When Emoji Speak Louder than Words: Personalized Emoji-first Messaging for Enhanced Communication between Partners and Close Friends

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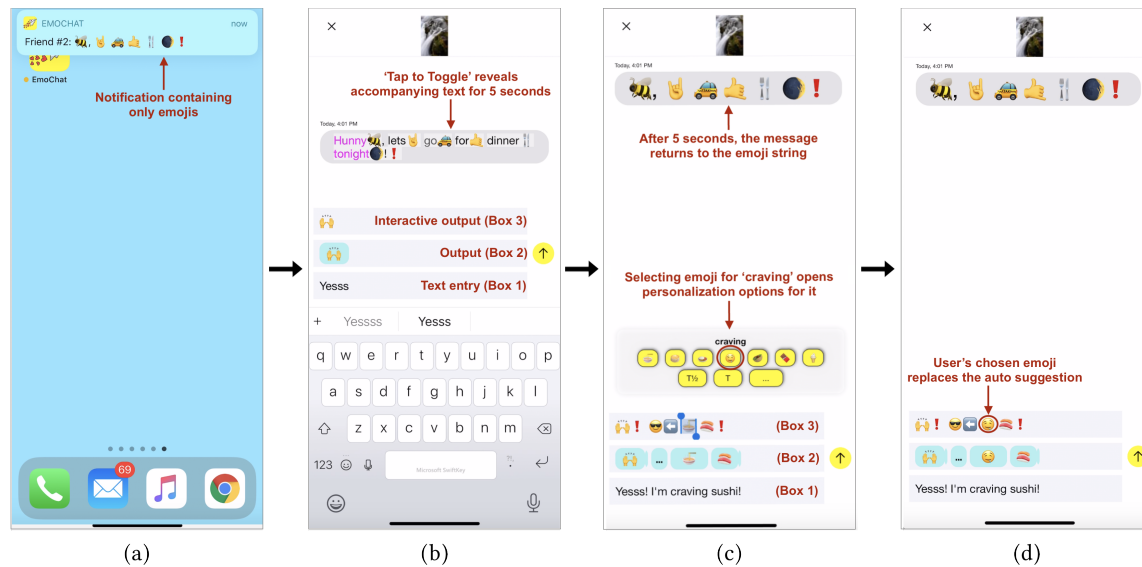
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Fig. 1. **EmoChat, an "emoji-first" messaging app designed to enhance connection between pairs of people in close relationships.** It leverages each pair's closeness and history with each other by fostering a shared vocabulary that the pair can co-create over time and mutually understand. **(a)** Recipients always see the emoji first, as in this notification of a new message from "Friend 2." **(b)** Once inside the EmoChat app, Friend 1 can long press messages to toggle between emoji and words. At top is Friend 2's message in word form. At bottom, Friend 1 types a reply to Friend 2 (Box 1), and EmoChat translates the reply to emoji on the fly (Boxes 2 and 3). Box 3 is tappable and allows Friend 1 to modify the automatic mappings. **(c)** The word "craving" (Box 1) was mapped to a single emoji, indicated by the matching width of the bubble above it (Box 2). Friend 1 selects that emoji in Box 3 to choose a new mapping for "craving." **(d)** The chosen mapping now appears and will become part of the pair's shared vocabulary. Both people can view and modify the shared vocabulary anytime.

Emoji are known to have a strong impact on emotions and positively affect relationships. People in close relationships use emoji in very personalized and secretive ways, thereby forming a shared vocabulary. In this paper, we present EmoChat, an emoji-first messaging app for pairs of users in close relationships that leverages the pair's closeness and shared experiences to create a highly personalized "communication zone" with the goal of enhancing communication. In EmoChat, each message is fully translated to

emoji. The recipient always sees the emoji first, but can view the text on demand with a tap. Through a field study, we investigated the affordances of personalized emoji-first messaging for close relationships, and we found that emoji-first messaging contributes the following values to text messaging: it adds to humor; it builds secrecy for the exchange of private messages; it promotes creativity, gamification, fun, and play; and it promotes companionship through affection and the sharing of perspectives. To the best of our knowledge, EmoChat is the first ever emoji-first messaging app. Our work creates a new paradigm for messaging that enables the communication of lightweight symbols before text and has implications for the future ecosystems of communication apps.

