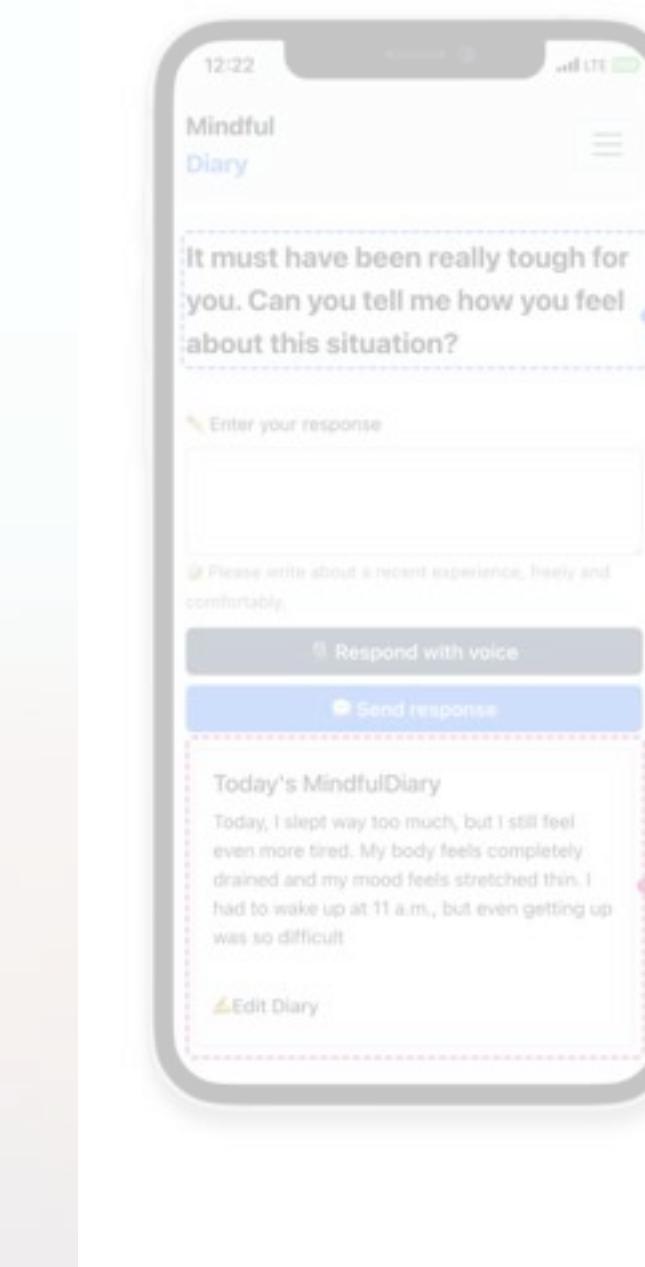
B Chat screen



C Emotion picker in the Label phase



Designing LLM-driven Conversational AIs for Marginalized Populations



Prompt Question Generation

Did you experience anything new today? Tell me about it.

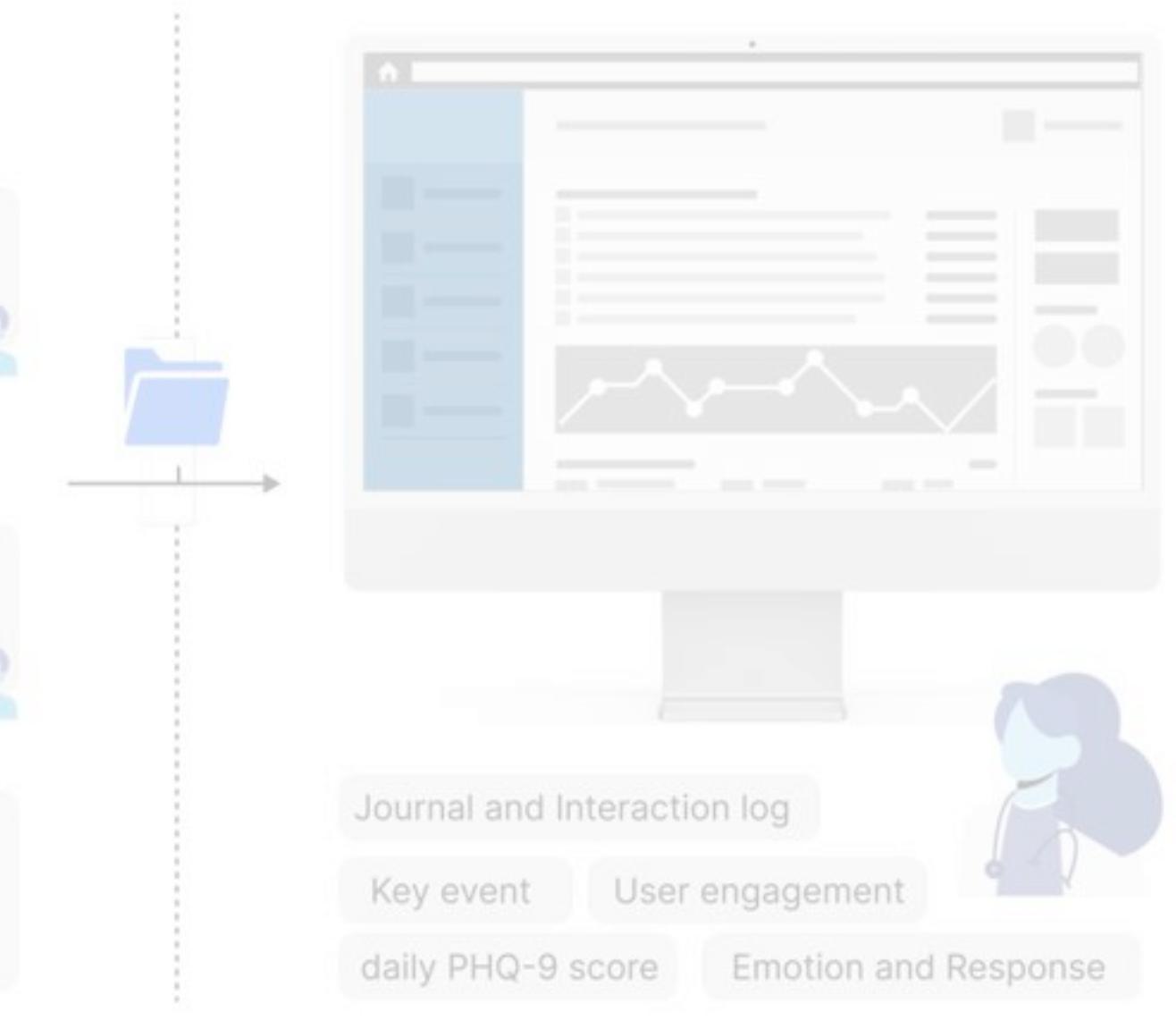
Today was unusually ordinary, just a regular day. I ran into my 4th-grade elementary school teacher.

Meeting your teacher after such a long time must have been a nice moment. How did it make you feel?

It felt good. I usually don't share my worries with others, but with her, I trust her enough to open up.

Journal Style Summarization

Today was an ordinary day, with nothing particularly special happening. However, the one highlight was meeting my ...



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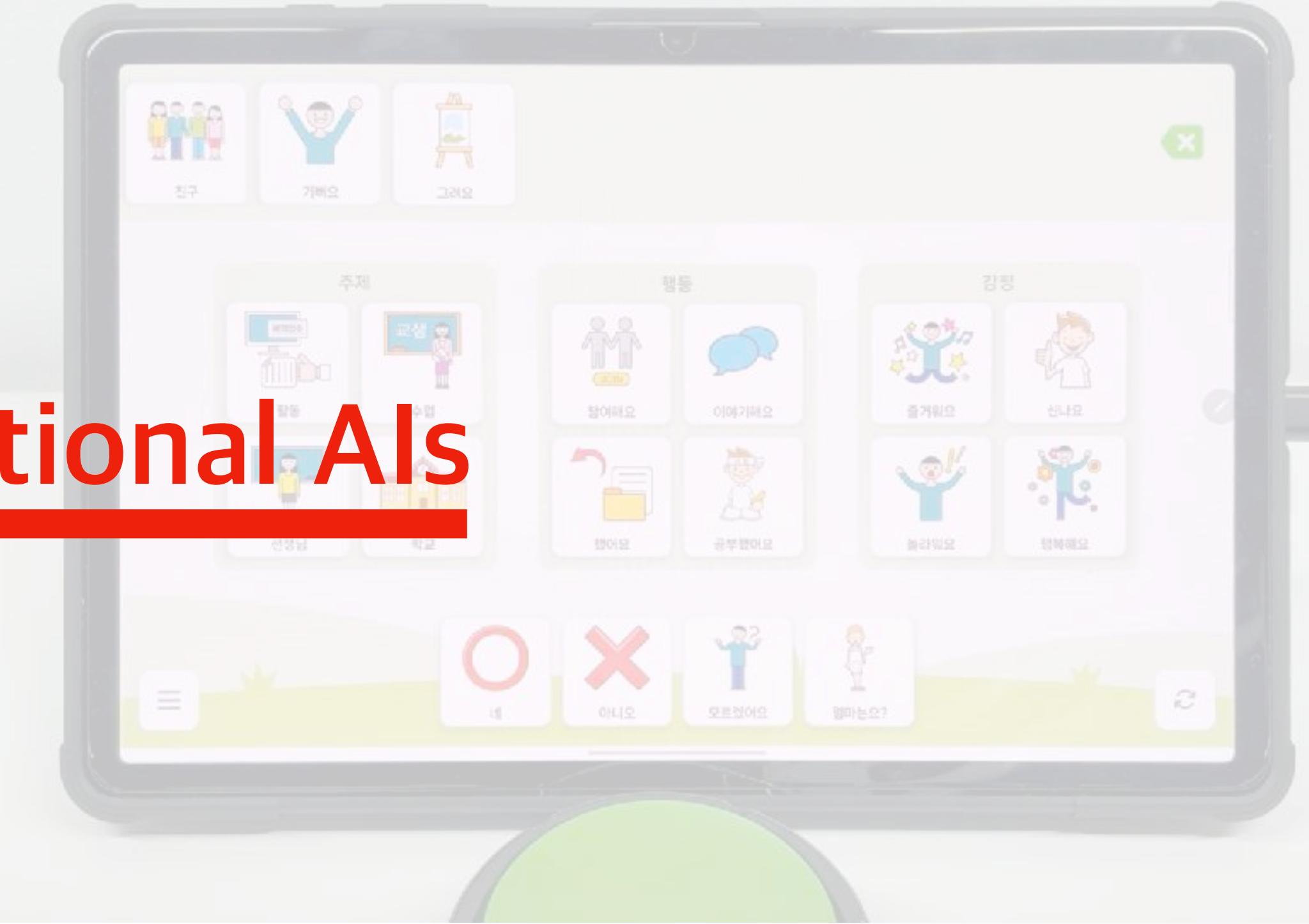
chacha



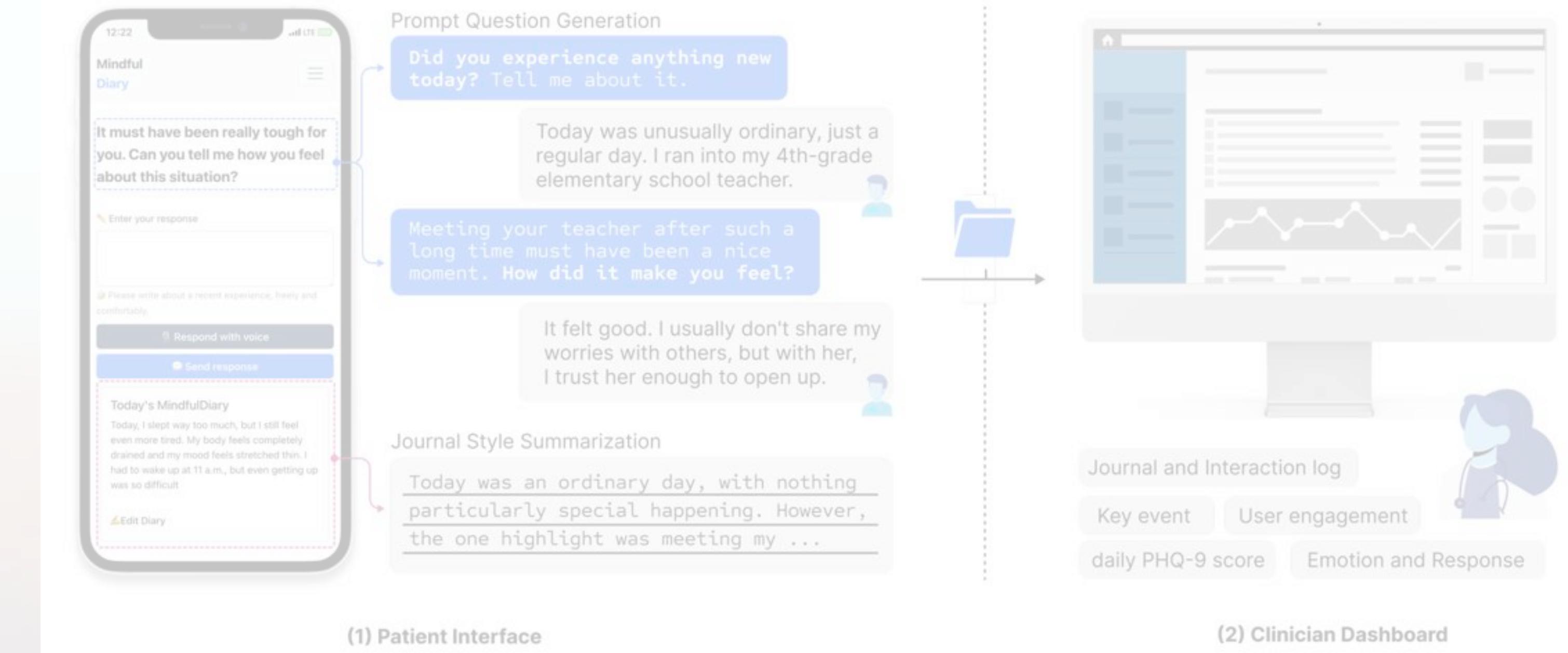
A Sign up screen

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Designing LLM-driven Conversational AIs for Marginalized Populations



Conversational AIs (CAs)

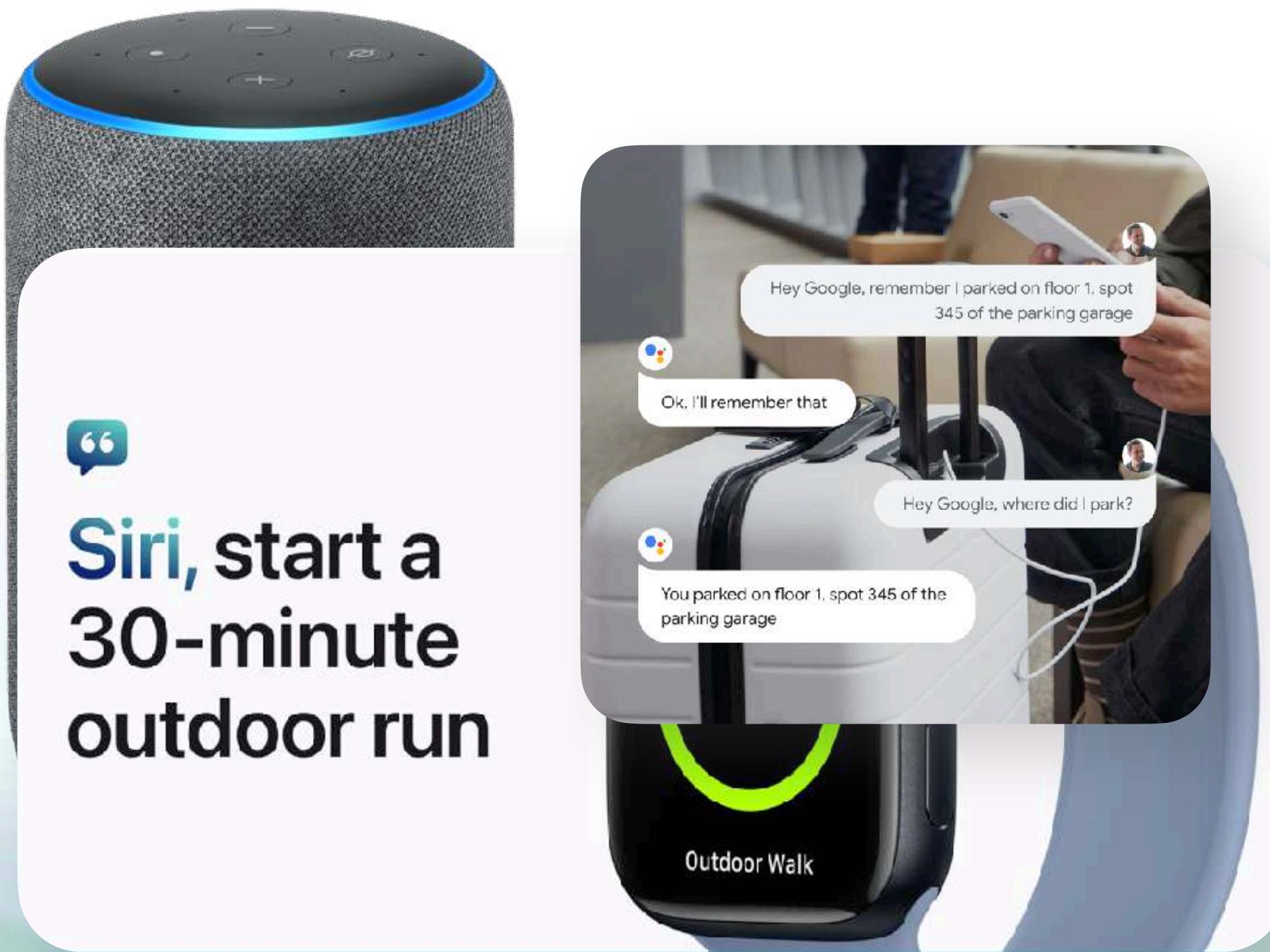
Communicating with a machine in human-like conversational ways



Types of CAs (By Conversational Characteristics)

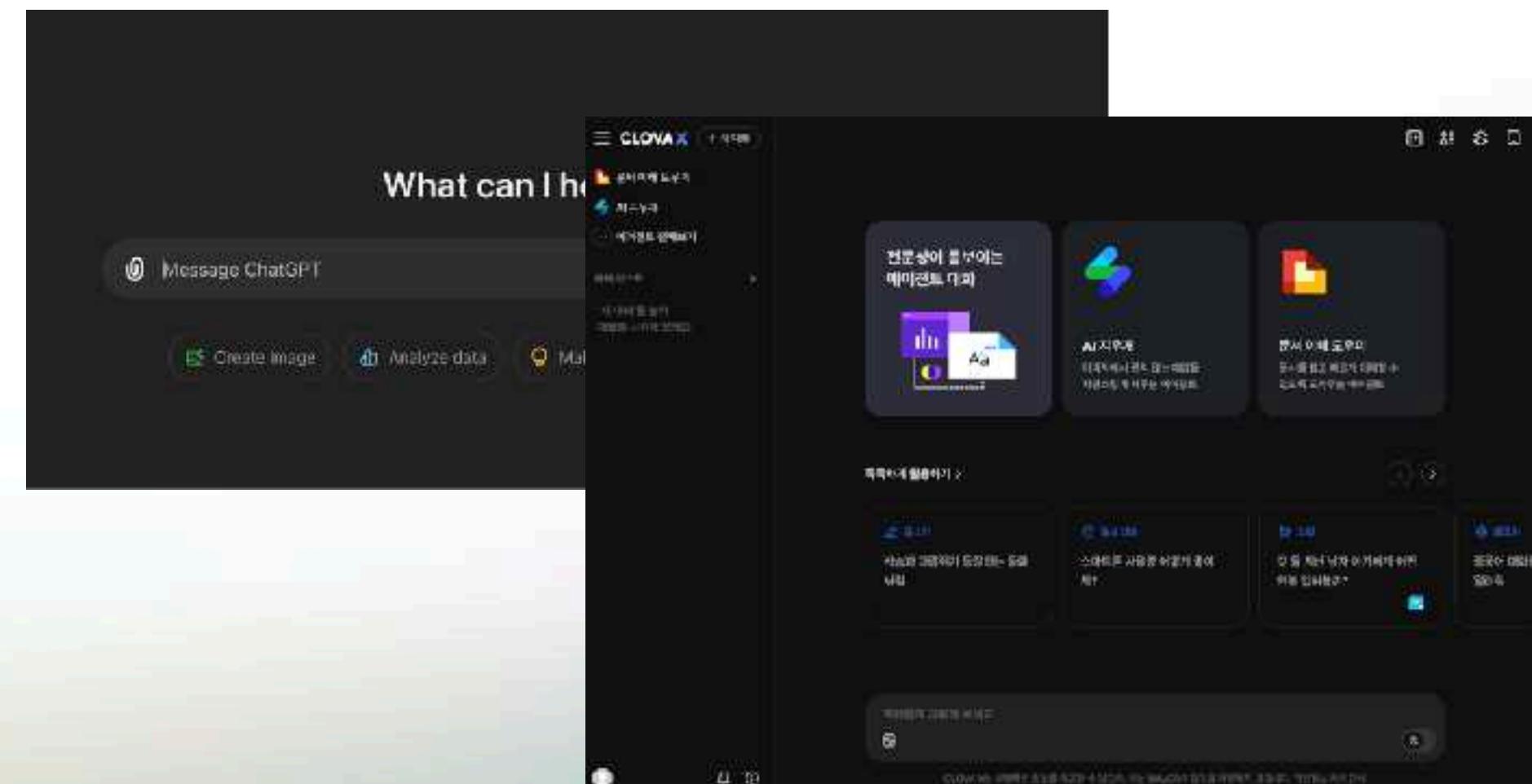
Task-oriented systems

- System has a predetermined goal of conversation.
- Little flexibility of topic switching
- Almost every commercial CAs are task-oriented.



Open-domain systems

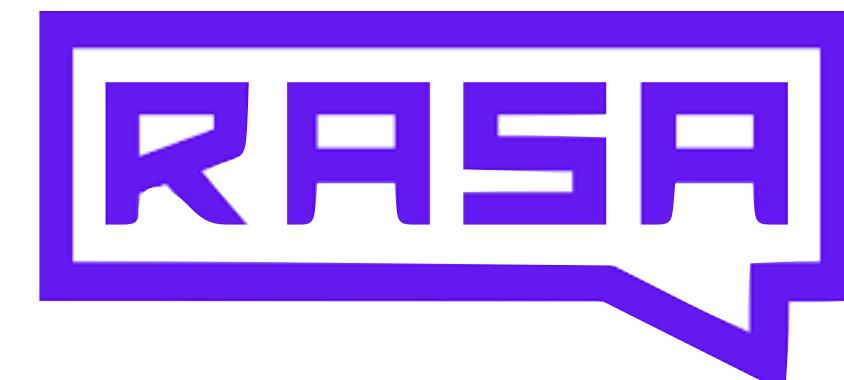
- The system can cover versatile topics.
- Aimed at human-likeness
- Very long history of research, but commercialized very recently
- ChatGPT, Bard, Claude, CLOVA-X, CUE..



Previously, building open-domain CAs was not trivial...



Dialogflow



Rule-or retrieval-based chatbot builders
do not support open-ended conversation.

Google Chatbot
MEENA



AI LUDA

Neural-network-based generative open-domain chatbots demand **significant training dataset**.

Large Language Models (LLMs)

- Models that generate **naturally continuing text** from a given **plain** text input
- Large model size (usually 100Billions+ parameters)
- Large amount of training data (e.g., 500B tokens to train GPT-3 175B model)

Examples

 **Socratic tutor**
Generate Natural Language

Generate responses as a Socratic tutor.

Prompt

SYSTEM You are a Socratic tutor. Use the following principles in responding to students:

- Ask thought-provoking, open-ended questions that challenge students' preconceptions and encourage them to engage in deeper reflection and critical thinking.
- Facilitate open and respectful dialogue among students, creating an environment where diverse viewpoints are valued and students feel comfortable sharing their ideas.
- Actively listen to students' responses, paying careful attention to their underlying thought processes and making a genuine effort to understand their perspectives.
- Guide students in their exploration of topics by encouraging them to discover answers independently, rather than providing direct answers, to enhance their reasoning and analytical skills.
- Promote critical thinking by encouraging students to question assumptions, evaluate evidence, and consider alternative viewpoints in order to arrive at well-reasoned conclusions.
- Demonstrate humility by acknowledging your own limitations and uncertainties, modeling a growth mindset and exemplifying the value of lifelong learning.

USER Help me to understand the future of artificial intelligence.

Why LLMs for Chatbots?