CCS Concepts: • **Human-centered computing → Collaborative and social computing systems and tools**.

Additional Key Words and Phrases: emoji-first communication, messaging, shared language, partners, close friends

1 INTRODUCTION

Emoji allow users to communicate concepts (*e.g.,* thoughts, ideas, and feelings) that are difficult to express through text alone. Emoji have a wide range of uses: they can emphasize concepts occurring in the text, replace words, and provide and enhance the affective context of text [1, 8, 46]. This wide range of uses allows users to more directly control the emotional content of their messages. Users can strengthen the emotion behind their text, augment the tone of the message, enhance humor, and increase the perceived positivity of text [14, 19, 37].

When people in close relationships spend time messaging each other, the content of their texts and texting patterns undergo linguistic alterations unique to their relationship [17, 33, 35]. Researchers have found that people in close relationships repurpose emoji in a similar way. Wiseman et al. [44] found that people in close relationships repurpose emoji for something other than their "intended" use, thereby creating shared emoji languages. In addition, researchers have found that people in close relationships use emoji to encode shared meanings unique to their relationship [23, 44]. As a result, emoji enhance communication in close relationships by increasing intimacy and encouraging play [18, 21, 23].

Mainstream apps allow users — including users in relationships — to send text messages that also contain emoji, but to the best of our knowledge, no existing app or system uses emoji *in the absence of* text specifically to enhance messaging in relationships. The broadcasting of location-related social media posts containing emoji without text has previously been studied and called "emoji-first" communication [24]. However, we are the first to explore idea of emoji-first messaging *for private communication between people*, for different purposes in a wide variety of situations. *We hypothesize that an "emoji-first" messaging app can positively impact the communication between people in close relationships* by (1) amplifying the perceived warmth and humor of their messages, and (2) promoting the creation of a shared language more strongly and directly than existing messaging apps and emoji keyboards do. For example, partners can encode their uniquely shared experiences and perceptions in a shared emoji-based language that they create, which would allow partners to recognize each other's messages from visuals alone, creating a greater sense of privacy, secrecy, and companionship.

Hence, we built *EmoChat, an emoji-first messaging app for pairs of users in close relationships such as close friends and partners.* We explore this idea of enabling emoji-first messaging personalized to the relationship in depth, and we introduce several supporting system design aspects such as the *Emotionary*, a dictionary-like structure that stores each pair's custom text-to-emoji mappings. Over time, a user pair's Emotionary will grow, reflecting the shared, personal,

unique meanings that user pairs assign to emoji. Our work creates the potential for a new messaging paradigm based on *personalized* emoji-first communication, through the following novel contributions:

(1) We design and study an emoji-first messaging app that users can use in a wide variety of situations. To enable private messaging in close relationships, we also introduce the novel idea of *personalized* emoji-first communication. We build on previous work that focused on the public broadcasting and interpretation of location-dependent emoji-first social media posts [24].

(2) We introduce "Tap to Toggle," a design feature that allows users to tap messages to toggle between viewing their emoji form or text form. Tap to Toggle allows the recipients room to interpret an emoji string first, and then gives them a method to understand the exact intended message behind the emoji string. Our field study participants reported that this 'room for interpretation' enhanced the sense of humor and surprise that they felt when messaging each other. Hence, we expand the definition of emoji-first communication to 'the exchange of messages containing emoji without being accompanied by text *at first*, though the user can view the associated text *later*'. In doing so, we capture the "emoji-first" paradigm more literally than previous work, which implemented emoji-first communication as the 'the exchange of emoji without text' [24].