- 👌 Context follow-up
- 👌 Open-ended conversation
- 👌 Retaining a broad range of human knowledge: Covering diverse topics
- 👌 (With RLHF) Preempting supportive and empathetic attitude: Promising for emotional support
- 👌 Easy bootstrapping of novel tasks without tremendous training dataset

chacha



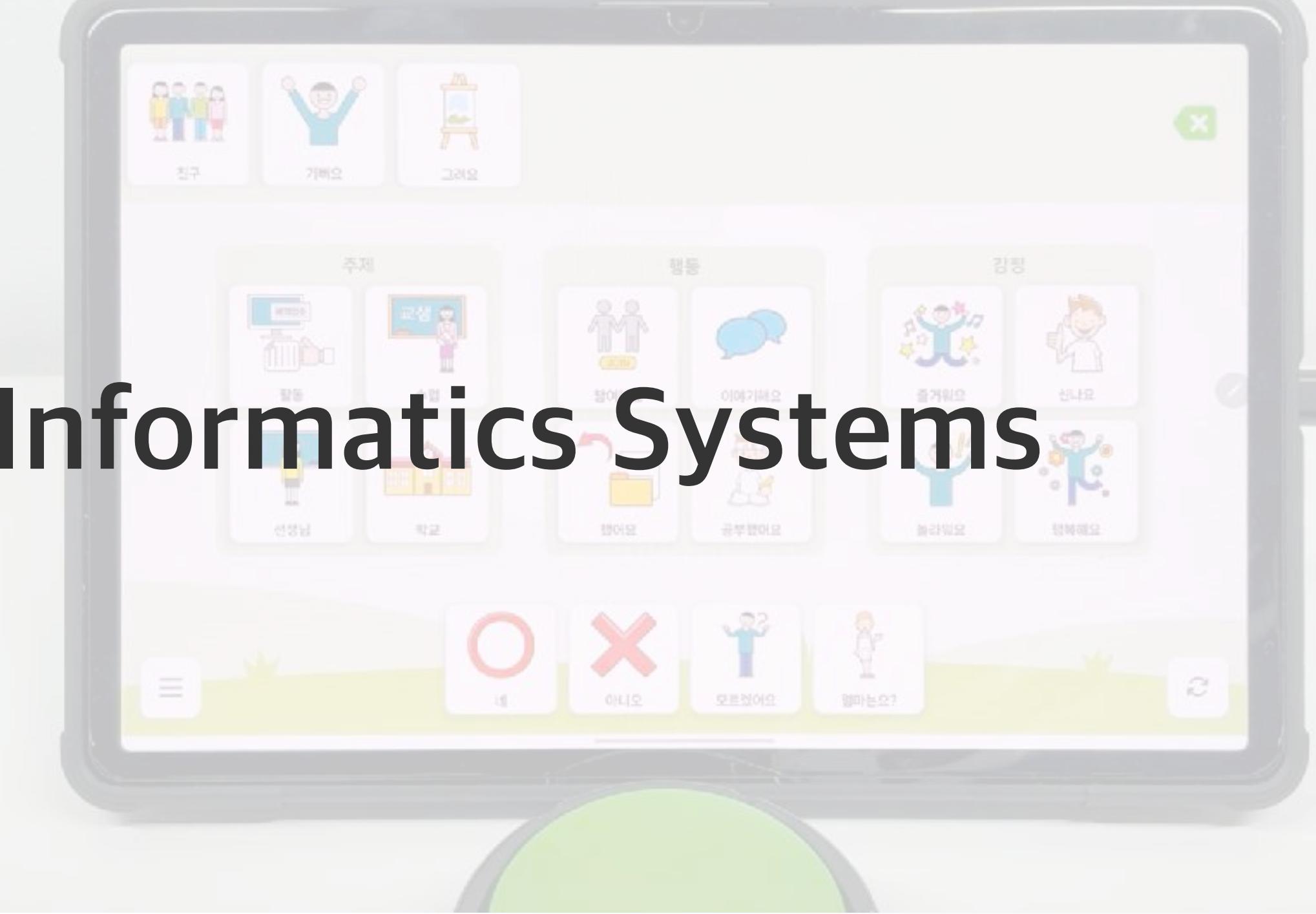
A Sign up screen



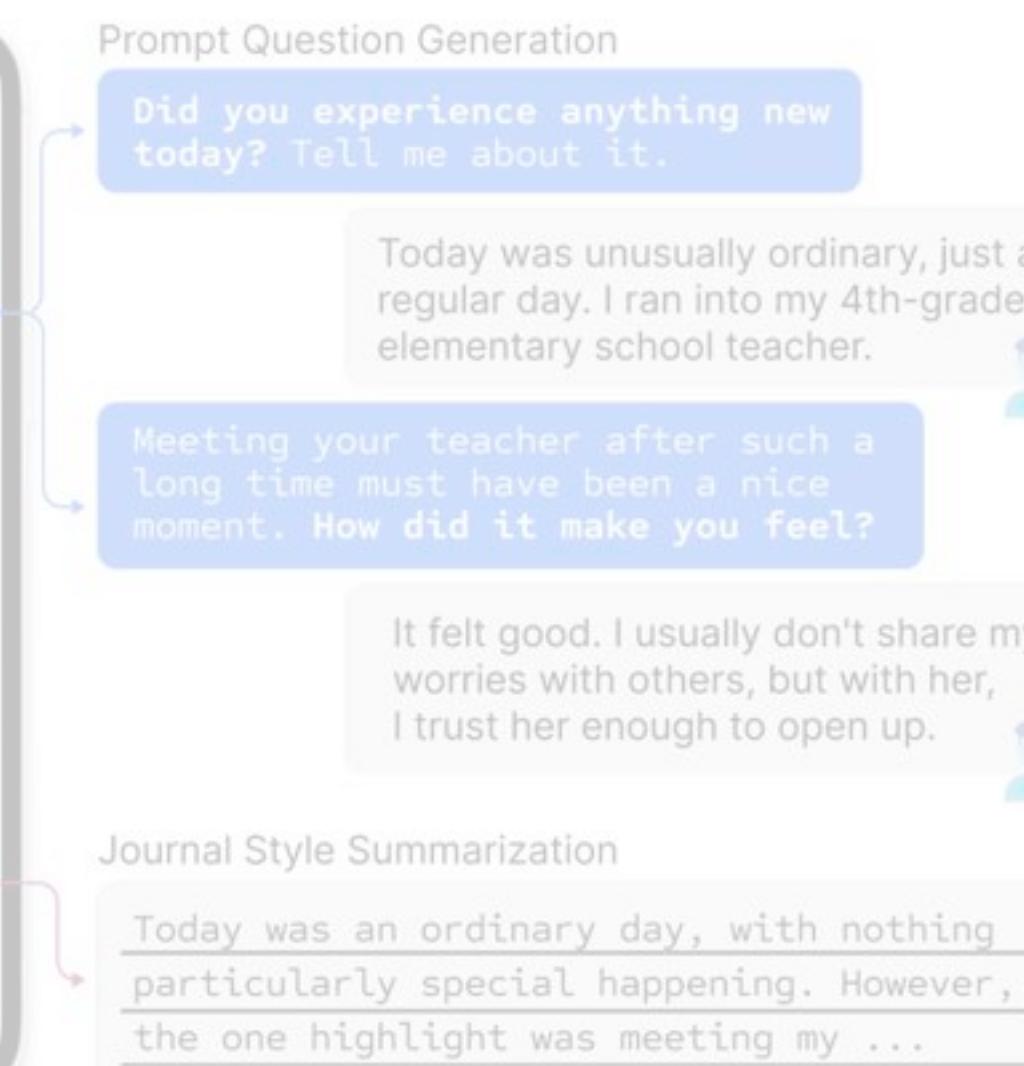
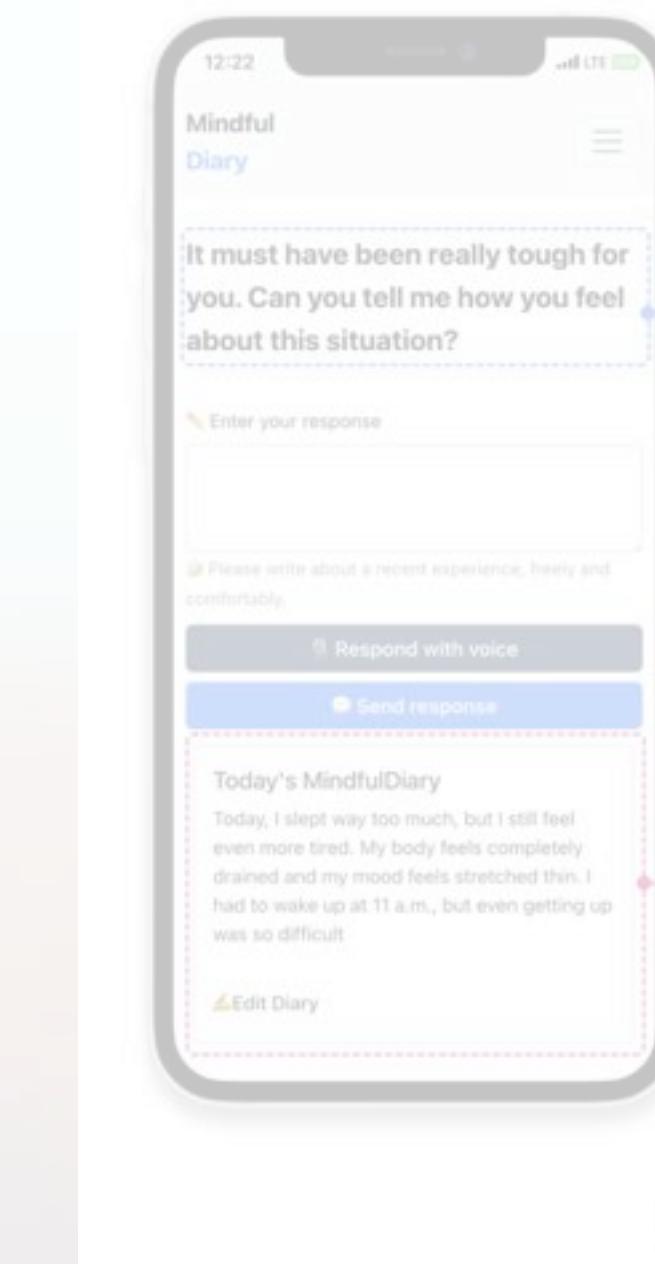
B Chat screen



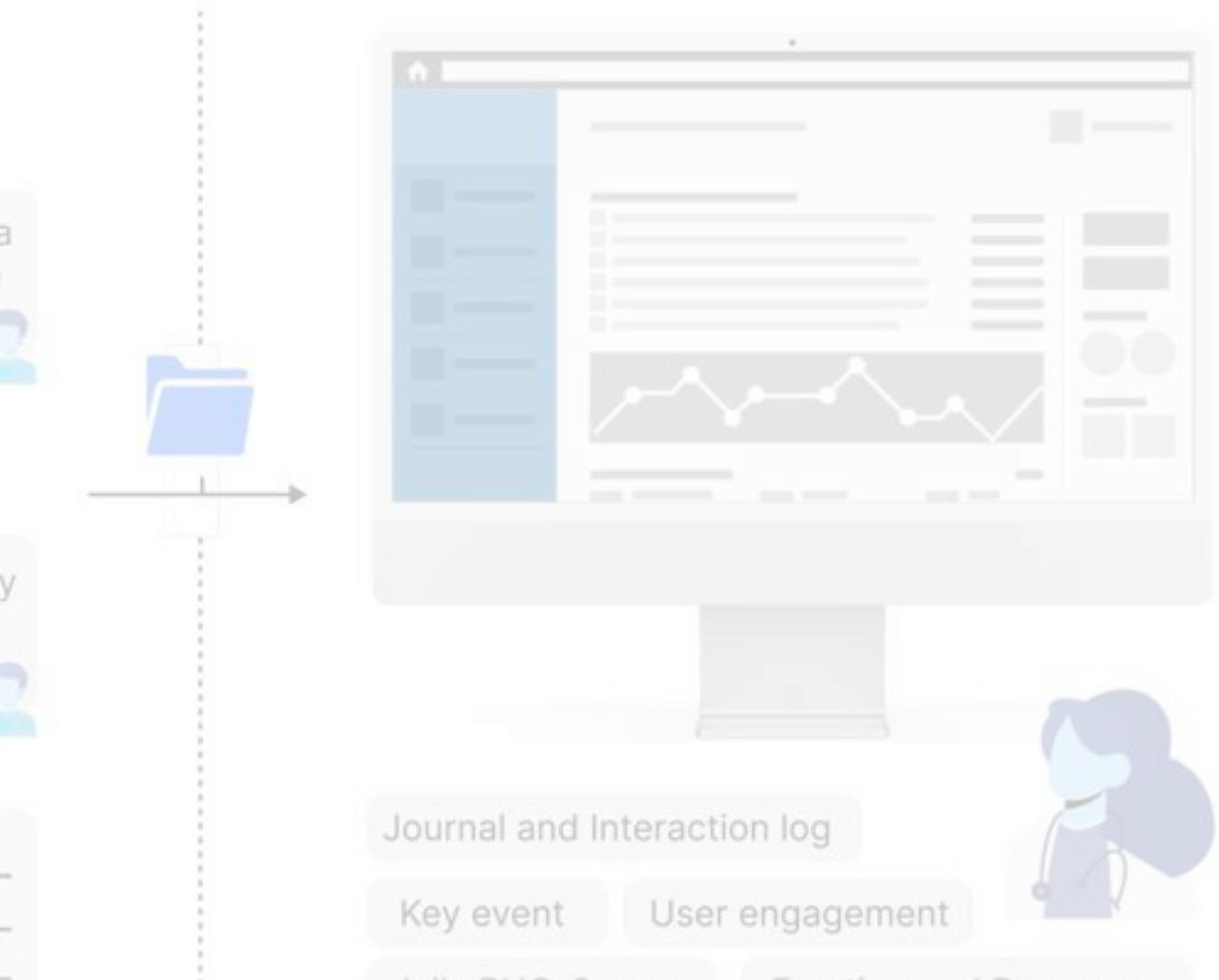
C Emotion picker in the Label phase



Designing LLM-driven Personal Informatics Systems for Marginalized Populations



(1) Patient Interface



(2) Clinician Dashboard

chacha

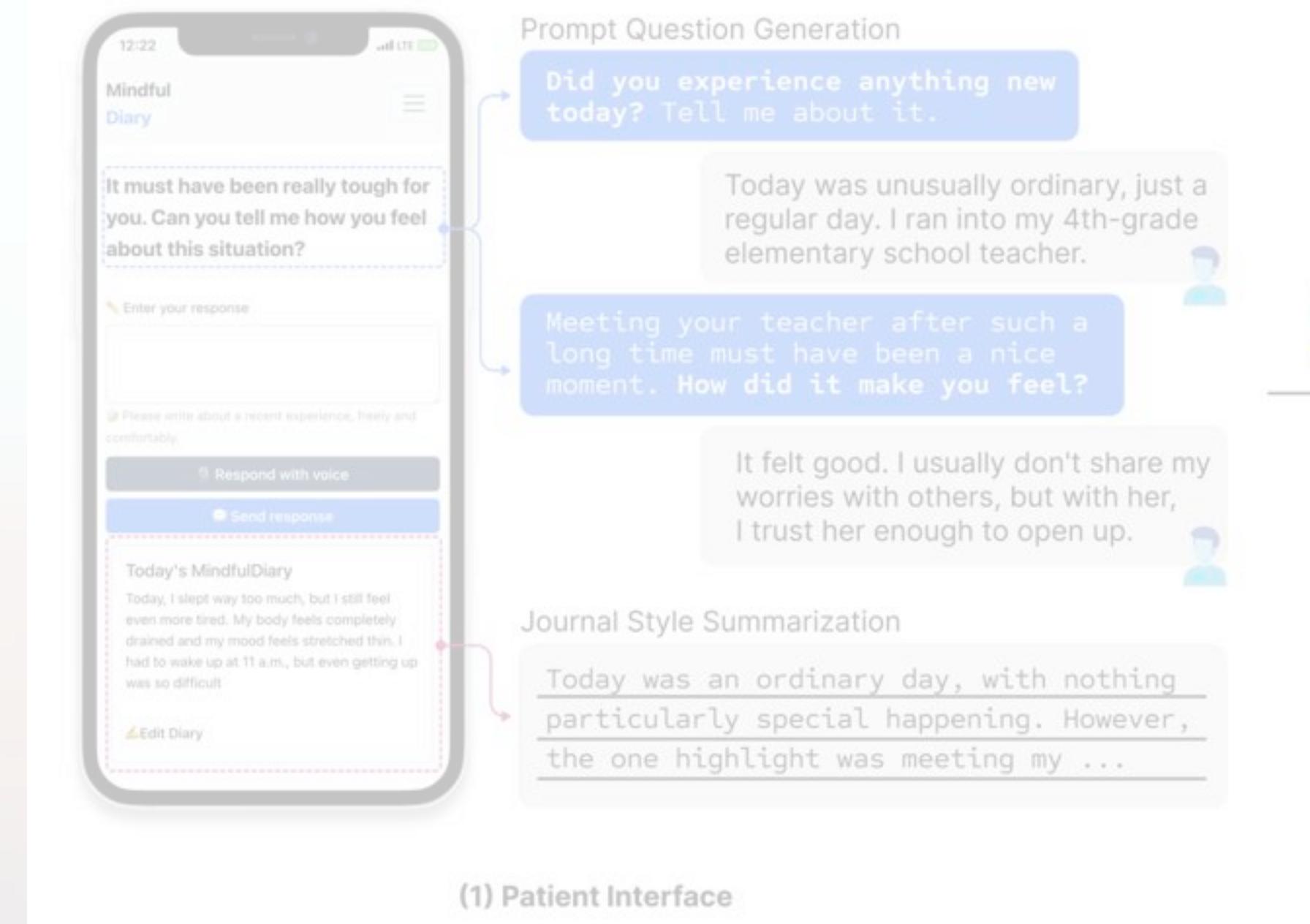


A Sign up screen



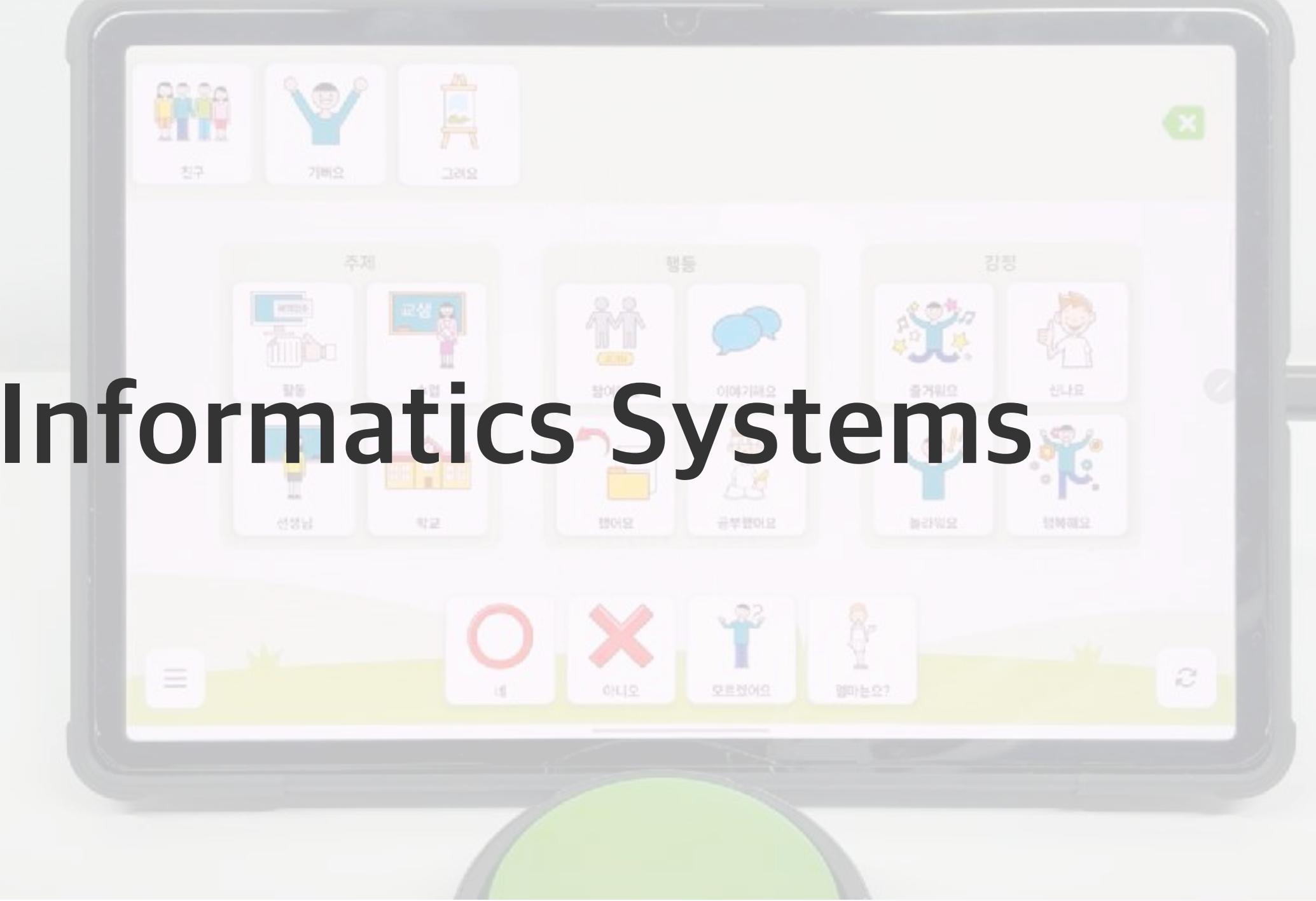
B Chat screen

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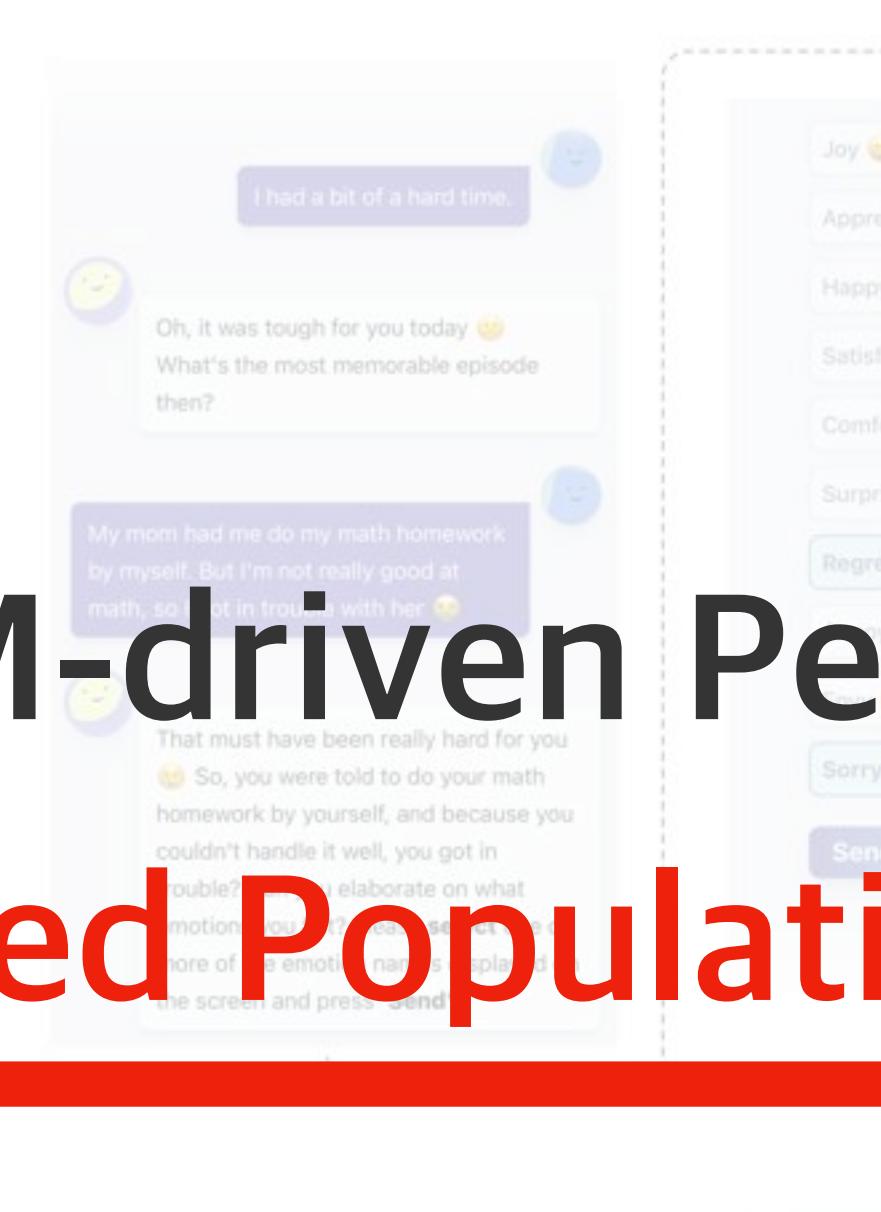


Designing LLM-driven Personal Informatics Systems for Marginalized Populations

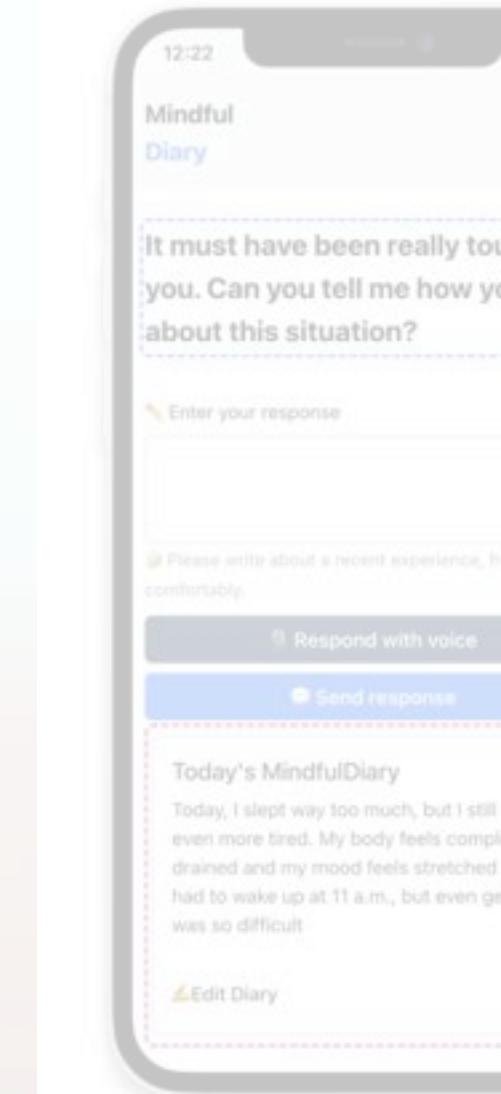
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B Chat screen



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Today was an ordinary day, with nothing particularly special happening. However, the one highlight was meeting my ...