(3) We introduce the idea of a shared *Emotionary*, which facilitates a shared vocabulary between pairs of people that they build up over time organically. The Emotionary leverages the closeness and shared experiences of couples and close friends in order to create a highly personalized "communication zone" [31] for them. We devise and implement a novel text-to-emoji translation algorithm that incorporates emoji meanings at varying degrees of precision and personalization: widely accepted meanings (from EmojiNet [42] EmojiLib [7]), context-dependent meanings (which we processed from 60 million Twitter tweets), and personalized meanings between each pair (using their shared vocabulary).

(4) We are the first to investigate the properties and affordances of an emoji-first messaging app for close relationships (Figure 3). We identify ten themes from participant interviews, allowing us to discover the values that EmoChat adds to messaging (compared to the status quo of text-based messaging), given its unique properties. Our results suggest that emoji-first messaging between partners in close relationships adds humor; builds secrecy for the exchange of private messages; promotes creativity, fun, a sense of play; and promotes companionship through affection and the sharing of perspectives.

Our analysis leads to insights that lay the foundation for a new paradigm of messaging apps that draws from both emoji (or other visual symbols such as stickers) and the unique characteristics of close relationships between people.

2 RELATED WORK

2.1 The Communicative Purposes of Emoji

Researchers have found that people use emoji to express emotion and sentiment [19, 40], to strengthen the intensity of an expressed emotion [19, 41], and to adjust the tone of a message by, for example, making messages less serious and more friendly [8, 9, 19, 41]. In fact, when users use multiple emoji together as part of a message, recipients expressed that these emoji had more sentimental value compared to a single emoji alone [40]. Users also use emoji to express humor [11, 19], irony, and sarcasm [10, 11, 13, 19]. Further, emoji are used to express tedious concepts that cannot be expressed via text [46], and can serve linguistic functions such as replacing words and describing contents [1, 8, 46]. Some previous work has also drawn parallels between emoji use and gestures such as those used for back-channeling (*e.g.*, "👍" for "OK") [14, 29].

Emoji also positively impact sentiment, emotion, engagement, and connection in relationships. For example, in close relationships, users will use emoji to express intimacy [10, 19], thereby increasing the perceived intimacy of messages [15, 21]. Emoji also increase the perceived positivity of messages and social media posts [10, 10, 32, 37]. Further, by adding additional emotional or situational context, emoji also make messages more engaging to their recipient [8] and help in relationship maintenance [8, 15, 23]. Additionally, emoji foster playfulness and creativity, which, in turn, strengthen the connections in relationships [5, 18, 23]. Emoji also aid in expressing humor [11, 19], which is related to observed affection in spouses [22], increased relationship satisfaction within couples [25, 47], and reduced relationship discord [38].

2.2 Developing Shared Meanings in Close Relationships

Most emoji have widely accepted meanings, and researchers have trained machine learning models to capture these meanings [2, 12, 32, 42, 43]. But many emoji also have context-dependent meanings, which are tied to the sender's intentions [8, 19]. Further, people in close relationships use emoji to encode shared meanings unique to their relationship [23, 44]. For example, Wiseman et al. found that people in close relationships repurpose emoji for something other than their "intended" use, thereby creating shared emoji languages. Two participants in their study reported using a shared love of food to evoke feelings towards their partner by using the pizza emoji 🍕 to mean romantic love. This was related to their shared understanding of common feelings ("because we both love each other as much as we love pizza") [44].

Research on how people in close relationships personalize emoji to encode shared meanings is scant. However, a wide body of research demonstrates how people in close relationships personalize and encode shared meanings in other linguistic and verbal contexts. For example, the way people talk to each other is related to their relationship with each other [4]. In text messaging, perceived similarity in texting behaviors between romantic partners is associated with their relationship satisfaction [33], and linguistic alterations, such as the use of abbreviations, are also related to personality traits and relationship status [17]. Participants in close relationships develop idiosyncratic private symbols while texting each other over time [35].

We have ample evidence to show that people in close relationships form their own shared meanings, languages, and symbolic codes when communicating with one another over long periods of time. We also have a few cases of prior work that show that people create their own shared meanings, languages, and symbolic codes with emoji when they text each other [44]. We aim to advance this literature by developing and studying a messaging app that allows people in close relationships to explicitly define a shared emoji language.