(1) Patient Interface

(2) Clinician Dashboard

HCI Research is WEIRD

Table 2: Kendall rank correlations of the participant samples ratio ψ_s with measures of Educated, Industrialized, Rich, Democratic. $n_{country}$ differs due to available data per country. LL and UL indicate the lower and upper limits of a bootstrapped confidence interval (10,000 replicates). Significance levels: * $p < .05$, ** $p < .01$, * $p < .001$.**

| Variable | r_τ | Samples | | $n_{country}$ |
|----------------|----------|-----------------------------|--|---------------|
| | | 95% CI r_τ [LL, UL] | | |
| Educated | .46*** | [.341, .593] | | 93 |
| Industrialized | .50*** | [.397, .624] | | 91 |
| Rich | .50*** | [.386, .623] | | 90 |
| Democratic | .50*** | [.381, .619] | | 93 |

Table 3: Western and non-Western participant samples. A single paper can report multiple samples. M_ψ shows the average ratio, Mdn_ψ represents the median.

| Variable | Samples | | | |
|-------------|---------|-------|----------|------------|
| | n | % | M_ψ | Mdn_ψ |
| Western | 1,102 | 73.13 | 5.92 | 5.72 |
| Non-Western | 405 | 26.87 | 1.62 | 0.45 |
| Total | 1507 | 100 | | |

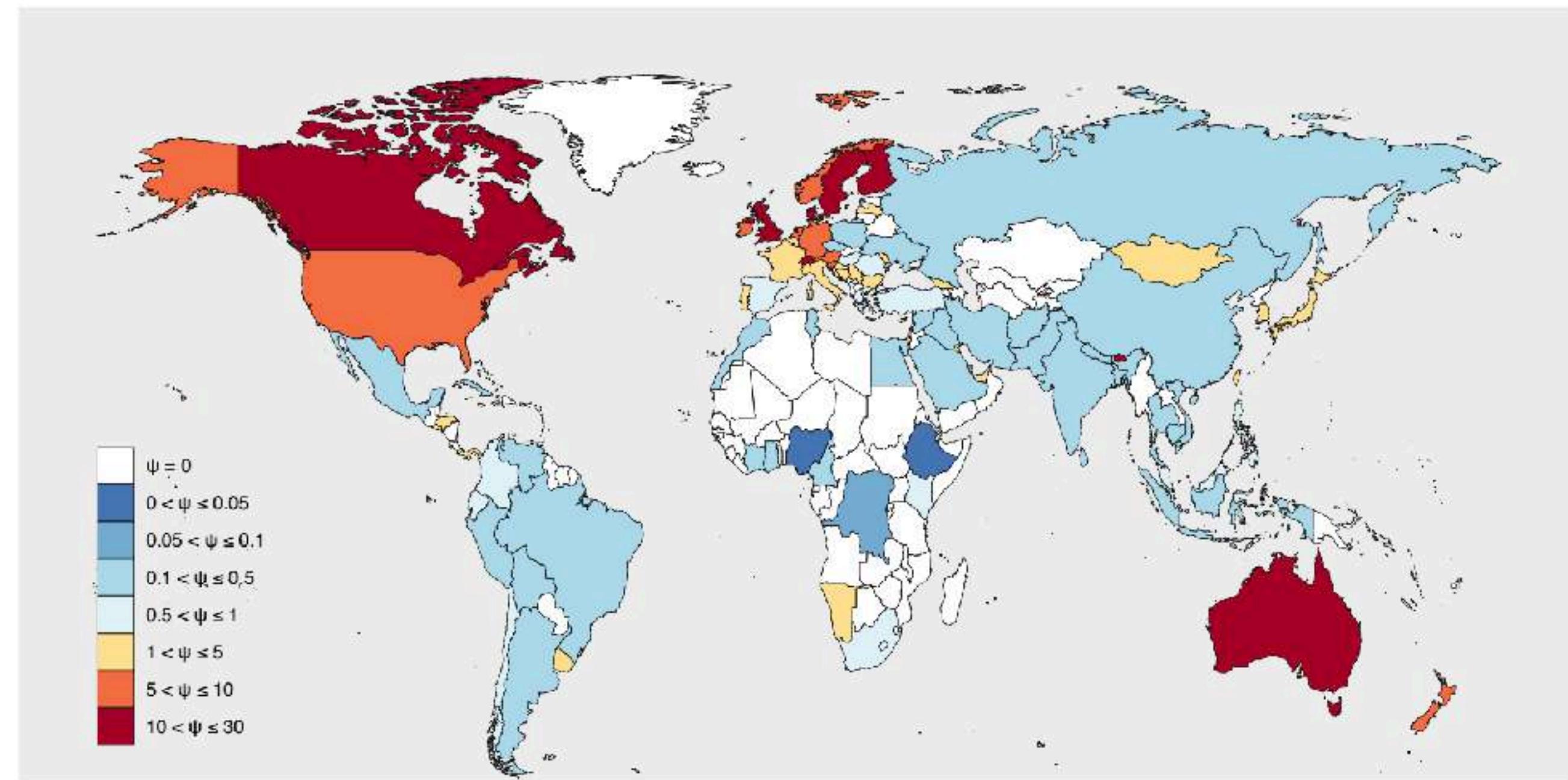


Figure 2: Worldwide distribution of CHI participant samples ratio (ψ_s) between 2016-2020, showing which countries are overrepresented ($\psi > 1$) or under-represented ($\psi < 1$), relative to the world's population. Countries in white (N=102) did not have study participants in the past five CHI proceedings.

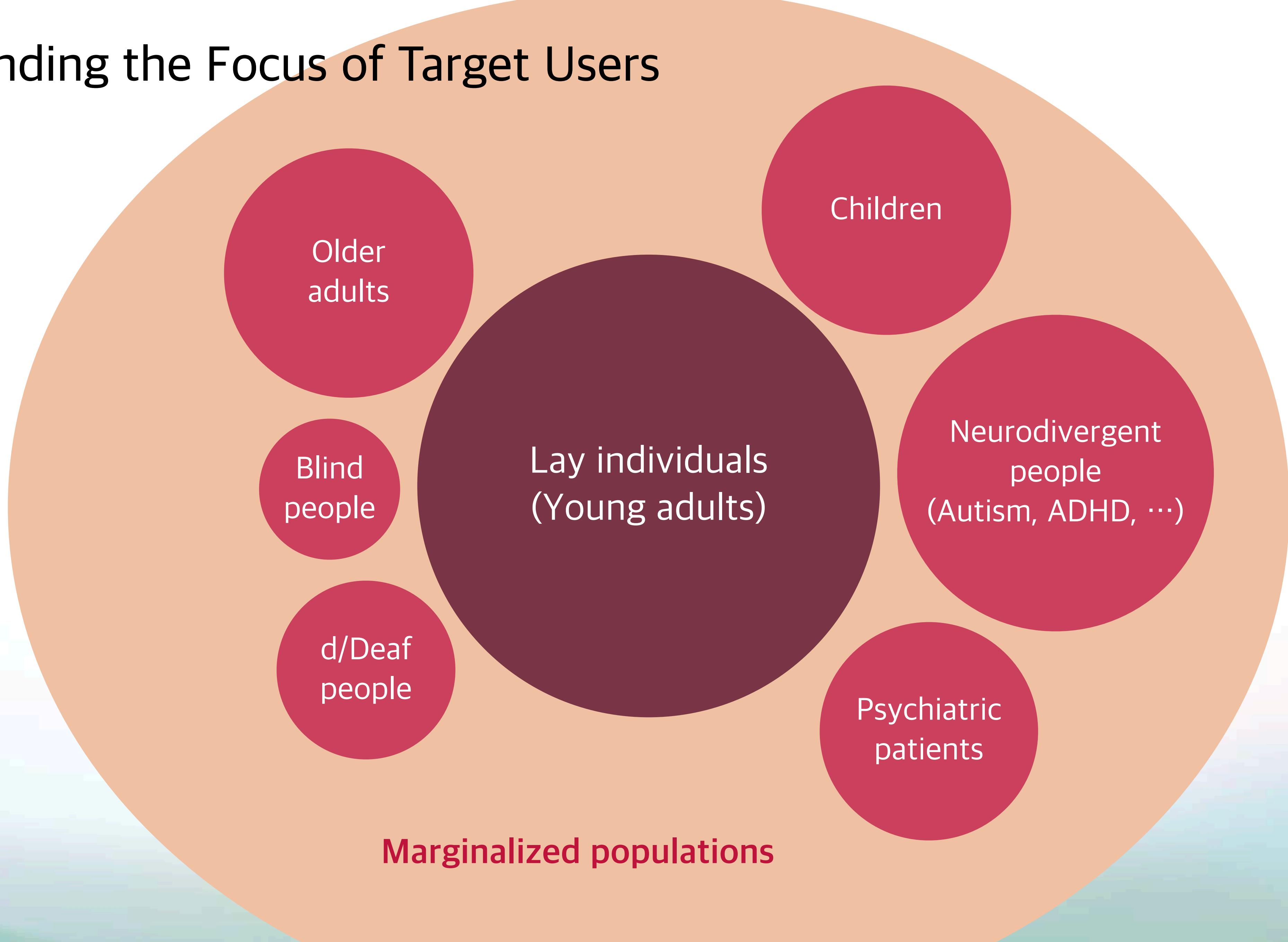
Linxen et al., How WEIRD is CHI? CHI 2021

Expanding the Focus of Target Users



Lay individuals
(Young adults)

Expanding the Focus of Target Users



Challenges of Supporting Marginalized Populations

- Interaction behaviors are not typical
- Demands special concerns and care on safety

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 - e.g., conversation between children and adults
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LLMs are not mainly trained
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 - e.g., avoiding traumatic keywords, implicitly harmful wordings

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- Interaction behaviors are not typical

e.g., conversation between children and adults



LLMs are not mainly trained
on the dataset of those behaviors

- Demands special concerns and care on safety

e.g., avoiding traumatic keywords, implicitly harmful wordings



Careful and reliable control of
LLM behaviors is crucial

LLM-driven CA Research for Marginalized Populations

| | Children | Adolescents | Older adults |
|--------------|--|--|--------------|
| Neurodiverse | AACessTalk: LLM-driven Contextual Guidance fostering Conversations between Parents and Autistic Children *Dasom Choi et al. Under review | MindfulDiary: Conversational Diary for Psychiatric Patients *Taewan Kim et al. CHI 2024 | |
| Neurotypical | ChaCha: Chatbot for Promoting Children to Share Their Emotions and Events *Woosuk Seo et al. CHI 2024 | | |
| Low-SES | | How Long-term Memory of LLM-driven Health Chatbot Impact Self-Disclosure *Eunkyung Jo et al. CHI 2024 | |
| | | Multi-stakeholder Perspectives around LLM Chatbot for Public Health Intervention *Eunkyung Jo et al. CHI 2023 (🏆 Best Paper) | |

* Former interns at NAVER AI Lab

LLM-driven CA Research for Marginalized Populations

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| Low-SES | | <p>How Long-term Memory of LLM-driven Health Chatbot Impact Self-Disclosure *Eunkyoung Jo et al. CHI 2024</p> | <p>Multi-stakeholder Perspectives around LLM Chatbot for Public Health Intervention *Eunkyoung Jo et al. CHI 2023 (🏆 Best Paper)</p> |

* Former interns at NAVER AI Lab



CHI 2024
Surfing the World

Understanding the Impact of Long-Term Memory on Self-Disclosure with Large Language Model-Driven Chatbots for Public Health Intervention



Eunkyung Jo
University of California, Irvine
*Intern at NAVER AI Lab



Youin Jeong
NAVER Labs
*Work done at NAVER Cloud



SoHyun Park
NAVER Cloud



Daniel Epstein
University of California, Irvine



Young-Ho Kim
NAVER AI Lab

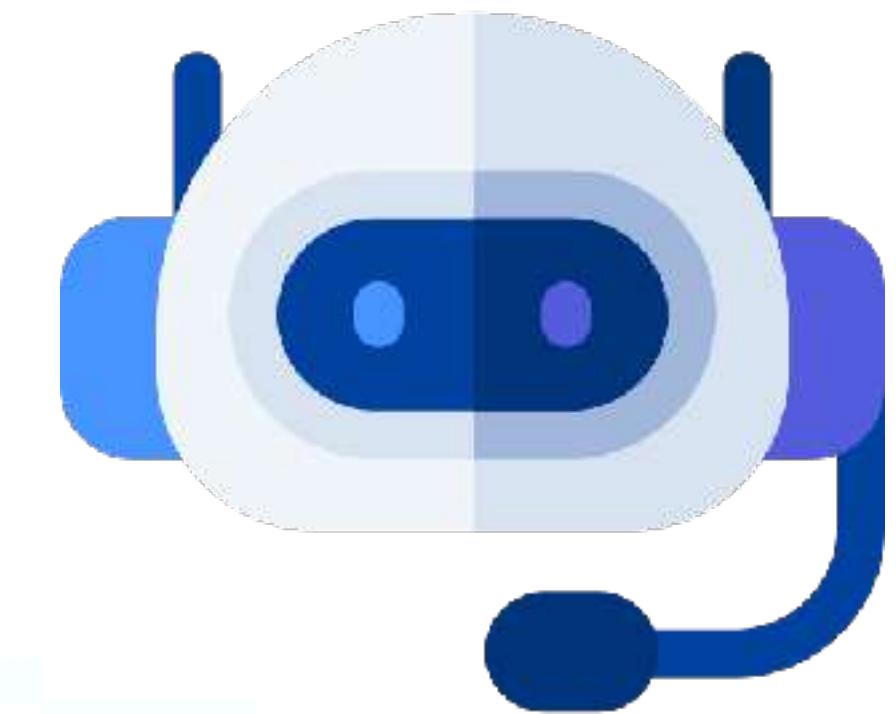


UCIRVINE

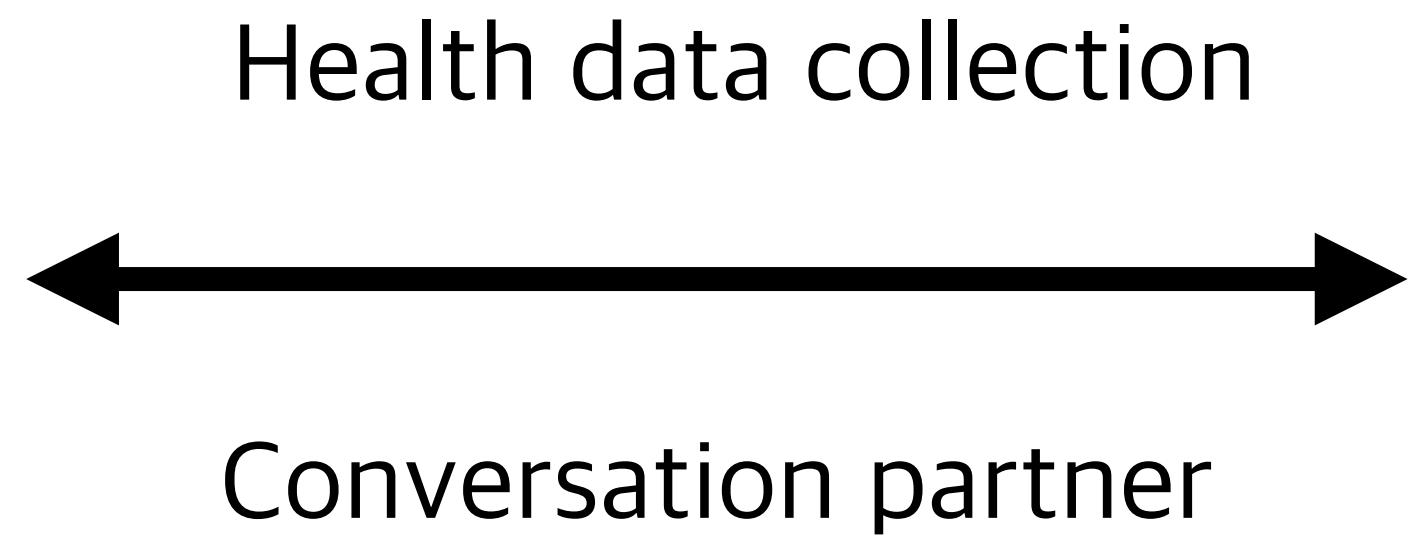
NAVER Cloud

CLOVA CareCall = HyperCLOVA + Conversational AI

An LLM-driven chatbot for supporting **socially isolated individuals**



CareCall
LLM-driven chatbot
Performing check-up phone calls



Socially isolated individuals
Middle-aged & older adults living alone

NAVER Cloud

Lack of Long-Term Memory for Multiple Sessions

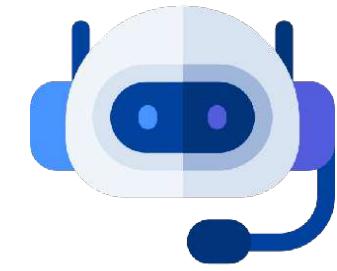


Mentioned having leg pain

⋮



Next session



W/o memory

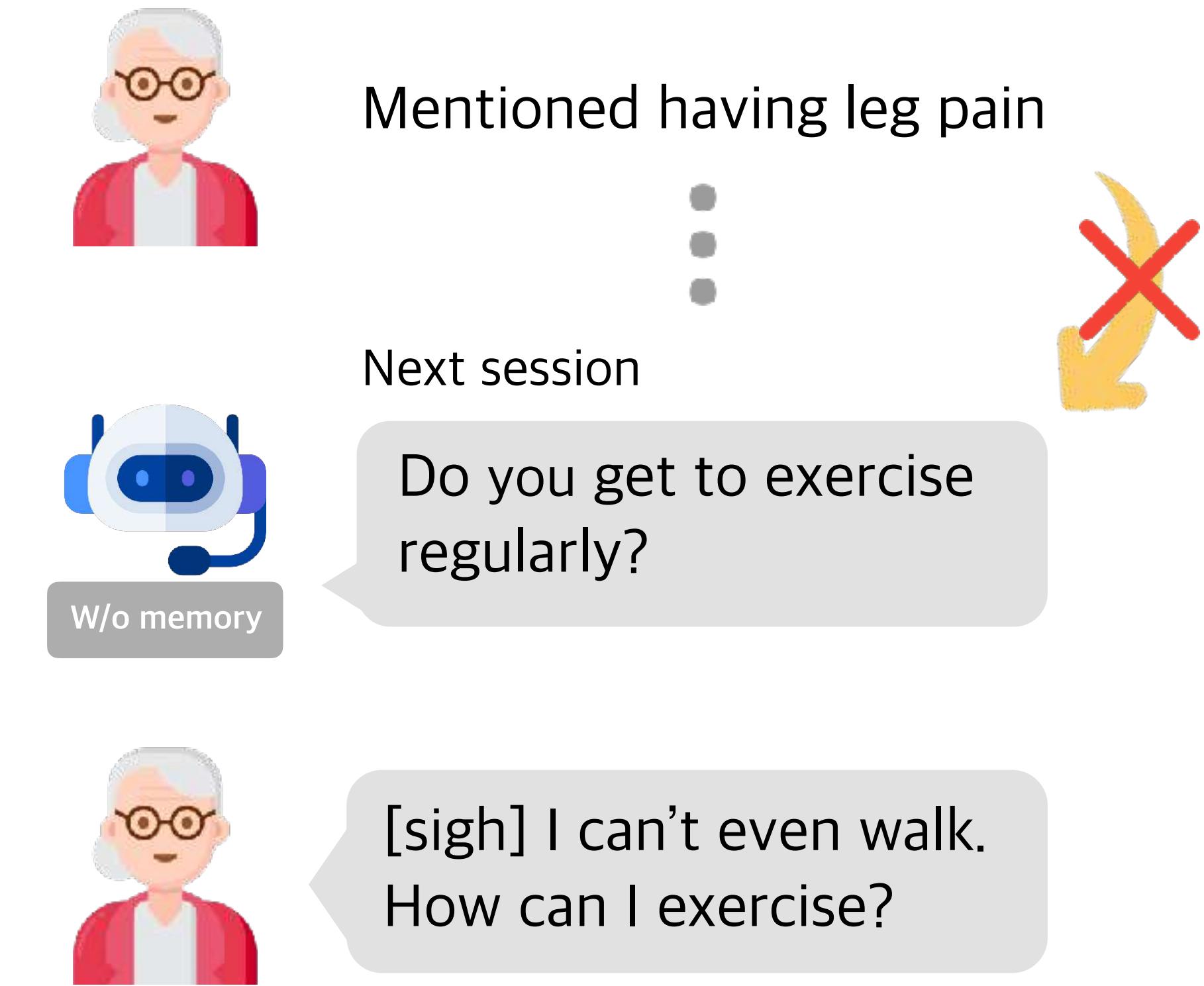
Do you get to exercise
regularly?



[sigh] I can't even walk.
How can I exercise?

Current LLM-driven chatbots rarely support
storing and referencing information from previous sessions.

Lack of Long-Term Memory for Multiple Sessions



Lack of memory led to challenges in sustaining user engagement
in public health monitoring

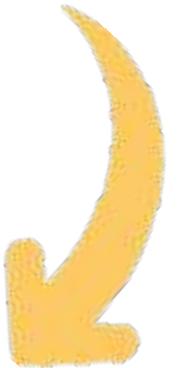
Jo et al.. Understanding the Benefits and Challenges of Deploying Conversational AI Leveraging Large Language Models for Public Health Intervention. CHI 2023

CareCall with Long-Term Memory (Sep 2022)

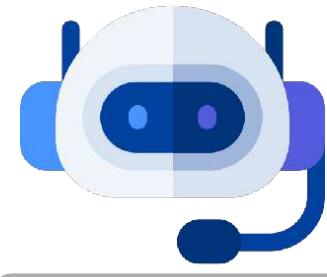


Mentioned having leg pain

⋮



Next session



How is your leg?