2.3 Emoji-First Communication

The literature described above *inspired us to build a tool that allows people in close relationships to communicate using their own personalized emoji language.* Further, research has also shown that using multiple emoji together can increase the emoji's sentimental effect on its users [40]. This led us to the fairly new idea of emoji-first communication, which was defined and implemented by Khandekar et al. [24] and involved the exchange of strings containing one or more emoji without text via a location-dependent social media app called Opico. In Opico, users can react to certain locations using a string of up to 5 emoji with no text. These reactions are displayed in a feed view and a map view. Other users can comment on the reaction in words and earn a "bullseye" if the author deems their description correct. While Opico focused on the public broadcasting and interpretation of location-dependent emoji-first social media posts, to the best of our knowledge, EmoChat is the first to extend emoji-first communication to private messaging between people.

The main difference between Opico and EmoChat is analogous to the main difference between Twitter and Snapchat: broadcasting short strings publicly vs. having private visual conversations with very close friends and family. Further, to enable private messaging in close relationships, we introduce the novel idea of *personalized* emoji-first communication.

Our research aims to "close the loop" on three threads of research: (1) research revealing the affordances or communicative purposes of emoji in general, (2) research showing that couples repurpose emoji to form shared languages or meanings with each other, and (3) research proposing the idea of emoji-first communication and investigating how well people can understand the meaning of emoji-only strings. To this end, we extend the idea of emoji-first communication to private messaging between people in close relationships, which should allow pairs of users to assign their own private meanings to various emoji. We explore this new concept in-depth by creating novel features to better support it (*e.g.* 'Tap to Toggle' 3.1.3). Our app, EmoChat, can be used for different purposes in a wide variety of situations, contrasting with prior work [24], which explored emoji-only communication for the specific purpose of reacting to locations. Through a field study, we investigate the properties and values of emoji-first messaging between people in close relationships.

3 EMOCHAT SYSTEM

EmoChat is an iOS app that enables emoji-first communication between two people in a close relationship, leveraging their closeness and history with each other to foster a shared emoji vocabulary called an *Emotionary* between them. Each user must create an account and specify a single partner with whom they will use EmoChat. The 'Chat' interface then allows the pair to send and receive emoji-first messages (see section 3.1) between them. It converts all text into emoji on the fly as the user types (see our supplemental video or the text boxes in Figure 1(b)), and it uses EmoChat's automatic text-to-emoji mapping algorithm described in Section 3.3 to do so. Users have the option to personalize the messages they send by defining their own text-to-emoji mappings. Our supplemental video and the text boxes in Figure 1(c) show this process in action, and Section 3.2 describes this process in full.

3.1 Emoji-First Chat Interface

The 'Chat' interface allows users to exchange emoji-first messages with their partners. That is, the users receive sequences of emoji representing a text message without being accompanied by text *at first*, though they may choose to view the message in text *later* by tapping the messages.

Figure 1(b–d) shows EmoChat's Chat interface. Like most messaging apps, the emoji-first messages appear in bubbles: yellow for messages sent and grey for messages received. The user can type, personalize, and preview their message using three boxes at the bottom of the interface (see Sections 3.1.1 and 3.2 for more details). Once the user is satisfied with the message they have created, they can send it by tapping the 'send' button (yellow circle containing an upward arrow). When a message is received, the receiving user only sees the emoji string at first in both the iOS notification (Figure 1(a)) and in the EmoChat app, but they can tap the emoji string to reveal the message's corresponding text.

3.1.1 Entering Text. Figure 1(b) shows three text boxes (Boxes 1–3) that the user uses to type messages, which work as follows:

- *Box 1*: This is the "main" box that users type into, and they use their phone's standard text-based keyboard to do so. Users can enter emoji here as well through their smartphone's keyboard.