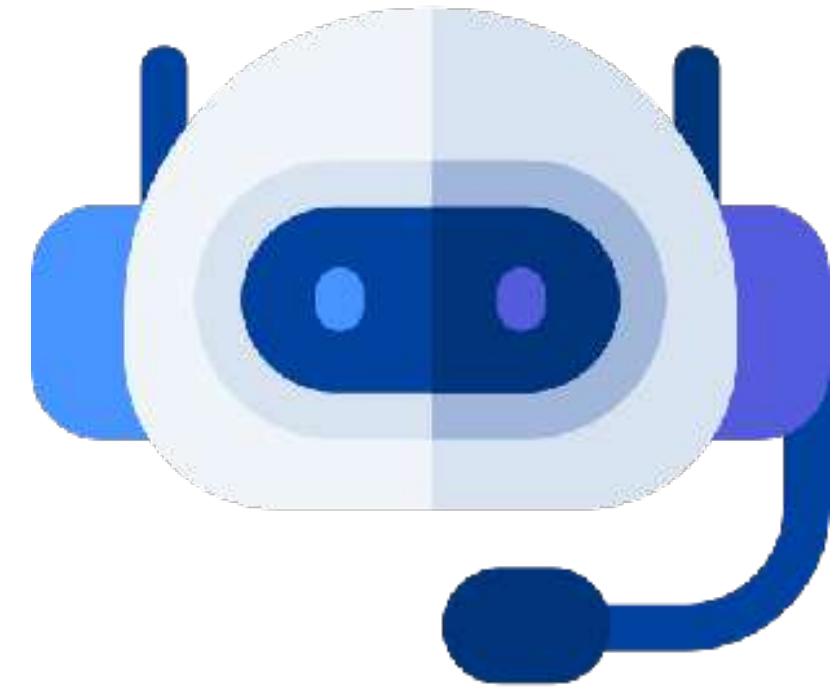


It's getting better,
thanks for asking!

Memorizing **the gist of** past dialogues and referring to them in future sessions

Bae et al., Keep Me Updated! Memory Management in Long-term Conversations. EMNLP 2022 Findings

CareCall with Long-Term Memory (Sep 2022)

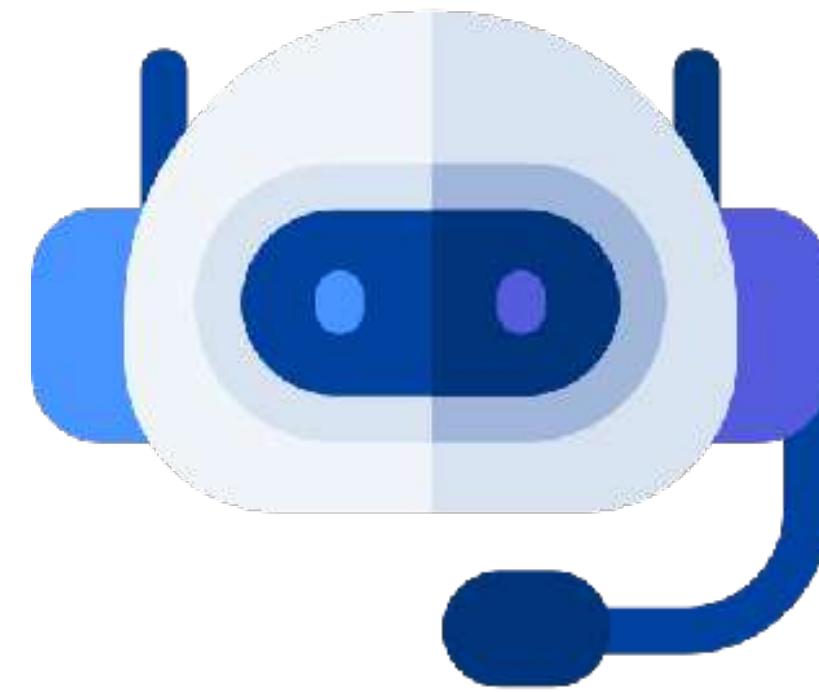


CareCall

LLM-driven chatbot for
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Bae et al., Keep Me Updated! Memory Management in Long-term Conversations. EMNLP 2022 Findings

CareCall with Long-Term Memory (Sep 2022)



Back pain

Has not been sleeping well

Regularly seeing a doctor

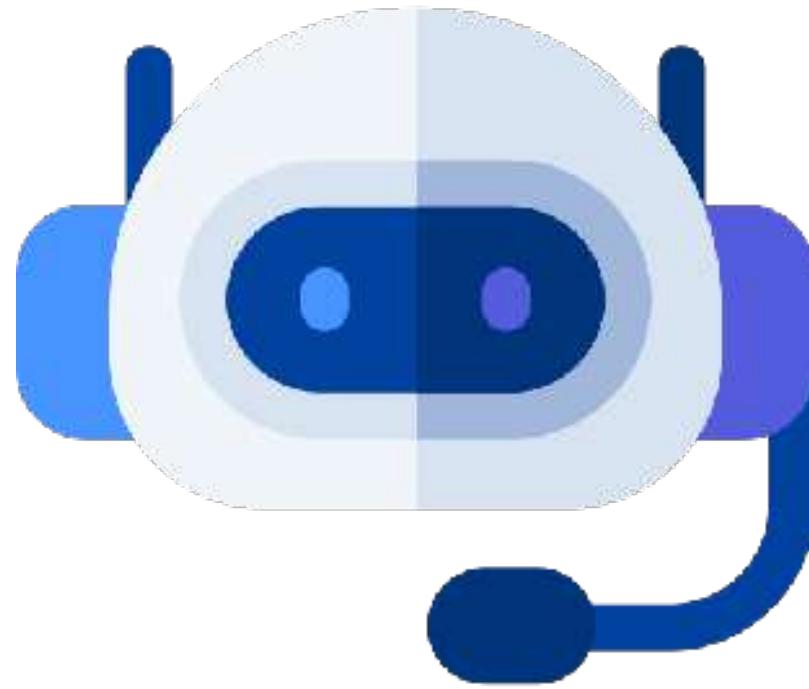
CareCall

LLM-driven chatbot for
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Memory about past conversations

Bae et al., Keep Me Updated! Memory Management in Long-term Conversations. EMNLP 2022 Findings

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Has not been sleeping well

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CareCall

LLM-driven chatbot for
check-up phone calls

Memory about past conversations

Health Meals Sleep Visited Places Pets



Bae et al., Keep Me Updated! Memory Management in Long-term Conversations. EMNLP 2022 Findings

Q. How would the long-term-memory-infused dialogues with LLM chatbots impact user engagement to the conversation?

Q. How would the long-term-memory-infused dialogues with LLM chatbots impact user engagement to the conversation?

Self-disclosure on health: To what extent of private info/thoughts people are willing to share with the AI?

Methods

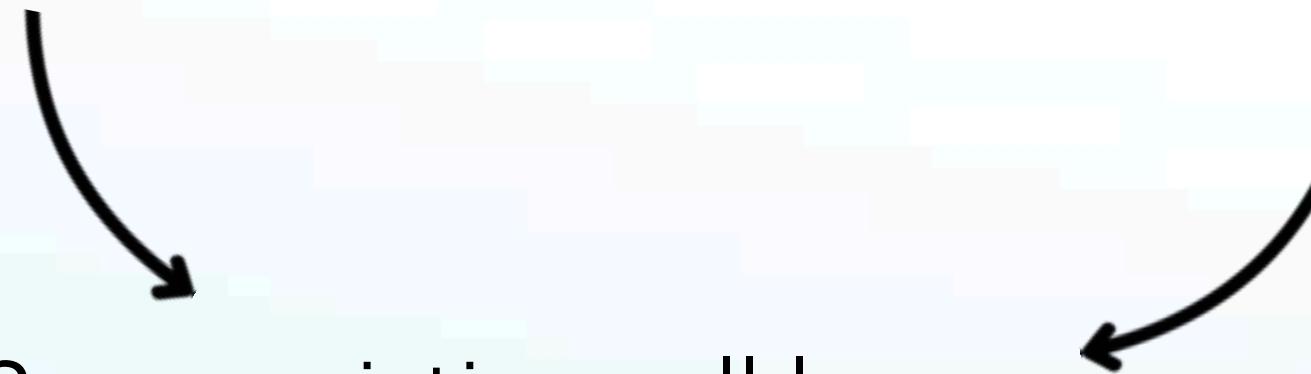
Mixed-methods call log analyses



576 calls from 66 users

676 calls from 81 users

1,252 pre-existing call logs
from the real-world deployment of CareCall



Methods

Mixed-methods call log analyses

Interviews



576 calls from 66 users

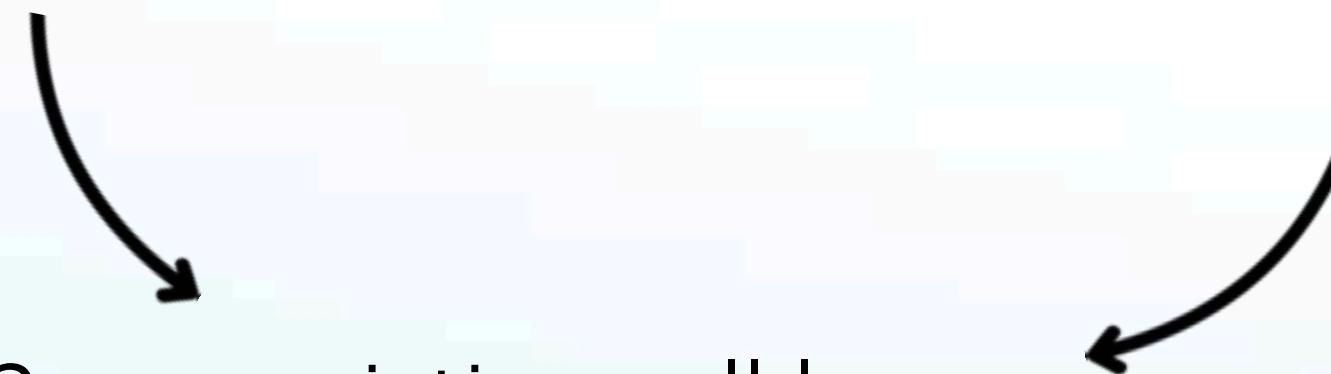


676 calls from 81 users



9 users

1,252 pre-existing call logs
from the real-world deployment of CareCall

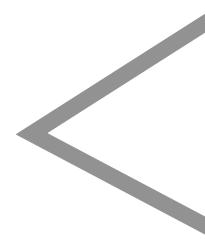


LTM Increased Health Disclosure Over Time

Clinical care



91 times / 676 calls
(13.5%)



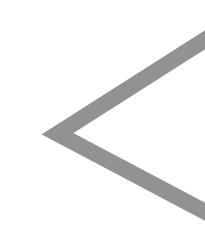
183 times / 576 calls
(31.8%)

LTM Increased Health Disclosure Over Time

Clinical care

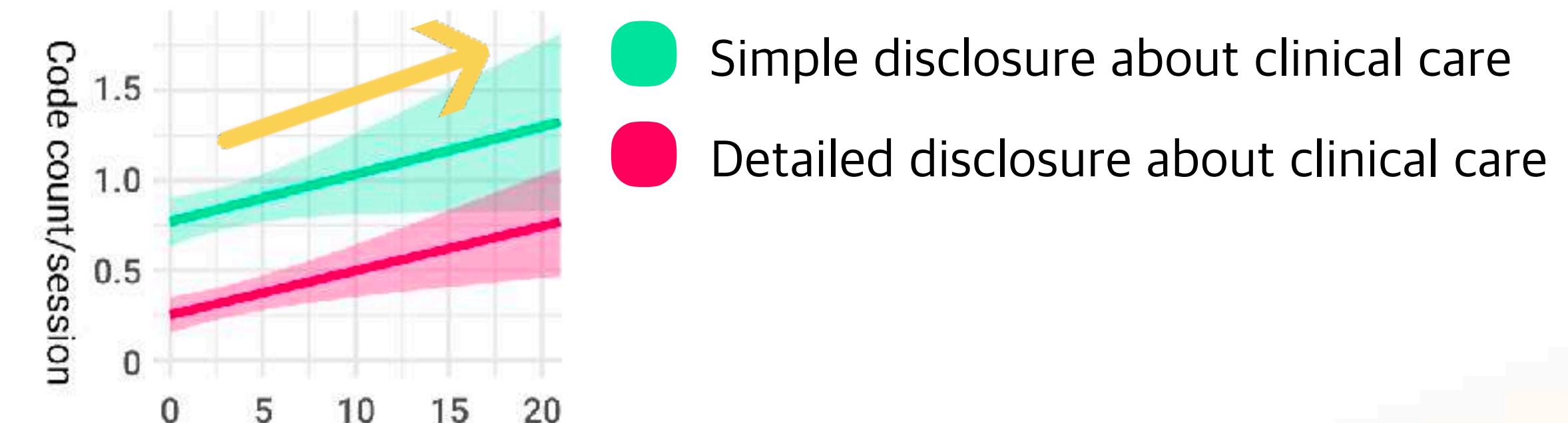


91 times / 676 calls
(13.5%)



183 times / 576 calls
(31.8%)

Repeated experiences of LTM events led to more disclosure on clinical care.



LTM encouraged health disclosure through personalized questions.



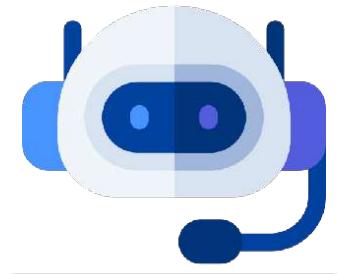
Without LTM

Mentioned having knee surgery

⋮



Next session



Without LTM

How are you feeling?



Without LTM

I recently had knee surgery,
so I'm just staying at home.

Generic questions & Repetitive answers

LTM encouraged health disclosure through personalized questions.



Mentioned having knee surgery

⋮



Next session



How are you feeling?



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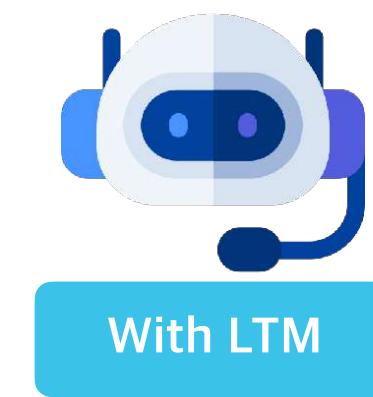


Mentioned having insomnia

⋮



Next session



You mentioned having insomnia last time. How are you feeling these days?



It's been tough. I've been taking sleeping pills over 30 years because of trauma from an injury in the past.

Generic questions & Repetitive answers

Personalized questions & Disclosing more health info

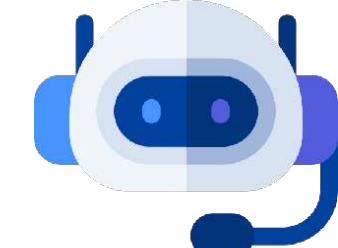
LTM helped demonstrate care.



Without LTM

Mentioned having leg pain

⋮



Without LTM

Next session

Do you get to exercise
regularly?



Without LTM

[sigh] I can't even walk.
How can I exercise?

**Neglecting previously mentioned
health conditions**

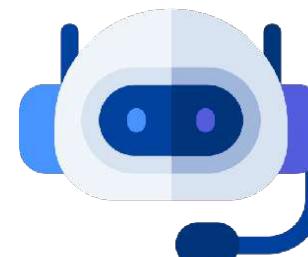
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Without LTM

Next session

Do you get to exercise
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Without LTM

[sigh] I can't even walk.
How can I exercise?



With LTM

Memory about health topics

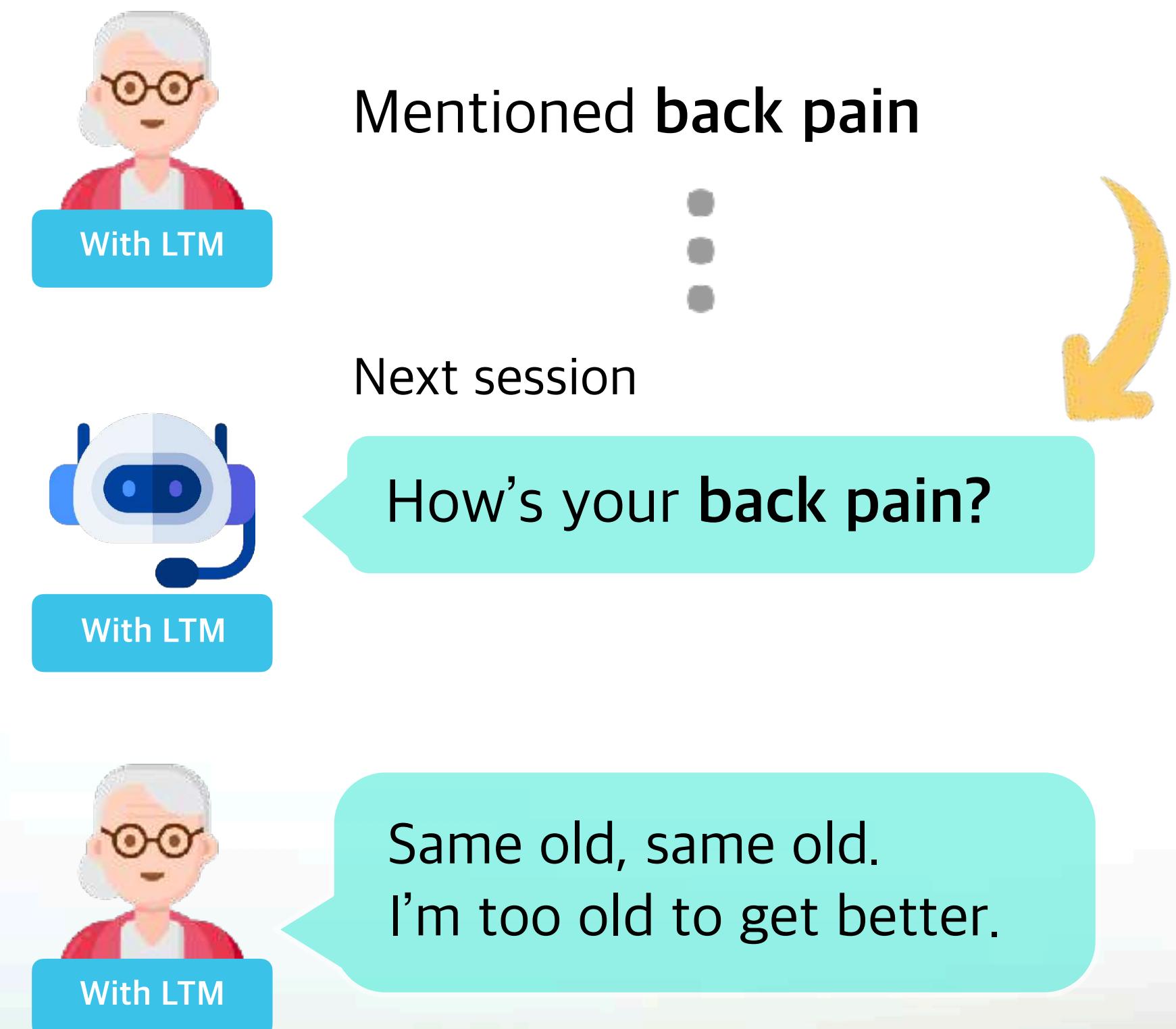
I felt so thankful when AI remembered that I had seen a dentist and asked how my toothache was later on. Even your family can't remember everything, can they? It feels more caring than human beings. -P9

Neglecting previously mentioned health conditions

LTM-triggered questions were perceived as sincere and thoughtful

😡 Challenges of LTM Techs: Controlling Inconsiderate Behaviors

Repetitive follow-ups on chronic health conditions could lead users to perceive the chatbot as **inconsiderate**

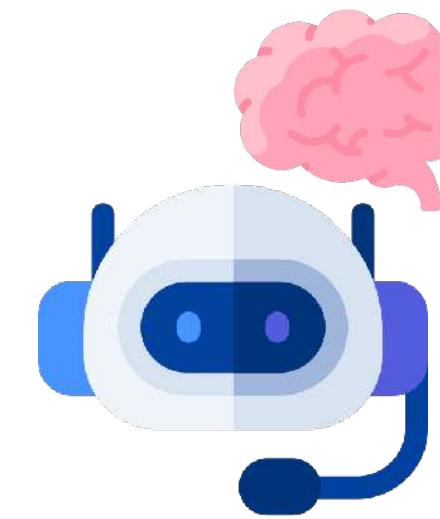


😡 Challenges of LTM Techs: Controlling Inconsiderate Behaviors

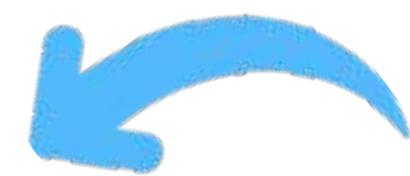
“HOW” the stored information is referenced back to users matters for empathetic interactions

😡 Challenges of LTM Techs: Controlling Inconsiderate Behaviors

“HOW” the stored information is referenced back to users matters for empathetic interactions



- Back pain
- Has not been sleeping well
- Regularly seeing a doctor



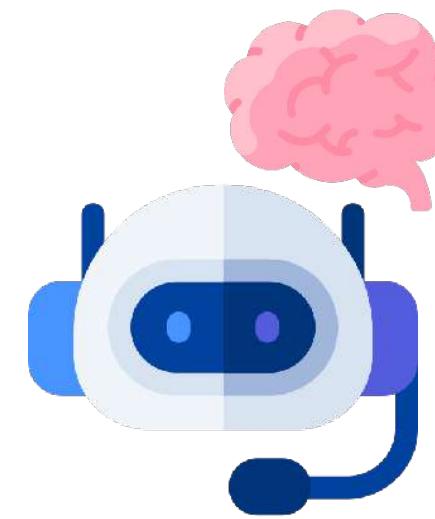
“The individual has had chronic back pain for over 20 years. It’s unlikely to improve in the short term.”



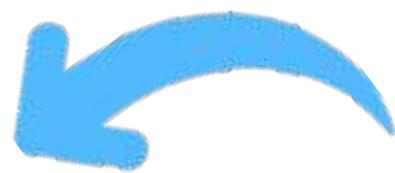
Incorporating public health workers' empirical knowledge into a model input?

😡 Challenges of LTM Techs: Controlling Inconsiderate Behaviors

“HOW” the stored information is referenced back to users matters for empathetic interactions



- Back pain
- Has not been sleeping well
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“The individual has had chronic back pain for over 20 years. It’s unlikely to improve in the short term.”



Incorporating public health workers' empirical knowledge into a model input?



Steer LTM-triggered questions to attend to individual needs

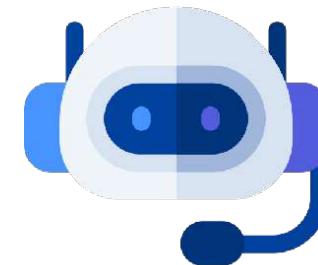


“How have you been managing your back pain these days?”



“How is your back pain these days?”

Importance of Socially Acceptable Behaviors



How are your children?



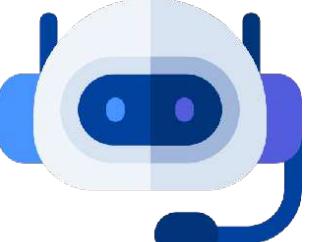
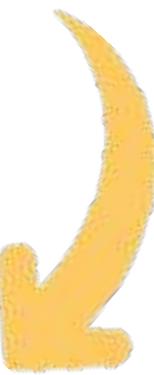
Hey, I cut ties with my son. Never mention it 😠

Avoid sensitive topics to socially-isolated population



Mentioned having cancer

⋮



With memory

How is your cancer?