- *Box 2*: This box shows the emoji strings that EmoChat automatically maps to portions of the Box 1 text. The width (in pixels) of the bubble around each emoji mapping in Box 2 matches the width (in pixels) of the corresponding input token from Box 1.
- *Box 3*: This topmost box acts as a final preview of the emoji message that will be sent, without the artificial spacing between emoji that Box 2 shows. Box 3 is also interactive. The user can select substrings of emoji within Box 3 (as shown in Figure 1(c)) to open the "personalization menu" and replace the emoji substring with their own emoji string mapping. Appendix A describes the personalization menu in more detail.

3.1.2   Emoji-Only Notifications. EmoChat sends users standard iOS push notifications whenever the user receives a message from their partner. As shown in Figure 1(a), the notifications contain the emoji string only, unaccompanied by text. Tapping the notification will take users to EmoChat's 'Chat' interface.

3.1.3   Tap to Toggle. All received messages are shown as emoji strings *at first*, but users can tap the message bubbles on the 'Chat' screen to reveal the underlying text for five seconds. Figure 1(b) shows the textual version of the message from Figure 1(a). The background of each text-to-emoji mapping in the textual version is a slightly lighter color than the background of the message bubble in order to show where each mapping starts and ends. A pink colored input text of a mapping indicates that the mapping was personalized by the sender, while a black colored input token indicates that the mapping was EmoChat's default mapping.

The ambiguity inherent in seeing only emoji first, and then — seconds later — seeing the underlying text creates room for interpretation that other messaging apps do not offer and is thus a defining feature of "emoji-first" messaging.

3.2   The Emotionary

The Emotionary is a shared vocabulary between a pair of users that organically builds up over time as they communicate with each other. It leverages the closeness and shared experiences of our target user population (couples and close friends) in order to create a highly personalized "communication zone" [31] for them.

Figure 2 shows the Emotionary screen. There are two portions: the user's text-to-emoji mappings on top and their partner's mappings on bottom. The mappings can be sorted alphabetically or by creation date.

Users can add new mappings to the Emotionary in two ways. The first way is via the "Add" button on the Emotionary screen, and the second way is through the 'Chat' screen itself, by simply changing any automatically generated text-to-emoji mapping. The previous section and Appendix A describe how emoji personalization works within the Chat screen. Our field study participants almost always added mappings from within the Chat screen and not the Emotionary screen.

The combined Emotionary allows users to utilize both their and their partner's mappings when typing messages. EmoChat prioritizes
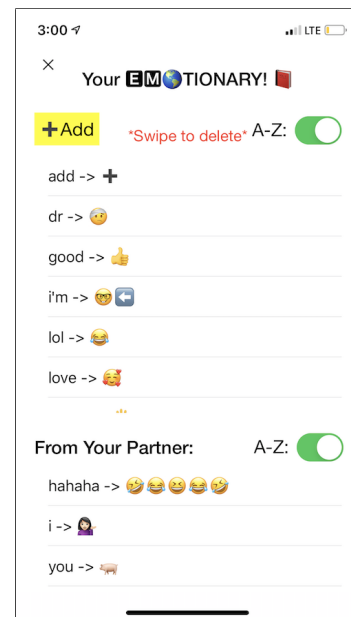

Fig. 2. **The Emotionary screen.** This screen shows the shared vocabulary of text-to-emoji mappings (from text strings to emoji strings) that a user and their partner has created over time. It serves as an emoji dictionary that both partners can contribute to and draw from in their communication. EmoChat's on-the-fly text-to-emoji mapping algorithm (Section 3.3 draws from the Emotionary.

a user's own Emotionary during message translation whenever their

partner has a competing mapping, as the next section describes.

3.3 Automated Text-to-Emoji Mapping Algorithm

Although one of our core motivations for EmoChat was to foster shared vocabularies between pairs of people, we did not want to give users the burden of choosing *every* text-to-emoji mapping within their messages, and so we devised a novel text-to-emoji mapping algorithm to do as much of the heavy lifting as possible for users. Our algorithm maps all text to emoji on the fly as it is typed, allowing the user to change only mappings that they are unhappy with rather than every single mapping.