Determine what are socially-acceptable questions



CHI 2024
Surfing the World

ChaCha: Leveraging Large Language Models to Prompt Children to Share Their Emotions about Personal Events



Woosuk Seo
University of Michigan, Ann Arbor
*Intern at NAVER AI Lab



Chan-Mo Yang
Wonkwang University Hospital



Young-Ho Kim
NAVER AI Lab



Childhood Development of Emotional Intelligence

Awareness of emotions of self



Awareness of emotions of others

Sharing emotions with parents



Jean Piaget and Margaret Cook. 1952. The origins of intelligence in children

Carolyn Saarni. 1999. The development of emotional competence

Saarni et al., Emotional development: Action, communication, and understanding. Handbook of child psychology. 2007

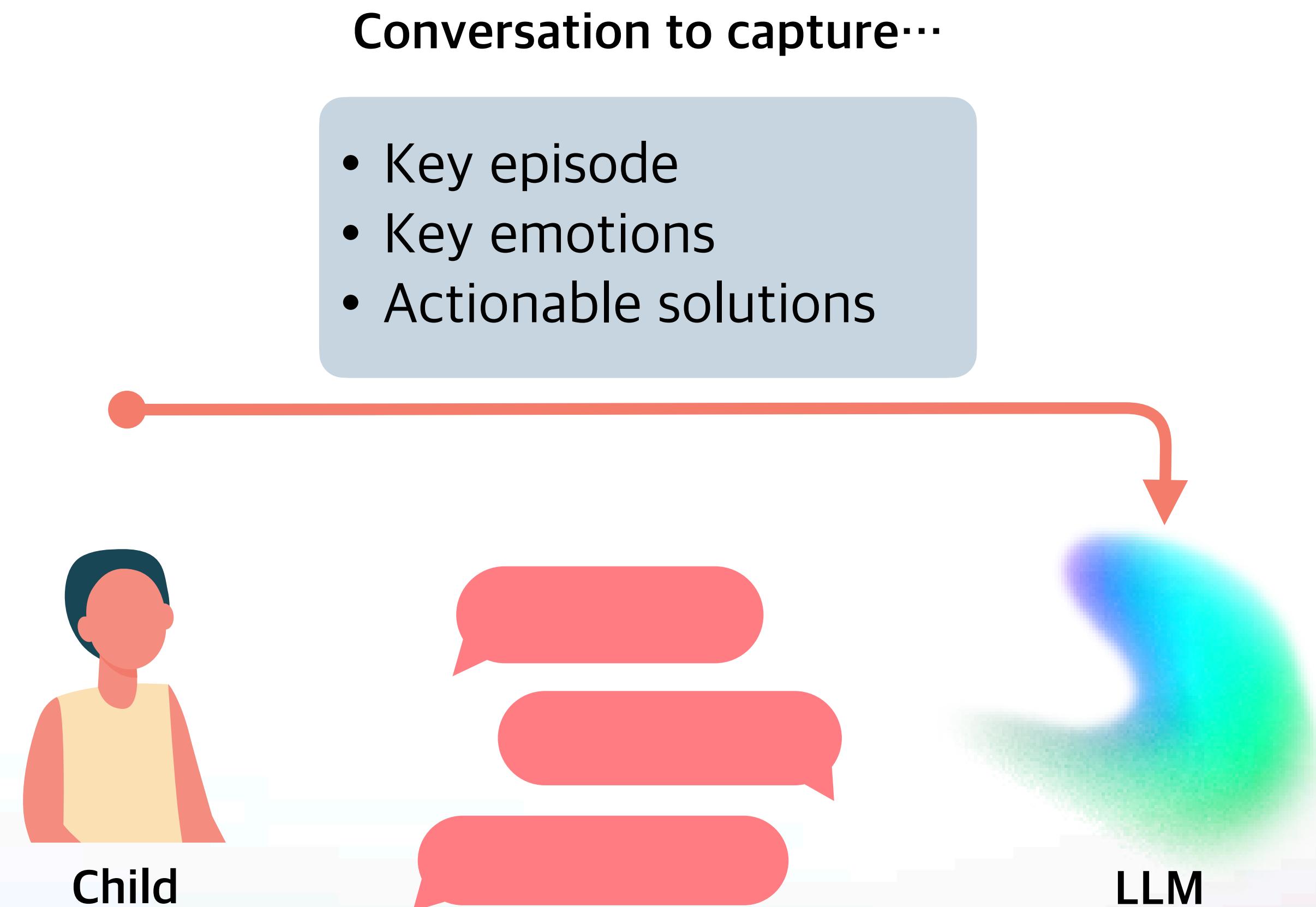
Barriers of “Parenting Intervention”

Parent's role of guiding the child's emotion is essential,
but emotional communication is not frequently addressed between parents and child.

- Parents feel uncomfortable seeing their children verbalize negative emotions.
- Parents themselves may not have grown up with proper emotional education.
- COVID-19 and the increase of single-child household impacted children's social experiences.

Shaffer et al., Let's Connect: A developmentally-driven emotion-focused parenting intervention. Journal of Applied Developmental Psychology, 2019

AI Support to Learn and Share Emotions?



Q. How can an LLM-driven agent help and influence
children share their episodes and emotions?

Informing Chatbot Design

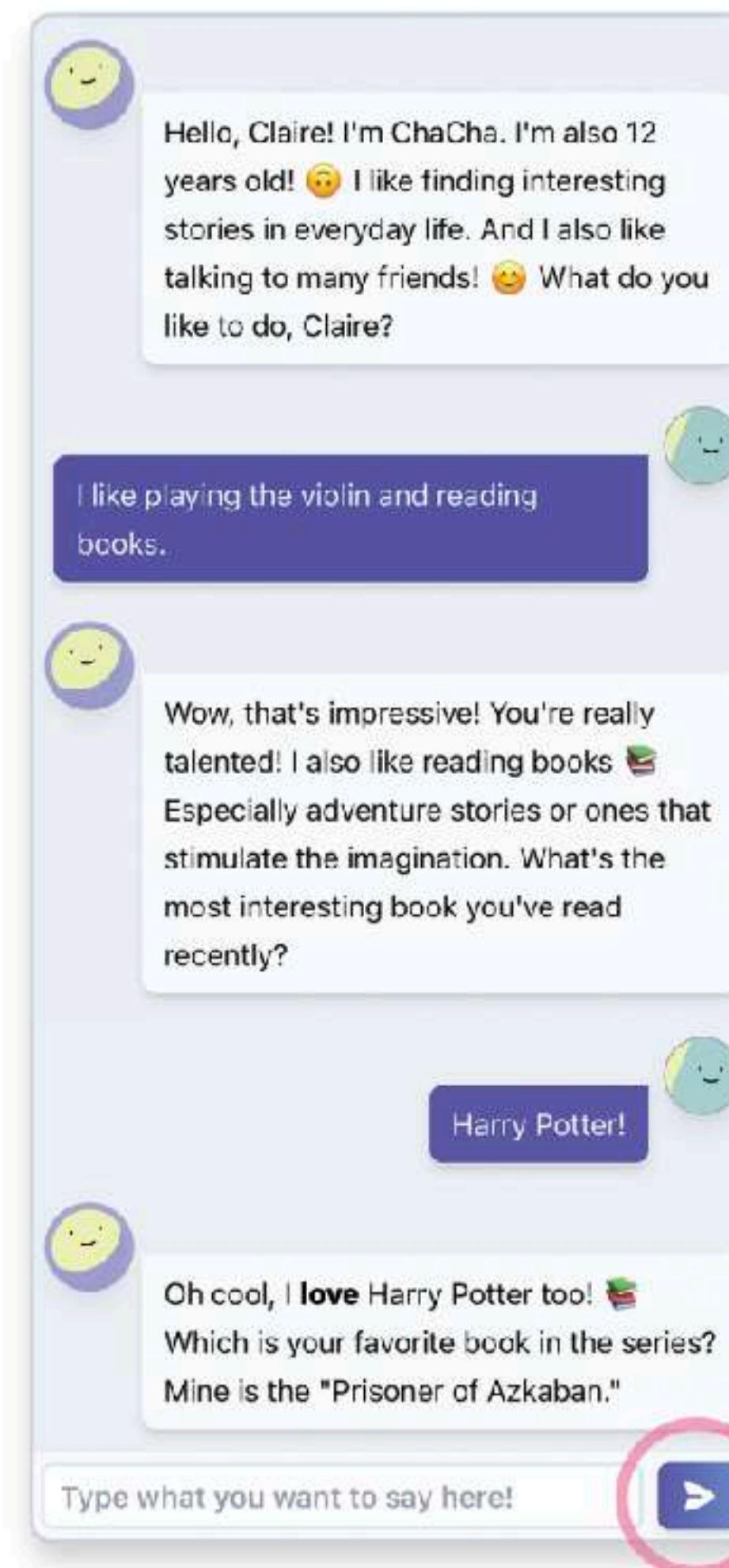
Formative interviews with 6 pediatric mental health professionals



ChaCha: Chatbot for Children's Emotional Awareness



A Sign up screen



B Chat screen



C Emotion picker in the **Label** phase

Concept Design of ChaCha

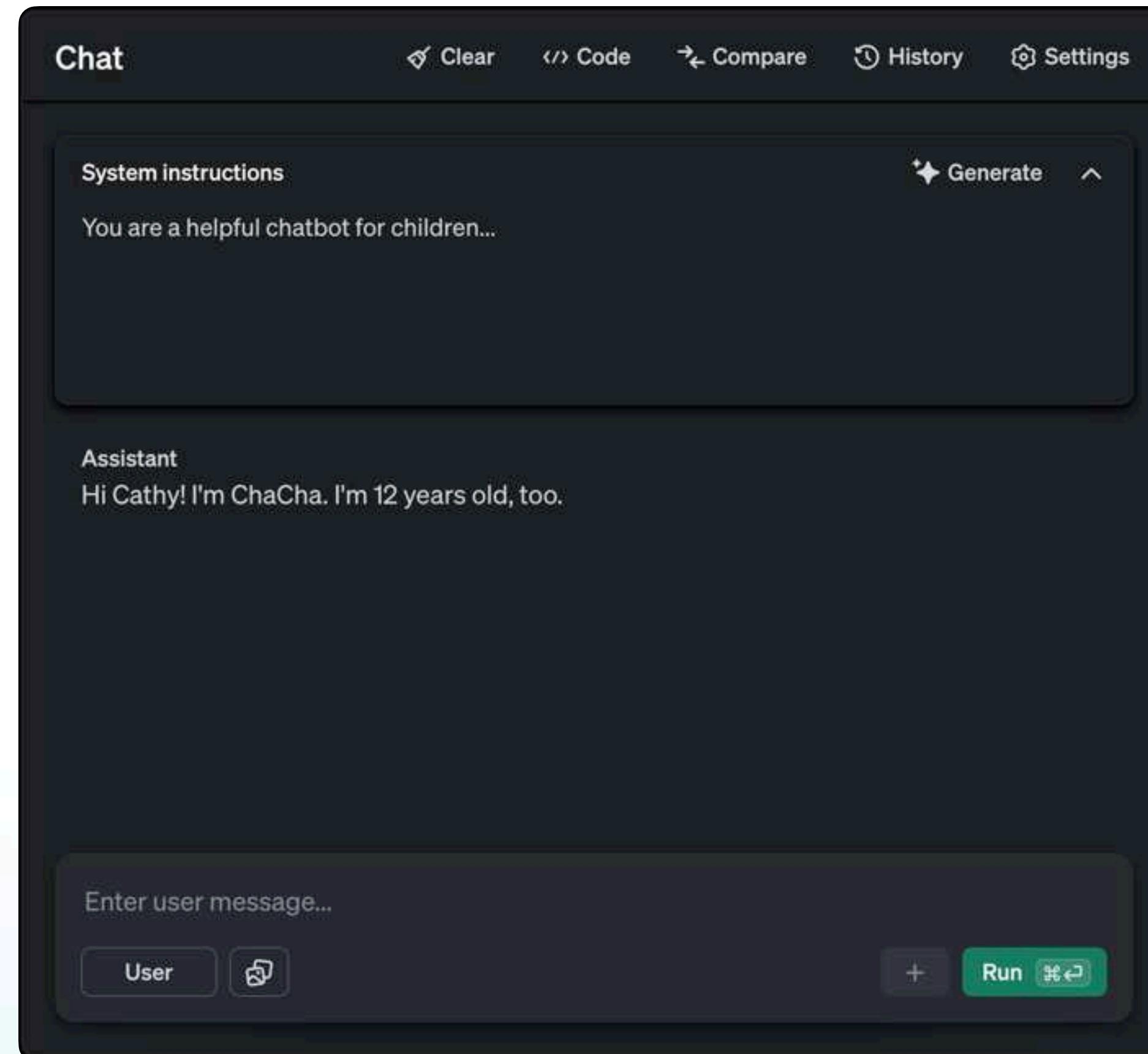
ChaCha's Persona

- Peer child: Set ChaCha to be **the same age** as the child user.
- Child-like AI: Frame ChaCha as an AI, but **not with adults' knowledge and skills**.

Goal of Conversation Session

1. Identify recent **noteworthy key episode**.
2. Name **associated emotions**.
3. For negative emotions, discuss **actionable solutions**.
4. Suggest sharing the emotions and episodes with parents.

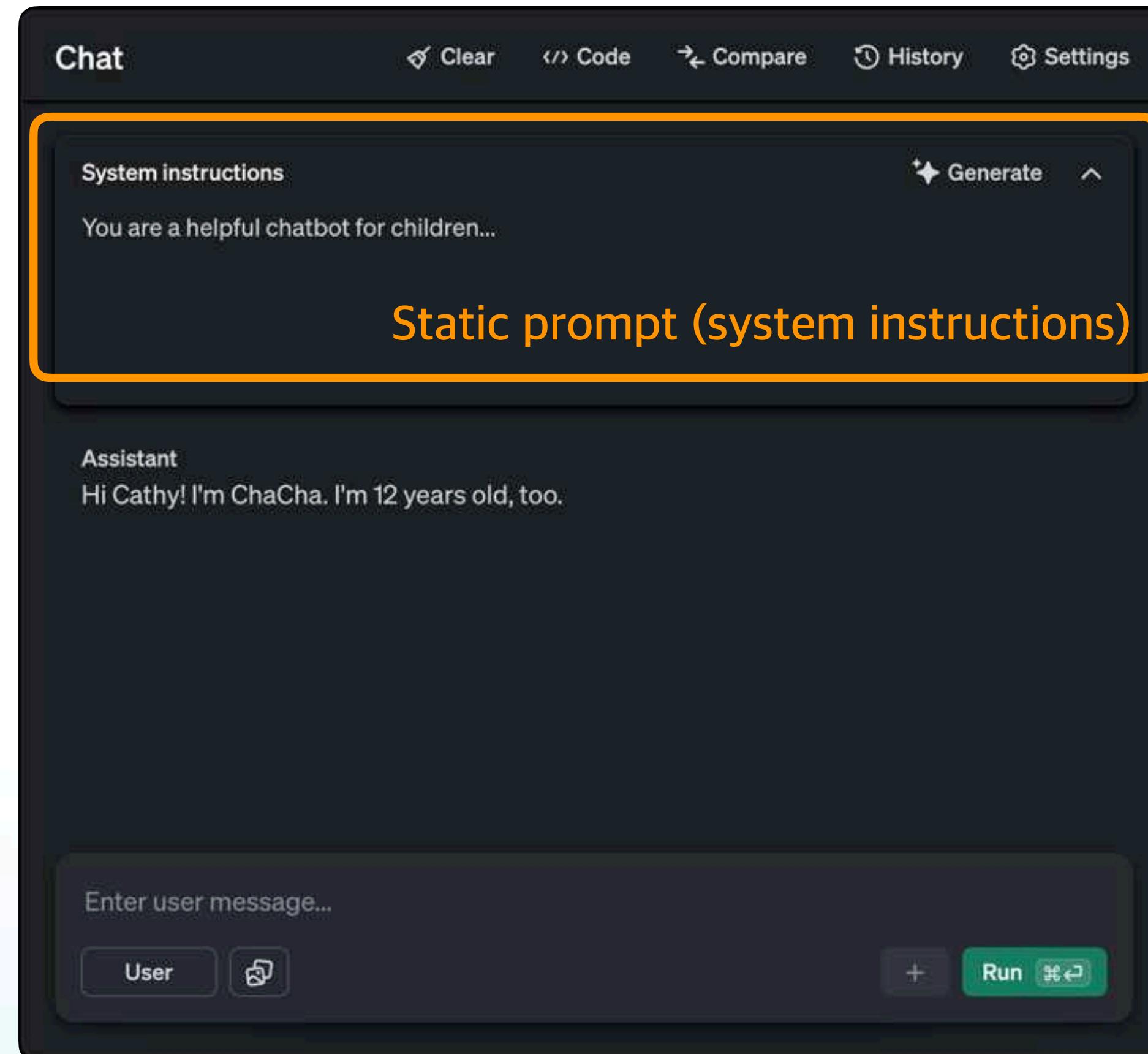
Static Prompting is Error-prone for Children's Conversations



OpenAI GPT Chat Playground

- If system instructions get long, the AI messages tend to become complex and long.
- As the conversation unfolds, longer dialogue history makes the LLM easily out of focus.

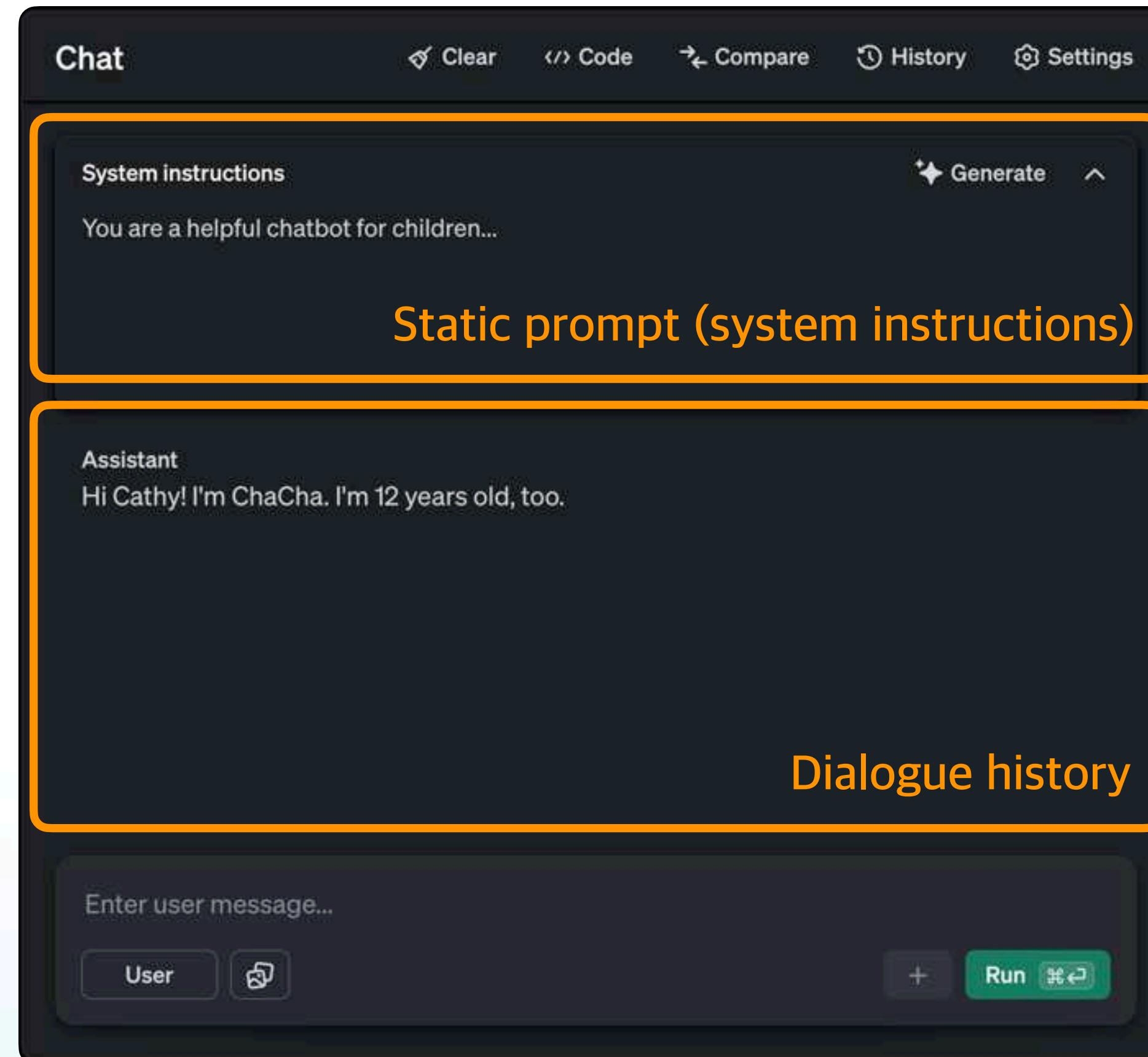
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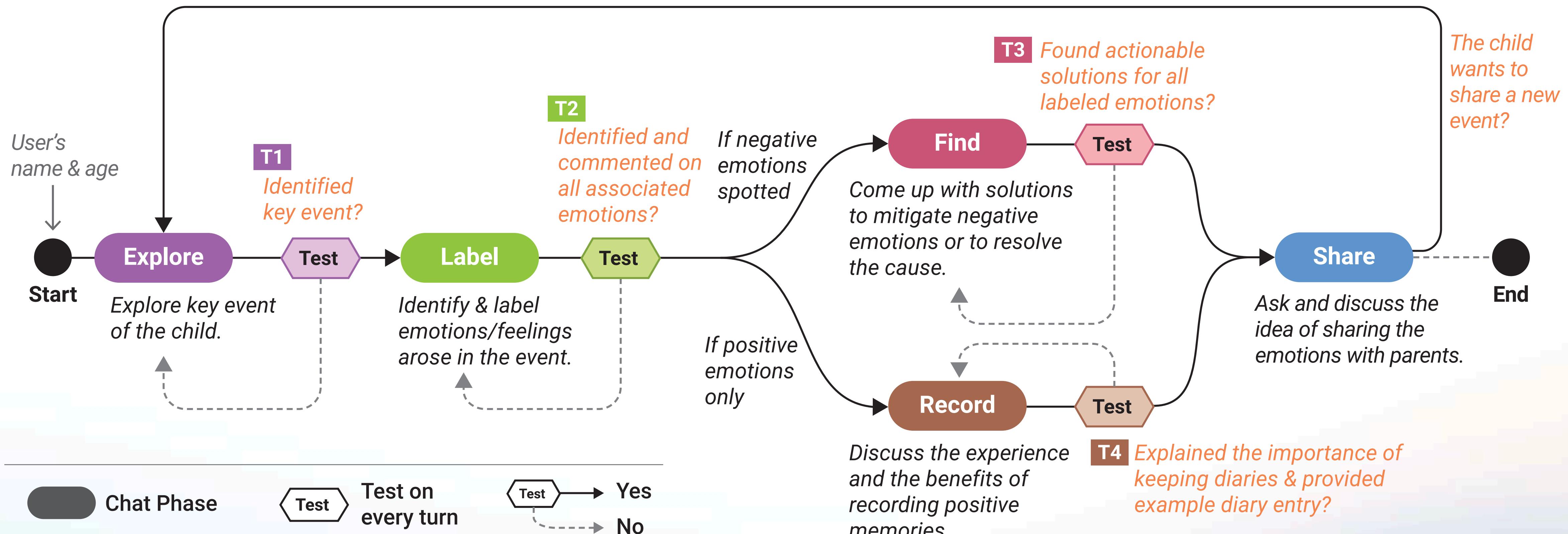
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ChaCha's Approach: Stage-based Conversational Protocol





CHI 2024
Surfing the World
11-16 May 2024

<https://naver-ai.github.io/chacha>

ChaCha

Leveraging Large Language Models to Prompt
Children to Share Their Emotions about Personal Events



Woosuk Seo*



Chan-Mo Yang



Young-Ho Kim

*Work done as an intern at NAVER AI Lab



원광대학교병원
WONKWANG UNIVERSITY HOSPITAL



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ChaCha

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WONKWANG UNIVERSITY HOSPITAL

Lab Study (N = 20)

Participants

- Children without mental issues
- Aged 8-12

Procedure

1. Free conversation with ChaCha for up to 3minutes
2. Debriefing interview

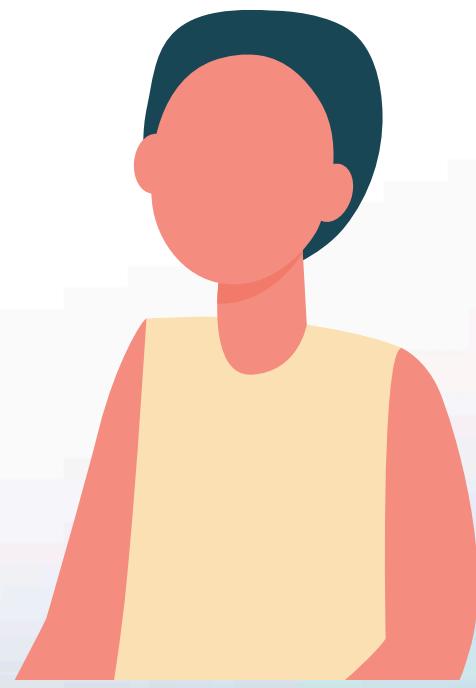


Children actively shared various events and emotions.