Our algorithm draws from several rich sources of data to automatically map text to emoji in a way that is as personalized as possible for each mapping. These sources encompass a range of possible emoji meanings, from widely agreed on to highly personalized to the pair. They are (in order of priority for the algorithm):

(1) The user's own contributions to the shared Emotionary, which represents the most personalized mappings. Emotionary entries map one or more words to one or more emoji.

(2) The Emotionary contributions that the user's partner made.

(3) The *"EmojiNet–EmojiLib dictionary"* [7, 42], which represent widely accepted meanings for emoji (for example, "stadium" maps to "🏟"). This dictionary maps one or more words to a single emoji.

(4) Our *"Emoji Word Embedding Model"*, which is similar to Barbieri et al.'s [2]. It maps any single queried word to a single emoji and incorporates emoji meanings that are context-dependent. For example, it allows us to map "fan" to "🏟" as well, and not just "stadium." The model can also generate alternative options for a queried word and for multi-word phrases that partners have previously defined custom mappings for. We trained our model on 60 million tweets from Twitter.

Appendix B describes how we generated mappings from the "EmojiNet–EmojiLib dictionary" and how we created our "Emoji Word Embedding Model" in full.

To map the input text to emoji(s), our algorithm first tokenizes the input text. If any word/phrase matches one of the user's own Emotionary entries, we map them accordingly. We then turn to the remaining word/phrases and attempt to match those with the user's partner's Emotionary entries. We then repeat this process with the EmojiNet–EmojiLib dictionary. Finally, for all tokens that still do not have a match, we query them in our word embedding model to map them to the emoji with the nearest vector. In the rare occurrence that the word cannot be found in any of the four resources, we leave the word as-is in its textual form.

4   SUMMARY OF EMOCHAT'S PROPERTIES

EmoChat's design and features described above give rise to four key properties, which proved to be very significant and were frequently referenced by our field study participants:

- **[Property 1]** *Emoji-first Communication:* Replacing text with emoji (Sections 3.1.1 and 3.3), emoji-only notification (Section 3.1.2), and 'Tap to Toggle' between text and emoji (Section 3.1.3) are all features which satisfy our prior definition of Emoji-first Communication.
- **[Property 2]** *Unexpected text-to-emoji automated mappings:* EmoChat's automated text-to-emoji mapping algorithm (described in Section 3.3 and Appendix B) often results in unexpected or humorous suggestions. References to this property are abundant in our user study feedback.

- **[Property 3]** *Personalization (custom text-to-emoji mappings):* The "personalization menu" in the Chat interface (Section 3.1.1 and Appendix A) and the Emotionary (Section 3.2) allow users to personalize their experience by creating useful shortcuts, encoding each other's nicknames and other shared meanings, or to correct shortcomings of the automatic text-to-emoji translations.
- **[Property 4]** *Sharing personalized text-to-emoji mappings with one's partner:* The shared Emotionary allows the translation algorithm to utilize custom mappings from both partners and will broadly impact the way messages are created and understood.

5 FIELD STUDY DESIGN

We recruited eleven pairs of participants (22 people total) who were in a close relationship with each other using a tech company's internal forum. Eight people identified as male, thirteen female, and one did not specify. They ranged from 19 to 39 years old and all spoke English as their primary language. Each pair specified that they text each other regularly throughout the day, although all except for one pair (*i.e.* pair 8) reside separately.

5.1 Protocol

Each pair participated in a 60-minute onboarding session over video chat, where we helped participants install EmoChat on their personal iPhones. We suggested that they install a third-party keyboard such as SwiftKey or GBoard instead of using Apple's default keyboard, since Apple's keyboard does not allow emoji to be searched by keyword.

We asked participants to use EmoChat for seven days however and whenever they liked, and we specified that EmoChat is meant to be used "in addition to other messaging apps and not to replace them." On Day 2 or 3 of the study (depending on the participants' availability), we scheduled a quick five-minute-long call to check for technical issues and answer any questions they had at that point. No major issues were reported.