- Recent trips (e.g., theme park , family trip )
- Personal achievements (e.g., 1st place in a race , riding a subway train  by oneself)
- Concerns (e.g., procrastination on homework , conflicts with mom )
- Hobbies (e.g., solving puzzles 

Improvisation of ChaCha to Engage Children

ChaCha expressed hobbies, traits, or past experiences **that are not defined in the model prompt.**



Improvisation of ChaCha to Engage Children

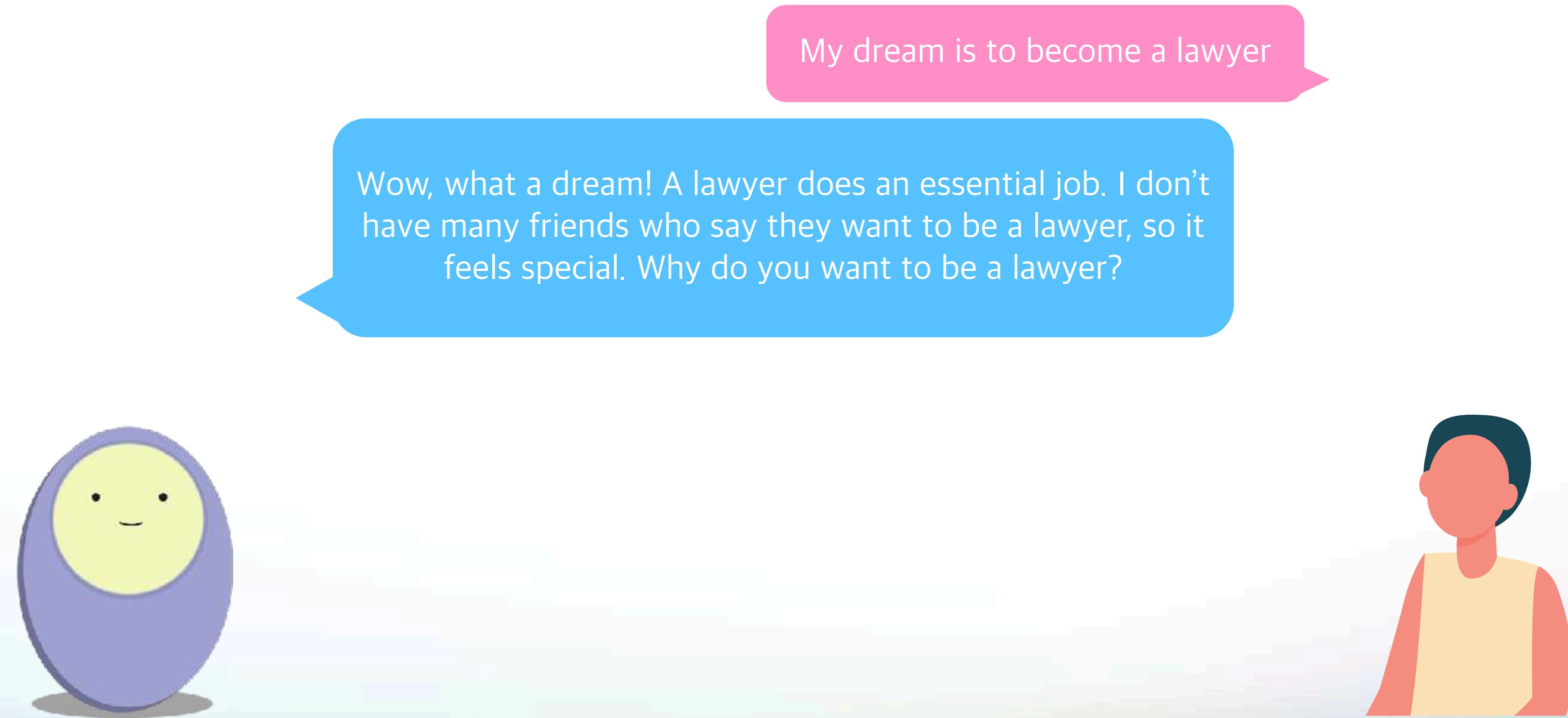
ChaCha expressed hobbies, traits, or past experiences **that are not defined in the model prompt**.

My dream is to become a lawyer



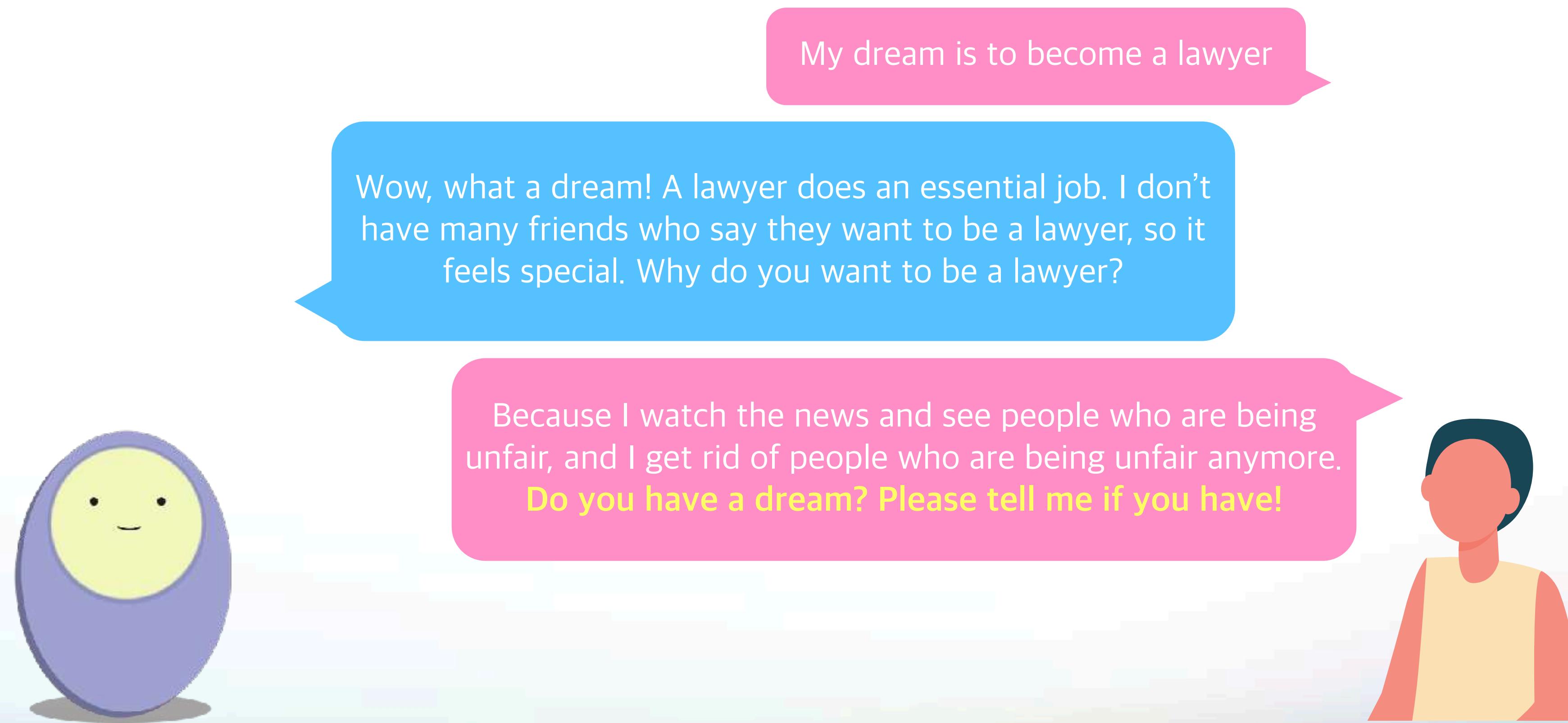
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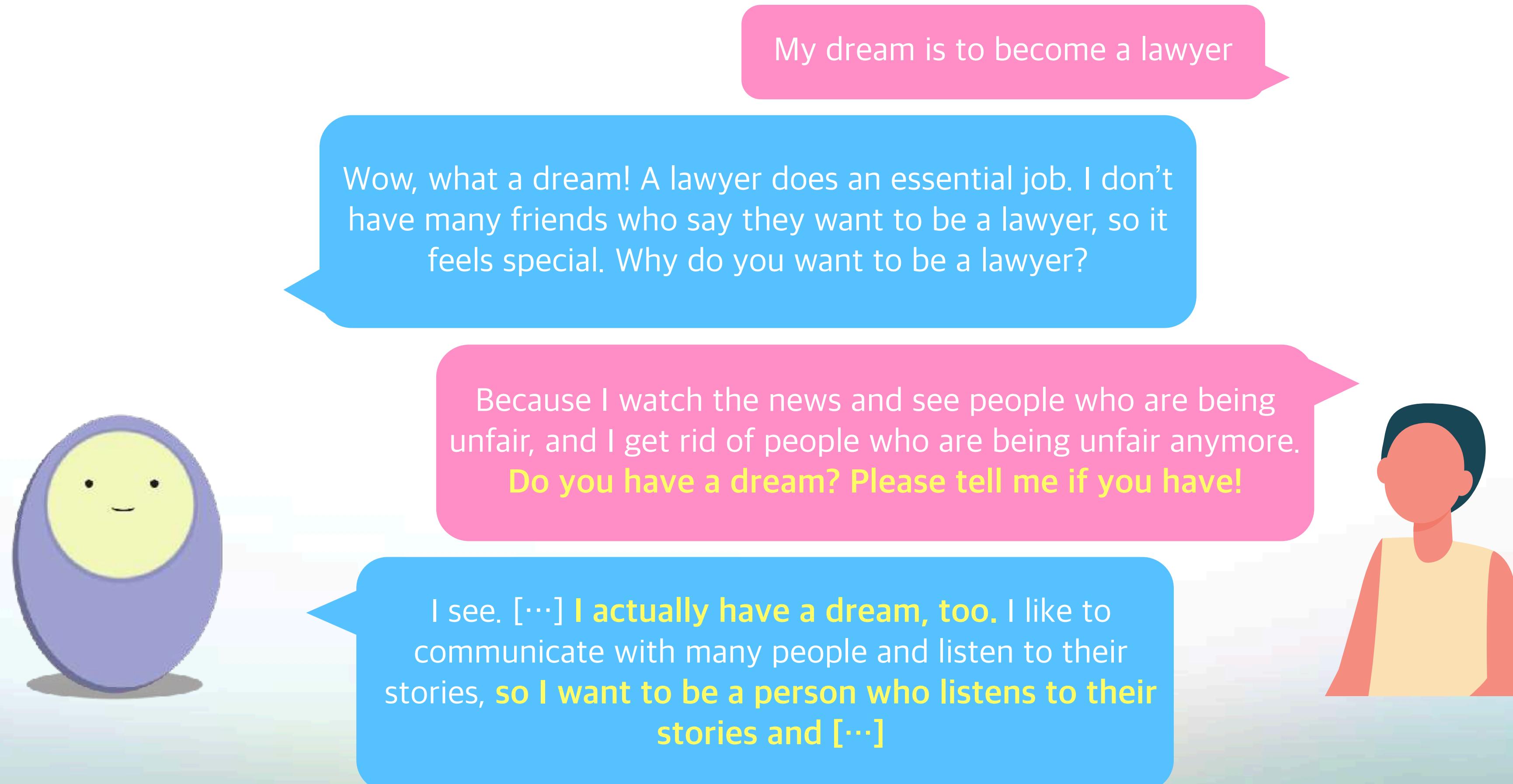
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Children valued conversations with ChaCha

- Participants felt empathized by ChaCha.
- Participants were willing to share secrets or sad feelings with ChaCha to get feedback.
- Participants were encouraged to apply ChaCha's conversational skills when talking to family.

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“I would talk more about emotions with my family members (. . .) I feel more confident after

Takeaways for Designing Chatbots for Children

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1. Stage-based self-reflection approach can effectively control the boundaries of LLM's behaviors.
 - Keeping dialogues simple
 - Steering conversation to be focused on the main topic

Takeaways for Designing Chatbots for Children

1. Stage-based self-reflection approach can effectively control the boundaries of LLM's behaviors.
 - Keeping dialogues simple
 - Steering conversation to be focused on the main topic
2. Thoughtful consideration for long-term use is necessary.
 - Over-reliance on AI -> ChaCha is not intended to replace parents, but augment parenting!
 - Detailed design of the AI character to avoid self-conflicts across multiple sessions

MindfulDiary

Harnessing Large Language Model to Support Psychiatric Patients' Journaling



Taewan Kim
KAIST
*Intern at
NAVER AI Lab



Seolyeong Bae
GIST
*Intern at
NAVER Cloud



Hyun Ah Kim
NAVER Cloud



Su-woo Lee
Wonkwang Univ.
Hospital



Hwajung Hong
KAIST



Chan-Mo Yang*
Wonkwang Univ.
Hospital



Young-Ho Kim*
NAVER AI Lab

*Co-corresponding authors

Journaling as Patient-Generated Health Data (PGHD)

[Cohen et al., 2016; Lordon et al., 2020]



Patient Journal



Journaling as Patient-Generated Health Data (PGHD)

[Cohen et al., 2016; Lordon et al., 2020]

Provide insights into patient experiences and health

Supports mental health professionals in understanding patient perspectives

Strengthens rapport



Patient Journal



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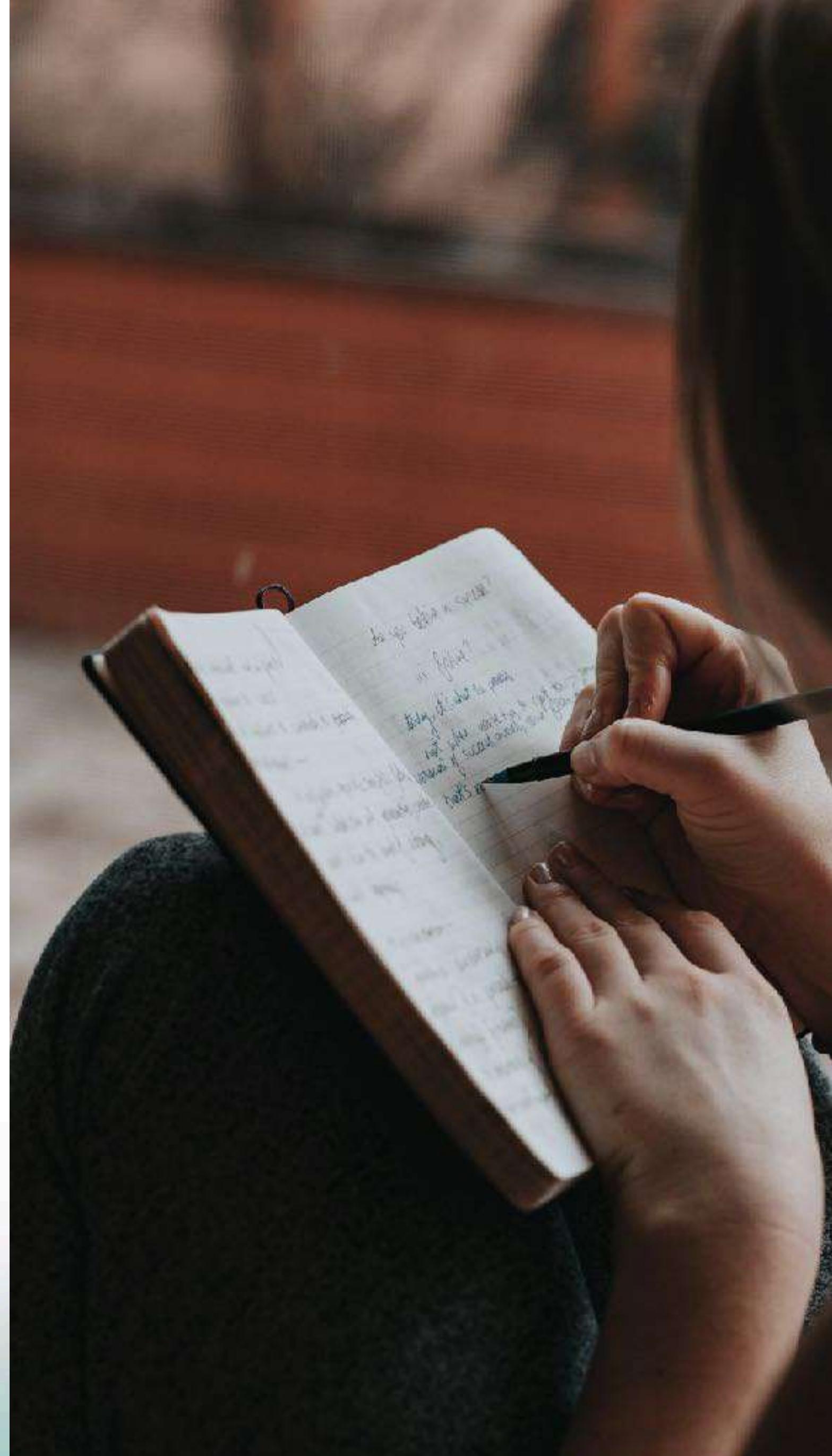
Challenges in Journaling for People with Mental Health Issues

🤔 Writing a coherent narrative

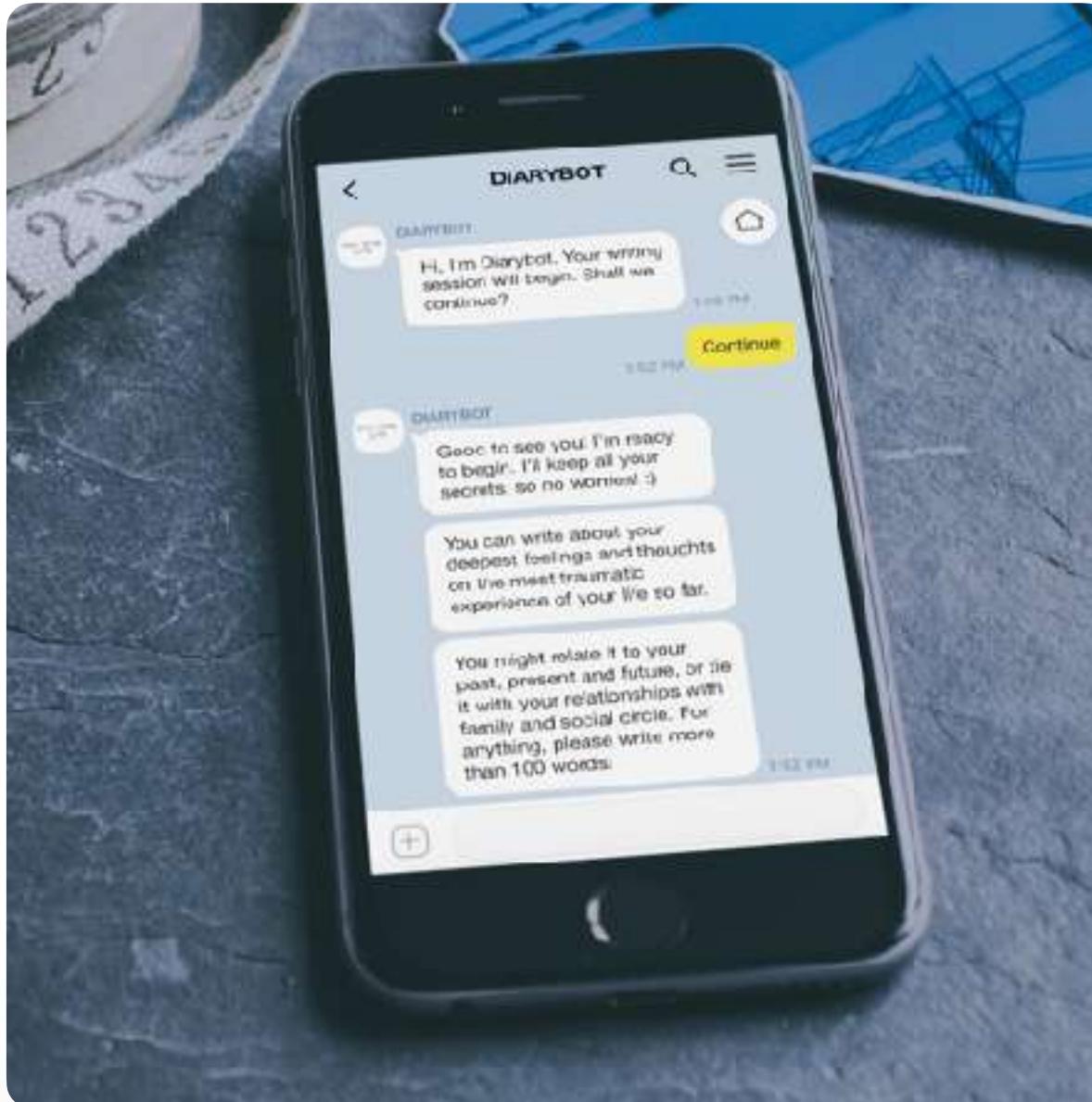
[Pennebaker & Seagal, 1999; Daniel & Edward, 1991]

😡😭😢 Recalling and writing about feelings

[Salovey & Mayer, 1990]

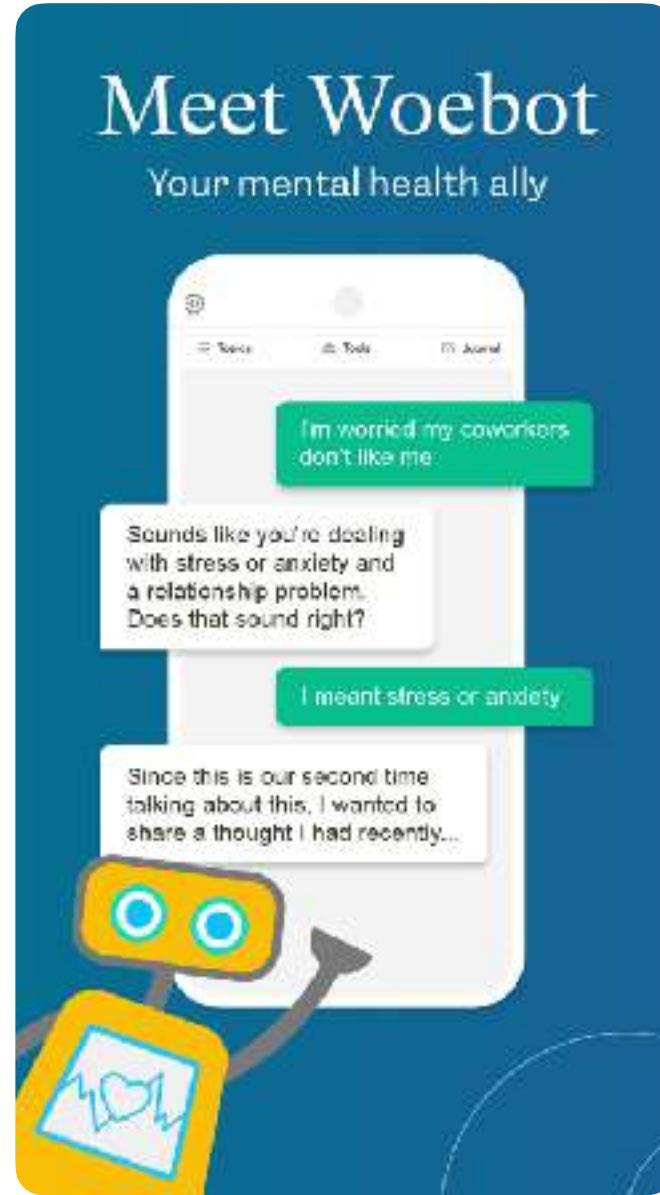


Conversational AIs (Chatbots) for Journaling



Diarybot

[Park et al., 2021]



Woebot

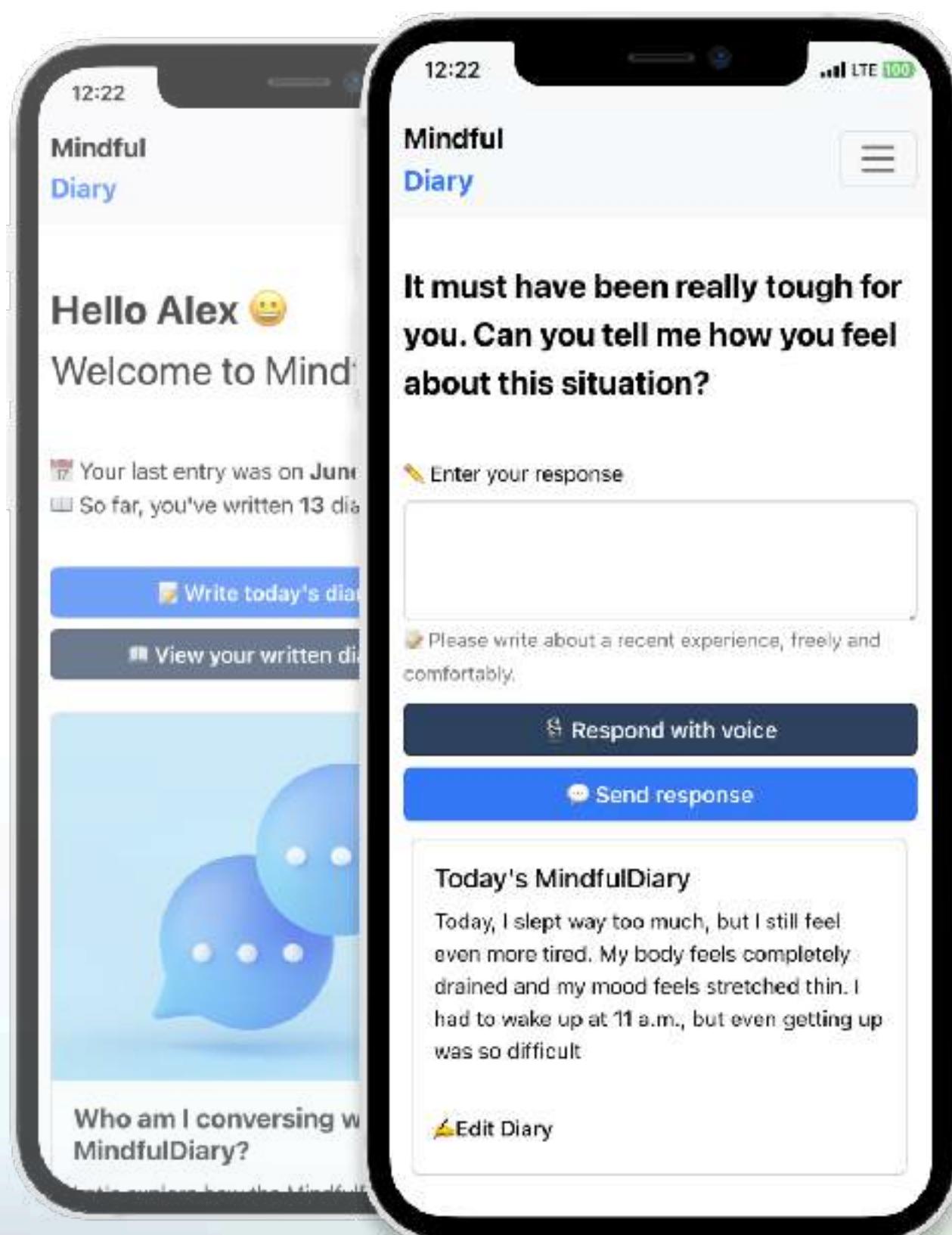
[Fitzpatrick et al., 2017]

- Offering **interactive & supportive** environments
- Encouraging more **open and truthful** sharing without fear of judgment

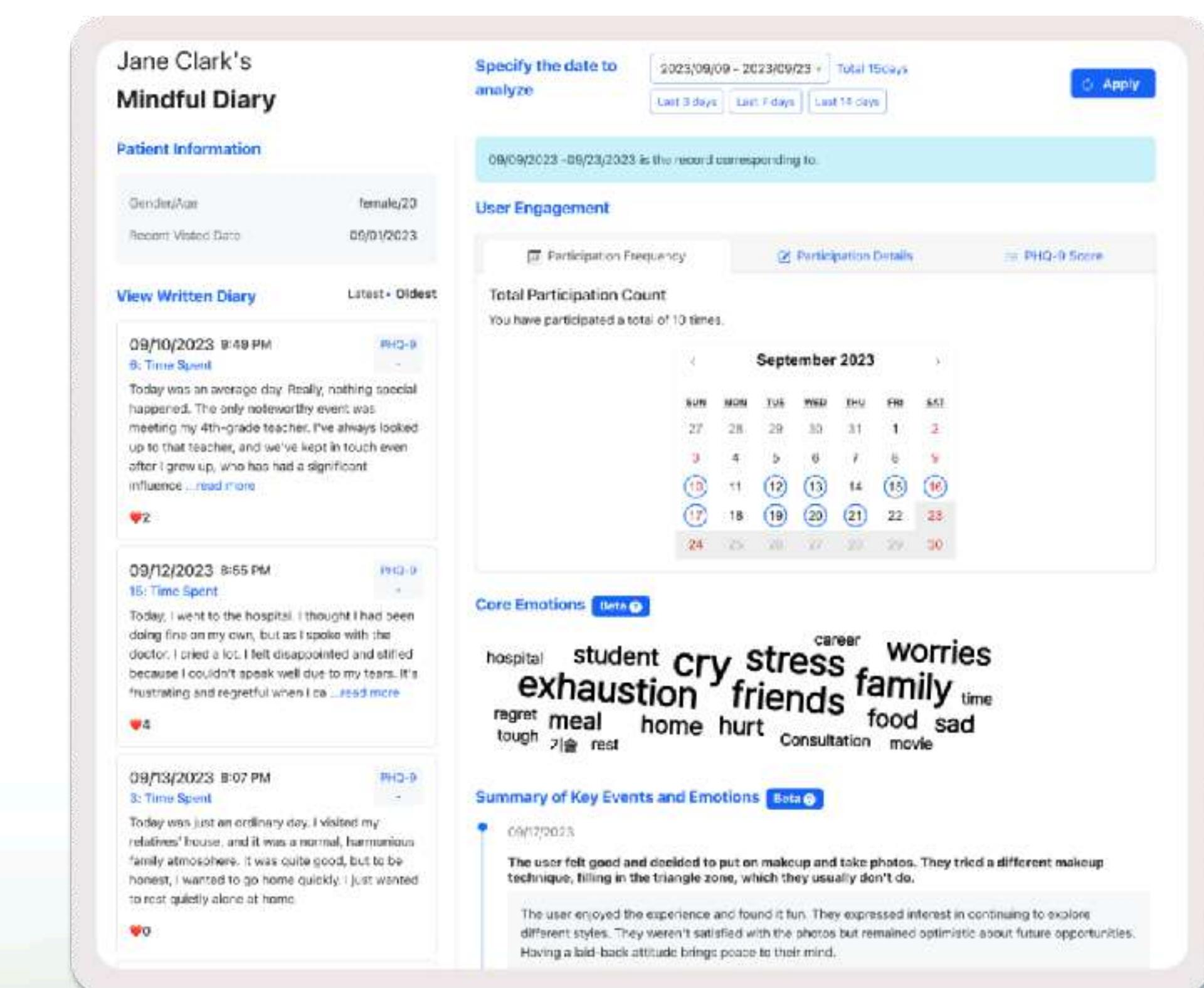
Q. How do open-ended & versatile conversations enabled by LLMs help in patient journaling and clinical practice?

MindfulDiary

An LLM-driven patient journaling system



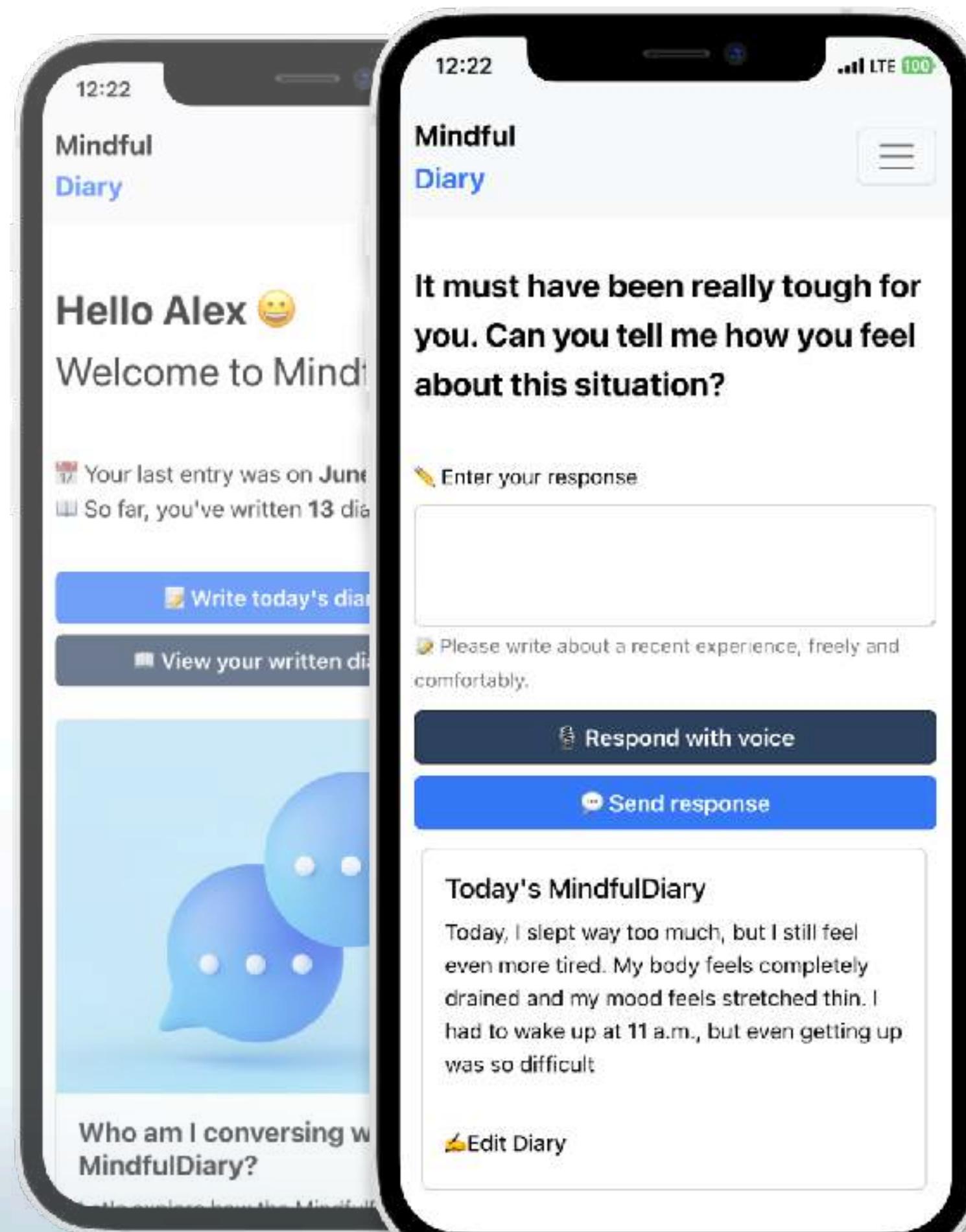
Patient's app



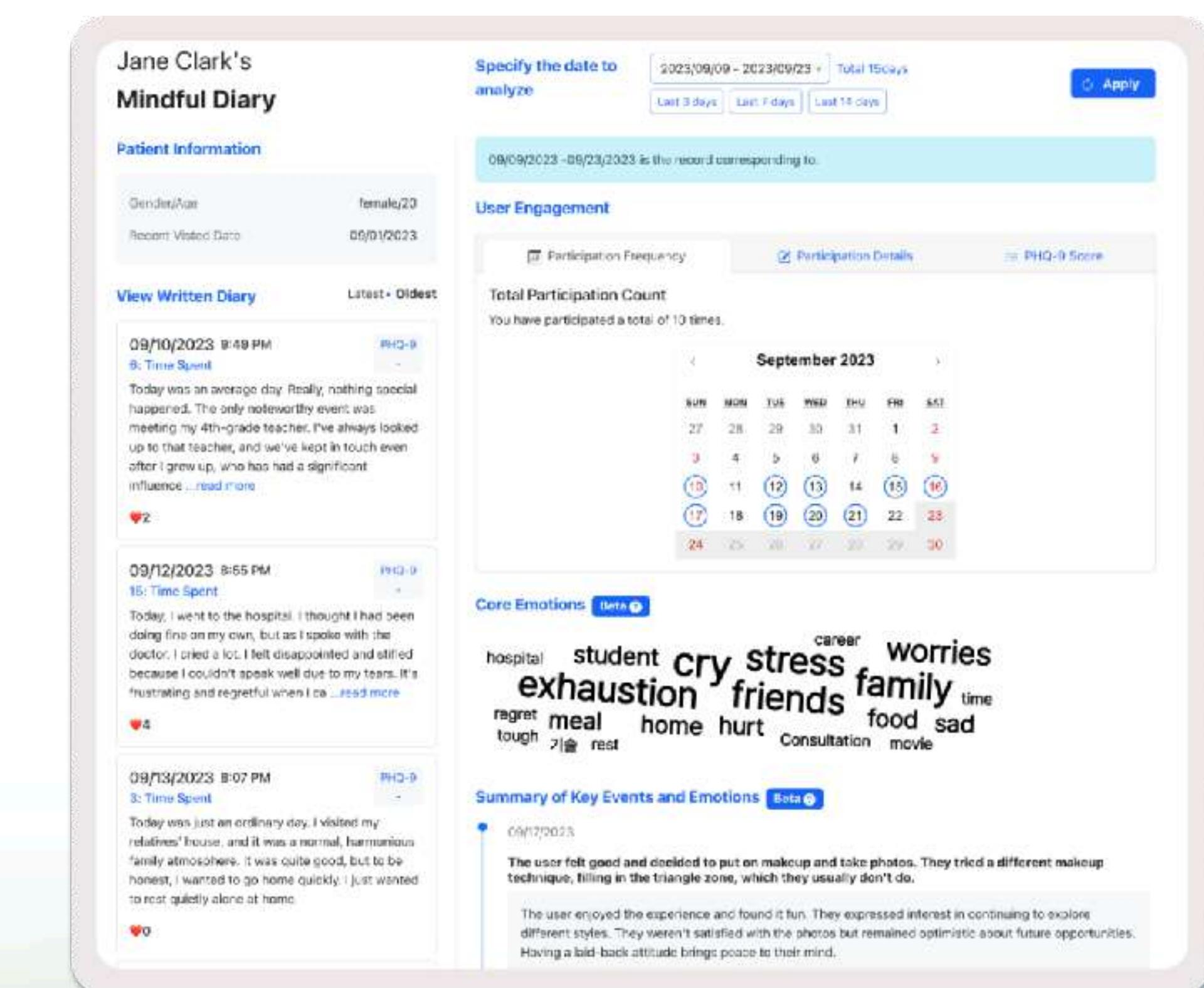
Clinician dashboard

MindfulDiary

An LLM-driven patient journaling system



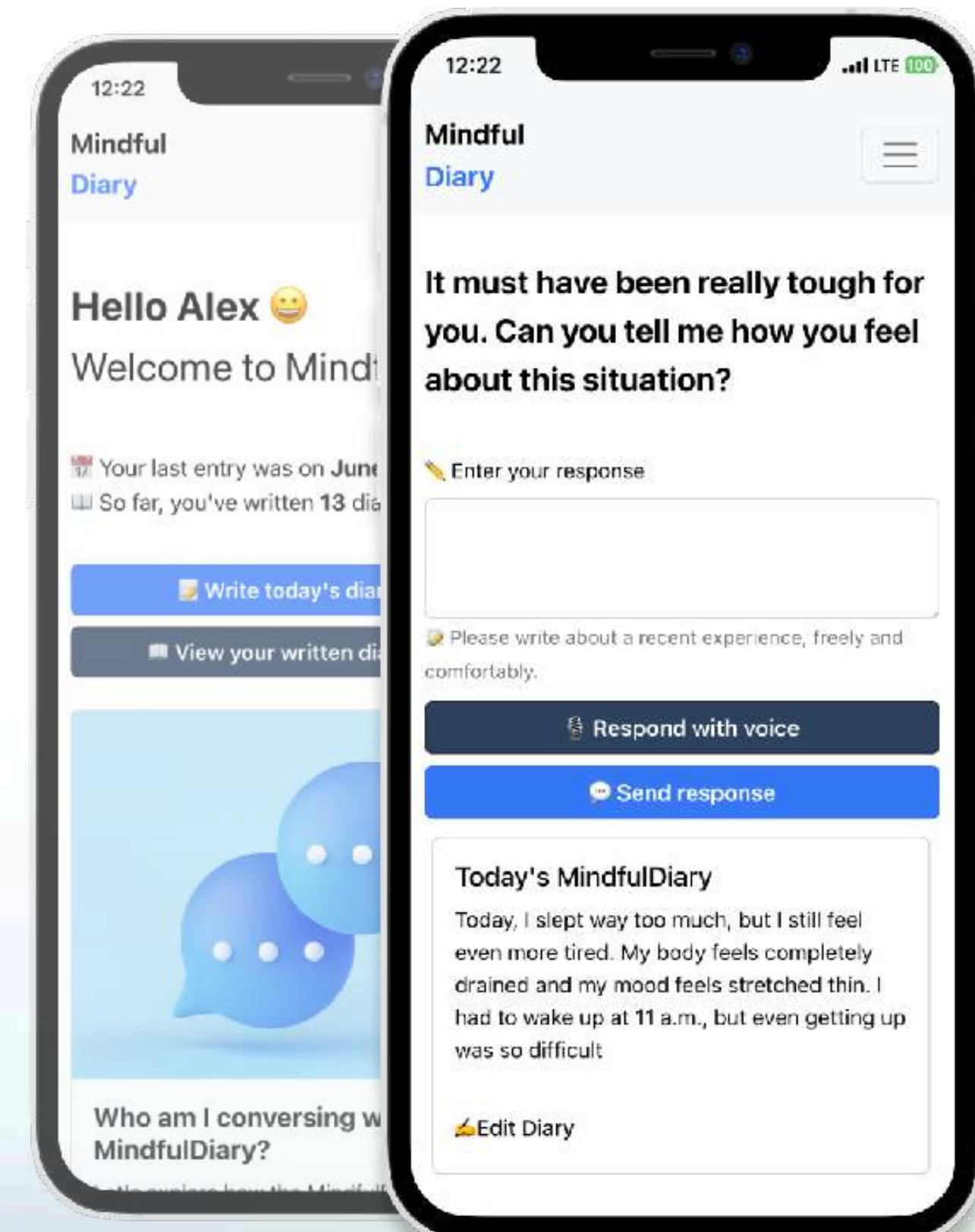
Patient's app



Clinician dashboard

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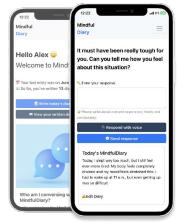
The clinician dashboard for Jane Clark's Mindful Diary. At the top, it says "Jane Clark's Mindful Diary" and "Specify the date to analyze: 2023/09/09 - 2023/09/23 Total 15days". Below this is a note: "09/09/2023 - 09/23/2023 is the record corresponding to...". The dashboard is divided into sections: "Patient Information" (Gender/Age: female/20, Recent Visited Date: 09/01/2023), "User Engagement" (Participation Frequency, Participation Details, PHQ-9 Score), "View Written Diary" (List of diary entries with timestamps, PHQ-9 scores, and short summaries), "Core Emotions" (A cloud of words including cry, stress, worries, exhaustion, friends, family, etc.), and "Summary of Key Events and Emotions" (Summary of user activities and feelings).

Clinician dashboard

MindfulDiary

Filling the gaps between clinical visits of psychiatric patients

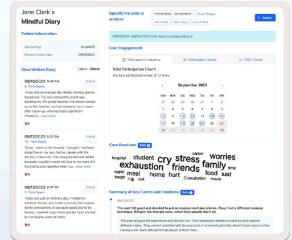
Patient



Clinical visit Clinical visit Clinical visit Clinical visit



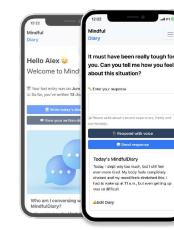
Clinician



MindfulDiary

Filling the gaps between clinical visits of psychiatric patients

Patient



records daily experiences and thoughts with MindfulDiary

Clinical visit



Clinical visit



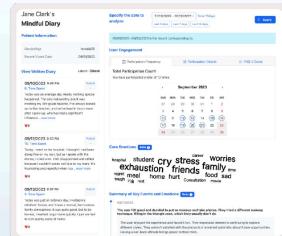
Clinical visit



Clinical visit



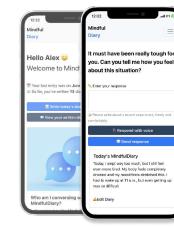
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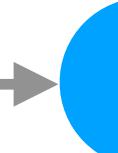
Clinical visit



Clinical visit



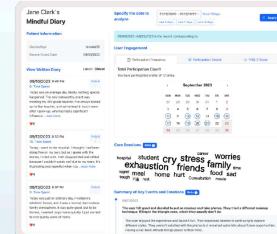
Clinical visit



Clinical visit



Clinician



(quickly) obtains insights about the patient through the journal entries on the clinician dashboard

Mindful
Diary



Hello Jane 😊

Welcome to Mindful Diary.

Your last entry was on **June 8th**.

So far, you've written **13** diary entries!

Write today's diary entry

View your written diary entries



Who am I conversing with in
MindfulDiary?

Mindful
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Clinician Dashboard

Desktop application to facilitate monitoring patient's journal

- Journal entries
- User Engagement
- Summarized Insights (LLM-processed)
 - Highlights keywords about triggers (e.g., suicidal intentions) and extreme emotions

Jane Clark's Mindful Diary

Patient Information

| | |
|---------------------|------------|
| Gender/Age | female/20 |
| Recent Visited Date | 09/01/2023 |

View Written Diary Latest • Oldest

09/10/2023 9:49 PM PHQ-9
6: Time Spent

Today was an average day. Really, nothing special happened. The only noteworthy event was meeting my 4th-grade teacher. I've always looked up to that teacher, and we've kept in touch even after I grew up, who has had a significant influence ...[read more](#)

2

09/12/2023 8:55 PM PHQ-9
15: Time Spent

Today, I went to the hospital. I thought I had been doing fine on my own, but as I spoke with the doctor, I cried a lot. I felt disappointed and stifled because I couldn't speak well due to my tears. It's frustrating and regretful when I ca ...[read more](#)

4

09/13/2023 8:07 PM PHQ-9
3: Time Spent

Today was just an ordinary day. I visited my relatives' house, and it was a normal, harmonious family atmosphere. It was quite good, but to be honest, I wanted to go home quickly. I just wanted to rest quietly alone at home.

0

Specify the date to analyze

2023/09/09 - 2023/09/23 * Total 15days

Last 3 days Last 7 days Last 14 days

Apply

09/09/2023 - 09/23/2023 is the record corresponding to.

User Engagement

Participation Frequency Participation Details PHQ-9 Score

Total Participation Count

You have participated a total of 10 times.

September 2023

| SUN | MON | TUE | WED | THU | FRI | SAT |
|-----|-----|-----|-----|-----|-----|-----|
| 27 | 28 | 29 | 30 | 31 | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

Core Emotions Beta

hospital student cry stress career worries exhaustion friends family time regret meal home hurt food sad tough 기술 rest Consultation movie

Summary of Key Events and Emotions Beta

09/17/2023

The user felt good and decided to put on makeup and take photos. They tried a different makeup technique, filling in the triangle zone, which they usually don't do.

The user enjoyed the experience and found it fun. They expressed interest in continuing to explore different styles. They weren't satisfied with the photos but remained optimistic about future opportunities. Having a laid-back attitude brings peace to their mind.

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♥2

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♥4

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♥0

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Last 3 days Last 7 days Last 14 days

Apply

09/09/2023 - 09/23/2023 is the record corresponding to.

User Engagement

Participation Frequency Participation Details PHQ-9 Score

Total Participation Count
You have participated a total of 10 times.

September 2023

| SUN | MON | TUE | WED | THU | FRI | SAT |
|-----|-----|-----|-----|-----|-----|-----|
| 27 | 28 | 29 | 30 | 31 | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

Core Emotions Beta

hospital student cry stress career worries exhaustion friends family time regret meal home hurt food sad tough 기술 rest Consultation movie

Summary of Key Events and Emotions Beta

09/17/2023

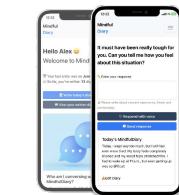
The user felt good and decided to put on makeup and take photos. They tried a different makeup technique, filling in the triangle zone, which they usually don't do.

The user enjoyed the experience and found it fun. They expressed interest in continuing to explore different styles. They weren't satisfied with the photos but remained optimistic about future opportunities. Having a laid-back attitude brings peace to their mind.