For the duration of the study, the participants also received a notification at 5pm every day reminding them to check-in with their partner. This notification was added to maximize compliance with study procedures.

5.2 Semi-structured interview and shared messages

We held a roughly 60-minute long semi-structured interview with each participant pair after the seven days passed. Each pair attended together via a video call. We structured the interview to get the partners to reflect on the messages they exchanged via EmoChat and answer general questions about their usage and impressions. Once all the interviews were complete, we transcribed them and analyzed them with the goal of extracting common themes between pairs. For our thematic analysis, we performed open-coding [39] on the interview transcripts. Following best practices for grounded theory [6], we iteratively constructed our analytic frame as we synthesized and identified emerging themes. We iteratively reviewed and refined these into a closed set of codes, which we then re-applied to the transcripts. Because we follow a grounded theory approach, inter-rater reliability is not appropriate or necessary [30]. This semi-structured exit interview is described in detail in Appendix C.

Based on previous work on how emoji are used for messaging in relationships, we hypothesized that most participants would have at least a few messages expressing humor [11, 19], intimacy or affection [10, 19], and creativity [5, 23]. Hence, during the interview, we asked each participant to share an example of a message that fit the following prompts: (1) a message they really liked, (2) a message they found to be especially funny, (3) a messaged they perceived as especially warm, affectionate and/ or appreciative, and (4) a message they perceived as especially creative. Occasionally,

Table 1. **Field study statistics.** 14 out of 22 participants (Pairs 1–8; 64% of ptcpts) enjoyed using EmoChat ("promoters"), 3 were neutral, and 5 did not enjoy using it ("detractors;" Pairs 9–11). Pairs rated their closeness with each other on a 7-point Likert scale.

Pair #	Enjoyed EmoChat? (Person A, B)	Relationship	Closeness	Total # Messages	Shared Emotionary Size (# Mappings)
1	Yes, Yes	Partners	6.5	110	22
2	Yes, Yes	Best Friends	6.5	217	139
3	Yes, Yes	Partners	5	163	40
4	Yes, Yes	Best Friends	4.5	187	75
5	Yes, Yes	Partners	3	185	100
6	Yes, Yes	Partners	3.5	163	119
7	Yes, Neutral	Best Friends	5.5	255	42
8	Yes, Neutral	Siblings	5	174	47
9	Neutral, No	Partners	4.5	101	39
10	No, No	Partners	4	164	82
11	No, No	Close Friends	3.5	261	110

	Closeness	Total # Messages	Shared Emotionary Size
Mean (SD) for pairs 1–8:	4.9 (1.3)	181.8 (42.4)	73 (42.3)
Mean (SD) for pairs 9–11:	4.0 (0.5)	175.3 (80.6)	77.0 (35.8)
Mean (SD) for all pairs:	4.7 (1.2)	180.0 (50.6)	74.1 (38.9)

some participants skipped a prompt if they were unable to find an example for it. This resulted in a total of 83 messages that participants shared with us, some of which we display in our analysis below.

6 RESULTS OVERVIEW

We found a strong dichotomy in participant pairs' reactions to EmoChat: over half of pairs strongly resonated with, valued, and enjoyed using EmoChat, while other pairs did not. Around 64% of participants (14 out of 22) enjoyed using EmoChat. They belonged to 8 out of 11 participant pairs (*i.e.* pairs 1 to 8), and we call the participants in these pairs "promoters" (see Table 1). The remaining three pairs did not enjoy using EmoChat and so we call them "detractors" (*i.e.* pairs 9 to 11).

Our analysis focused on answering three research questions, which we cover in Sections 7–9, respectively.:

- **RQ1:** What values does EmoChat add to mainstream messaging, and how?
- **RQ2:** What makes someone an EmoChat detractor?
- **RQ3:** What purposes was EmoChat used for?