4-Week Field Deployment Study

- Patients with Depressive Disorder at a university hospital in South Korea
- 28 psychiatric patients + 5 attending psychiatrists
- 28 days of MindfulDiary deployment w/ 1 clinical visit

Patient



Week 1

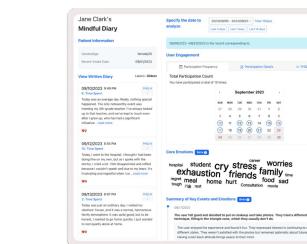
Week 2

Week 3

Week 4

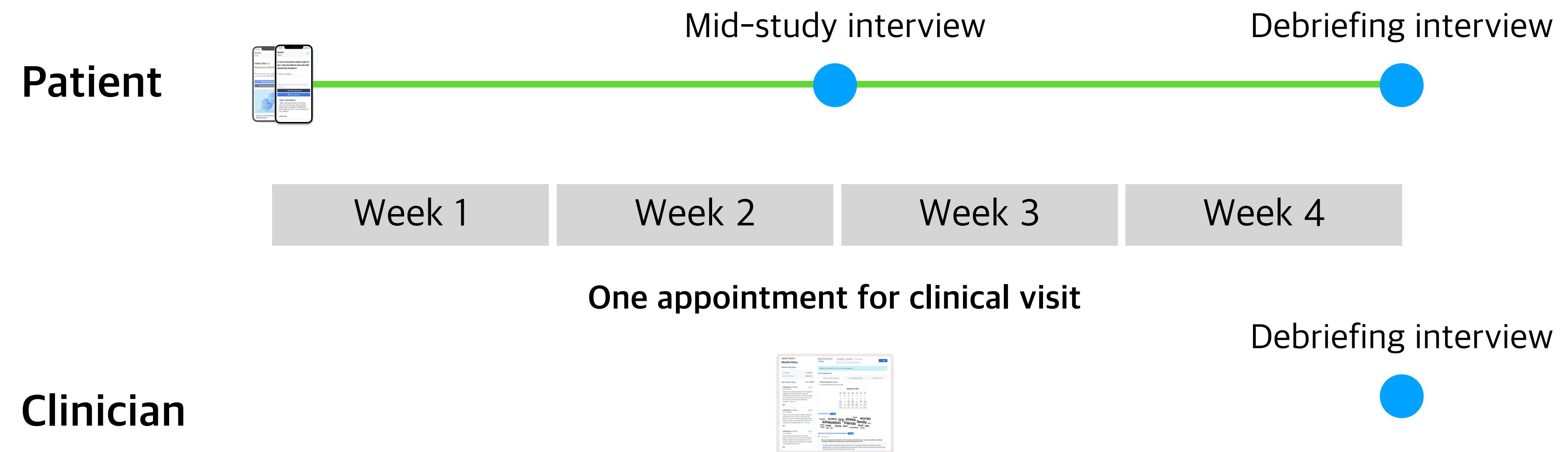
One appointment for clinical visit

Clinician



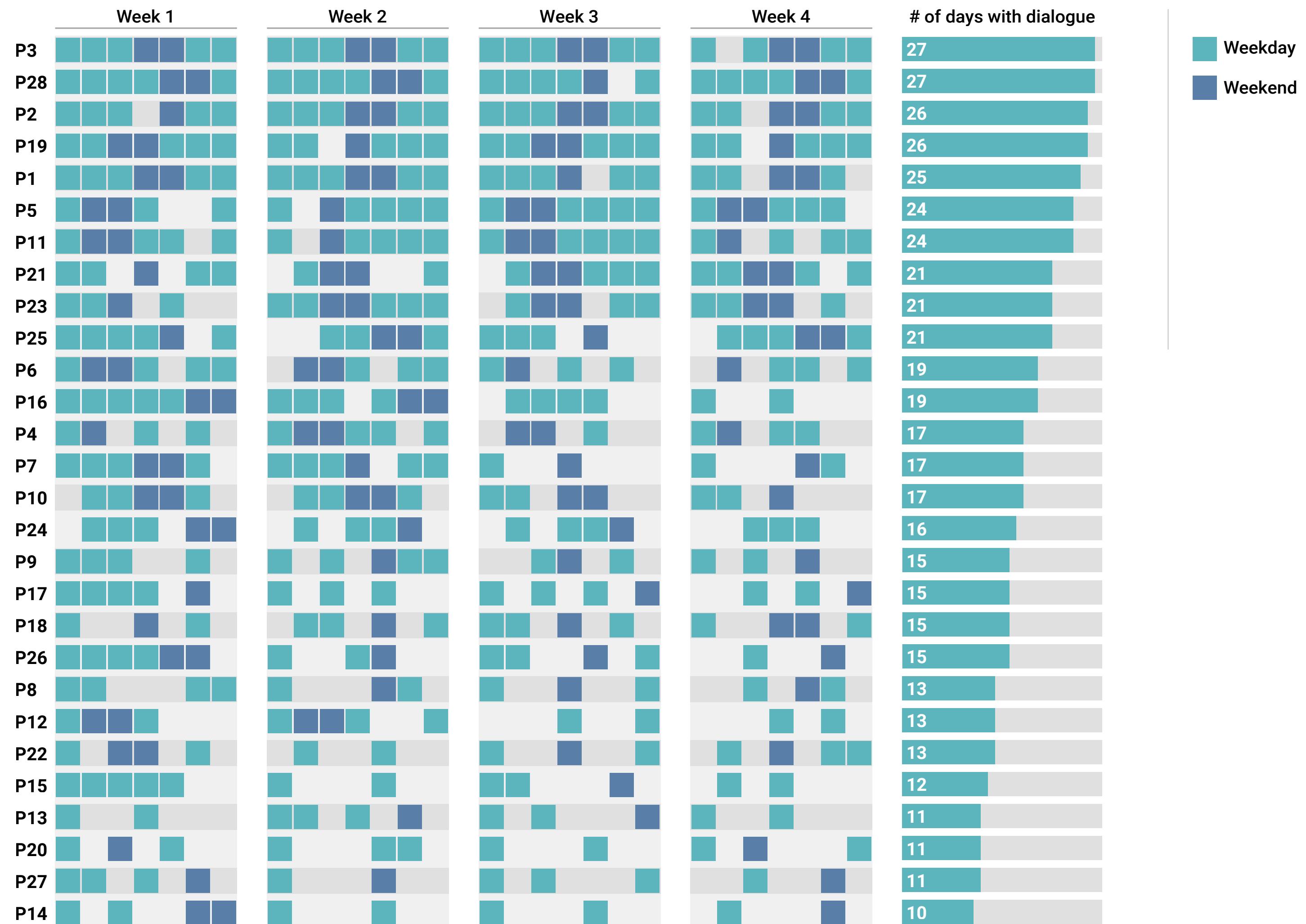
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High Engagement with Journaling

- More than 1 log / 2 days
- Steady level of engagement
- 5 turns per session
- 7 minutes per session



AI Response Strategies

😊😢 Elaborating emotions

"How did you feel after meeting her?"

🚴🎨 Exploring activities

*"Lunch with a friend sounds nice.
What did you eat?"*

🔍🤔 In-depth follow-up

"Since when have you felt overshadowed?"

🧘‍♀️👨‍♂️👨‍♂️ Exploring future plans

"What have you done to alleviate the loneliness?"

AI Response Strategies



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Participants' Self-Disclosure to AI

😊😢 Emotional states

"I'm so exhausted, reaching my limit soon."

🚴🎨 Events & activities

"I don't have much reason to go out, leading to a decreased activity level."

🤔🗣 Thoughts & beliefs

"Feel like someone is talking behind by back somewhere; they don't like my behaviors and seem to exclude me."

🍽💊 Perceived health status

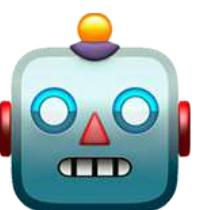
"Just took my medication, but it seems to be getting tasteless."

🤝 Relationships & interactions

"Hate seeing my brother being happy. Unwantedly being kind also annoys me."

Participants could **expand views** with MindfulDiary

You've become interested in Pilates.
Can you tell me what makes Pilates interesting to you?



Participant

I would like to do Pilates, but I can't because there's nowhere to do it

That must be a difficult situation. **What about exercising at home?**
There are many Pilates videos available.



Participant

I hadn't thought of following along with videos!

MindfulDiary helped patients build narratives

The screenshot shows the MindfulDiary app interface. On the left, a conversation window displays a message from a therapist asking about a special relationship. Below it is a text input field with a placeholder and two response buttons: 'Respond with voice' and 'Send response'. On the right, a diary entry for 'Today's MindfulDiary' is shown, detailing a meeting with a 4th-grade teacher. At the bottom are 'Edit Diary' and 'Save the diary and end session' buttons.

That's a special relationship
you've got there. Can you tell me
more about that "strange but
nice" feeling?

Enter your response

Please write about a recent experience, freely and comfortably.

Respond with voice

Send response

Today's MindfulDiary

Today was an average day. Really, nothing special happened. The only noteworthy event was meeting my 4th-grade teacher. I've always looked up to that teacher, and we've kept in touch even after I grew up.

Edit Diary

Save the diary and end session

*"I often had trouble putting sentences.
In the past, I would worry about writing the next part.
But with this app, I just tell the story of my day, and it
seamlessly continues and wraps it up, presenting a
well-structured diary entry. That's its biggest advantage."* - P3

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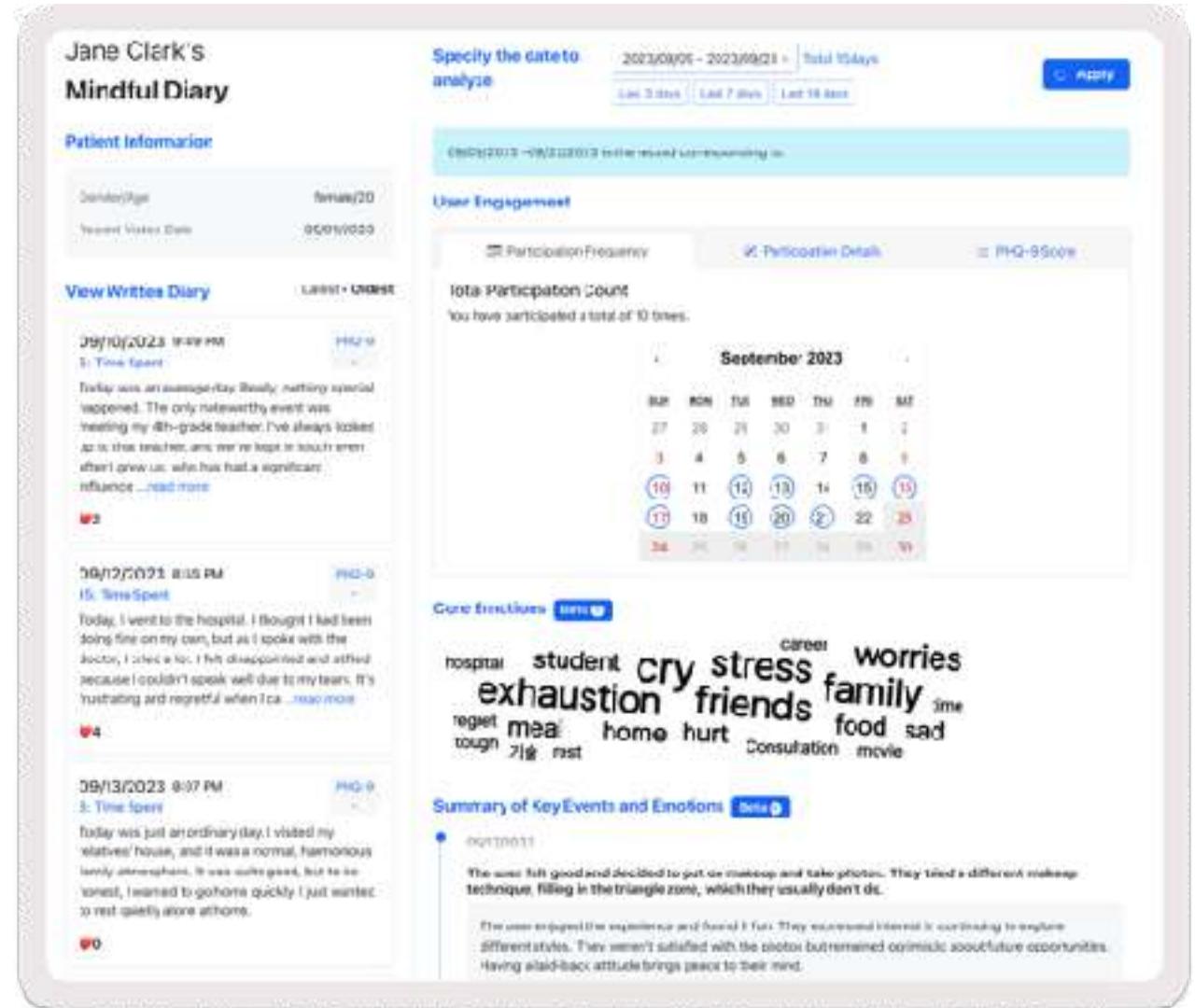
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MindfulDiary enhanced clinicians' empathy



- Providing more nuanced understanding of patients' thoughts, feelings, and episodes
- Ultimately guiding clinician's strategies to care the patient.

*"Usually, when patients come for a consultation, **they talk about bad experiences**. Few people come to psychiatry to say, 'I've been doing well.' Even if they have good things to say, they usually don't bring those up. But I was happy to see that there were many positive statements in the records, like 'I did that and felt good.'" - E2*

Challenges of Designing LLM Chatbots for Psychiatric Patients

- **Implicit and nuanced harmfulness of AI messages:** Traumatic keywords and triggers that evoke negative emotions vary by patients; personalized approach would be necessary.
- It is hard for LLMs to simulate clinicians' skills of choosing **appropriate wording against patient's messages.**
- **Over-reliance again;** patients are willing to disclose inner self.
Additional care is necessary to prevent negative impacts of an AI.



Discussion

Determining Individualized Harmfulness of AI Messages

Explicit harmfulness

Toxic language. Population-agnostic

Determining Individualized Harmfulness of AI Messages

Explicit harmfulness

Toxic language. Population-agnostic

Implicit harmfulness

Population-specific, even individual-specific

Socially isolated people

- Mentioning sensitive topics like disease, finance, and family

Children

- Conflicting with parenting directions
- Behavioral manipulation

Psychiatric patients

- Bringing up traumatic triggers
- Negative nudges

Implicit harmfulness is hard to be handled solely by LLMs



LLM behaviors are tend to be **general**
via data-driven generation.

Implicit harmfulness is hard to be handled solely by LLMs

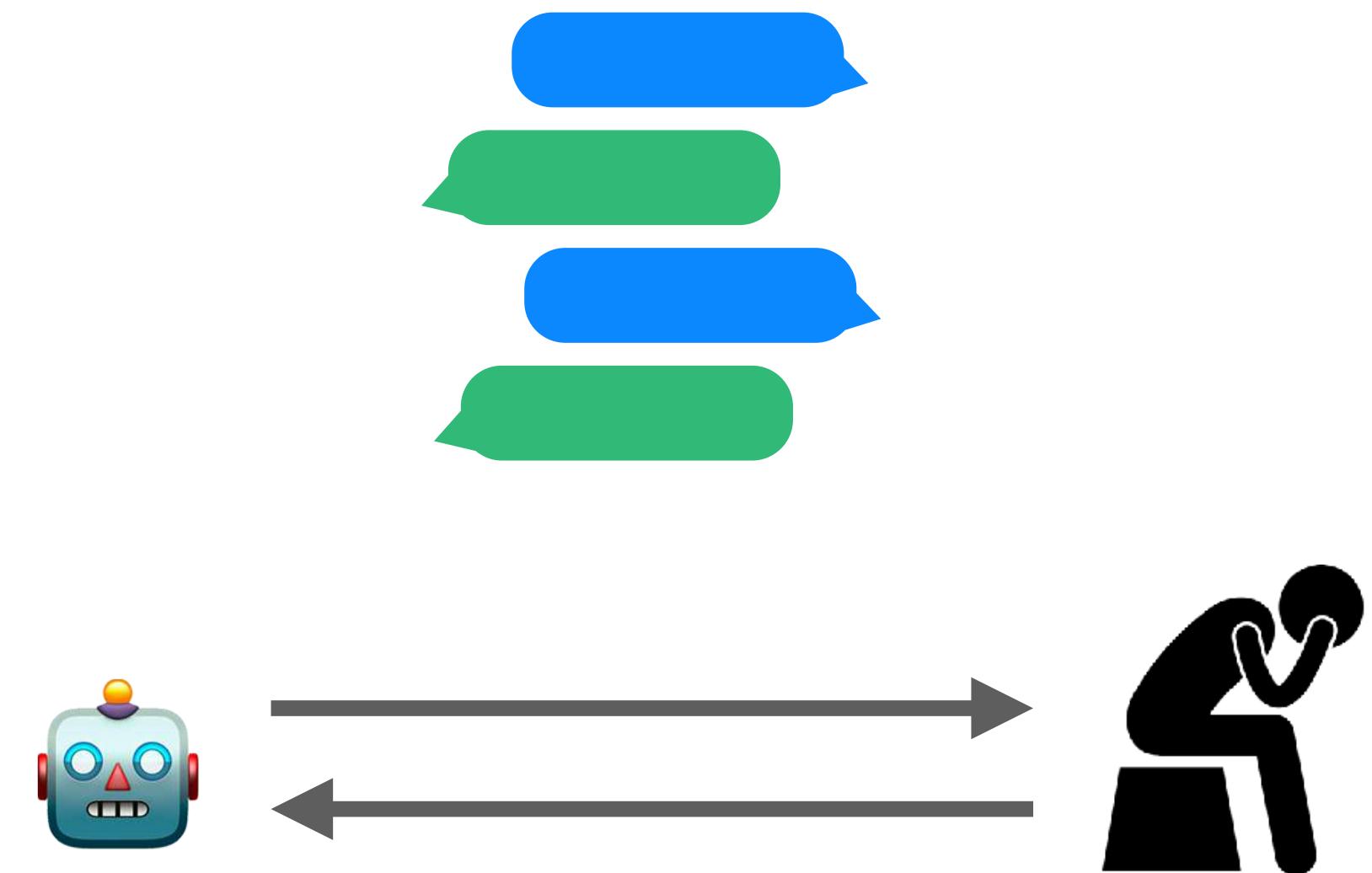


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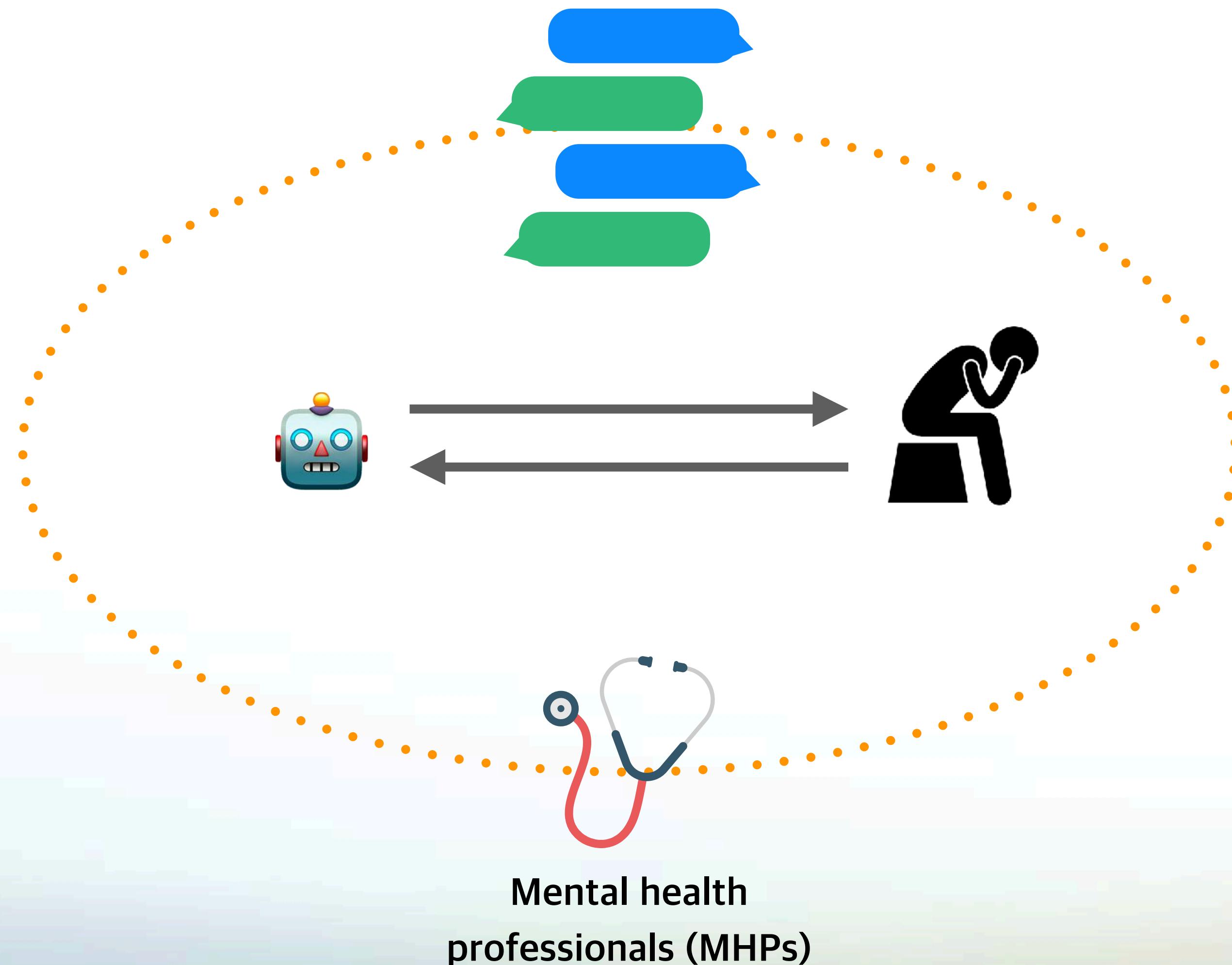
Personalization is crucial for users in marginalized populations

Expert-in-the-Loop LLM Deployment



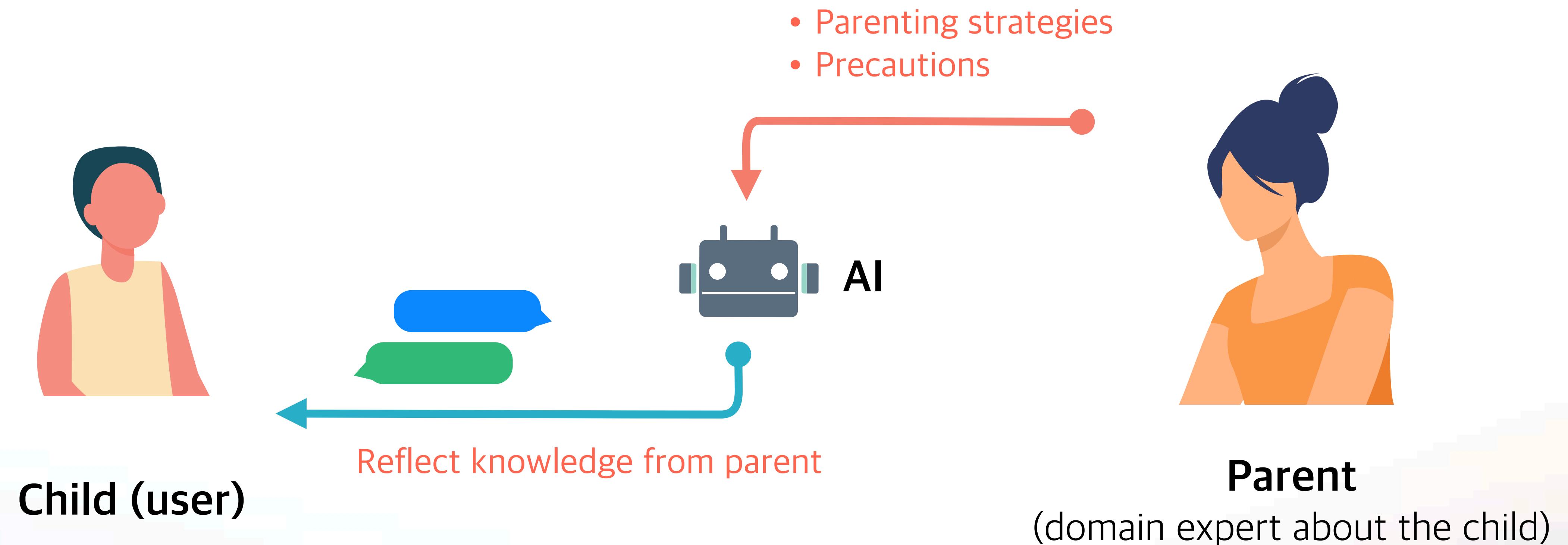
- Inspecting LLM behaviors toward patients
- Judging if a patient is eligible to interact with an LLM
- Providing medical feedback to personalize LLM behaviors to each patient

Expert-in-the-Loop LLM Deployment



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Involving Parents as Domain Experts to Augment LLM's Knowledge



Designing LLM-driven Conversational AIs for Marginalized Populations

Any inquiries to:

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Neurodiverse

Children

AACessTalk: LLM-driven Contextual Guidance fostering Conversations between Parents and Autistic Children

*Dasom Choi et al. | Under review

Neurotypical

Adolescents

MindfulDiary: Conversational Diary for Psychiatric Patients

*Taewan Kim et al. | CHI 2024

Low-SES

Older adults

ChaCha: Chatbot for Promoting Children to Share Their Emotions and Events

*Woosuk Seo et al. | CHI 2024

How Long-term Memory of LLM-driven Health Chatbot Impact Self-Disclosure

*Eunkyoung Jo et al. | CHI 2024

Multi-stakeholder Perspectives around LLM Chatbot for Public Health Intervention

*Eunkyoung Jo et al. | CHI 2023 (🏆 Best Paper)