7 RQ1 RESULTS: WHAT VALUES DOES EMOCHAT ADD TO MAINSTREAM MESSAGING, AND HOW?

Our open coding of participants' interviews revealed ten themes, which in turn revealed four affordances or values that EmoChat adds to communication between partners: (1) it adds to humor; (2) it builds secrecy for the exchange of private messages; (3) it promotes creativity, gamification, fun, and play by turning communication into a shared activity; and (4) it promotes companionship through affection and the sharing of perspectives. Upon further reflection, we found that the ten themes were fostered by the four basic properties of EmoChat summarized in Section 4, including EmoChat's emoji-first communication paradigm and how partners share personalized mappings with each other.

Figure 3 synthesizes these insights, and we consider it a major aspect of our work's theoretical contribution. The middle column shows the ten themes that our open coding revealed. The right column shows how the themes represent four values (or affordances) that EmoChat adds to communication between partners compared to typical text-based
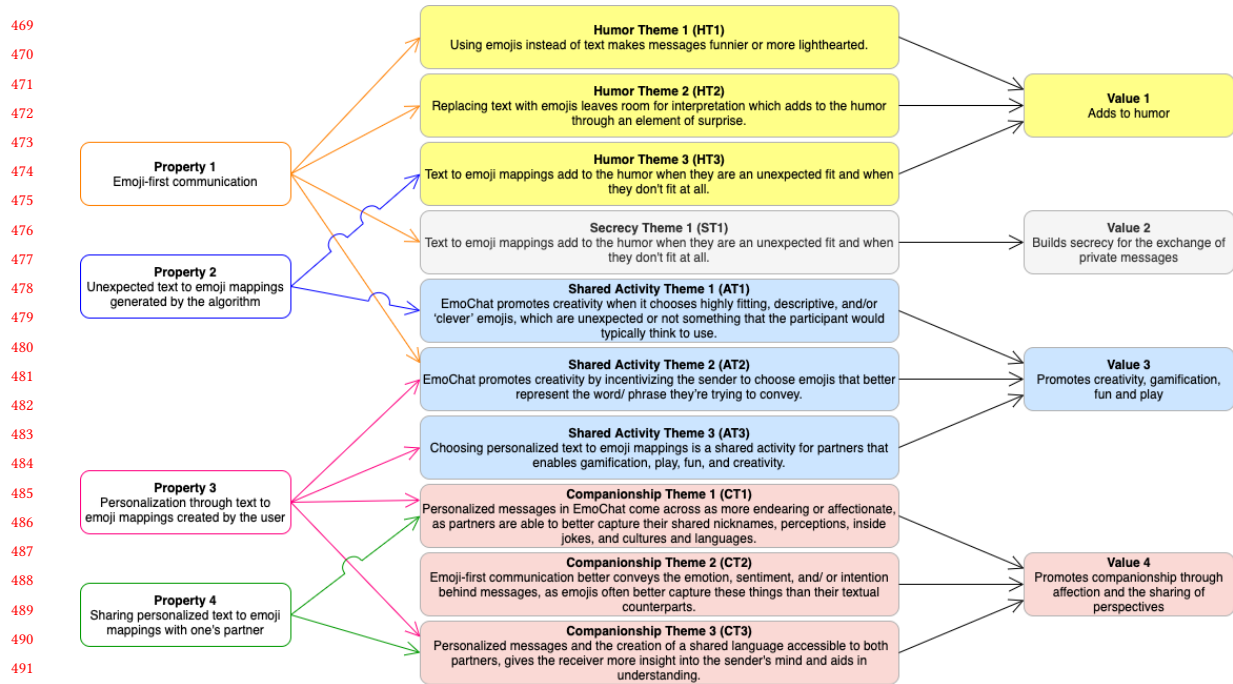
Fig. 3. We found ten themes in our field study results (middle col.), and these themes map to four primary values or affordances of EmoChat (right col.). Upon further reflection, we found that these themes were fostered by four basic properties of EmoChat (left col.). Put differently, EmoChat's basic properties such as emoji-first communication and sharing personalized mappings with one's partner (left col.) are akin to atoms that combine and interact with each other in rich ways, resulting in four significant values that are added to the partners' communication (right col): humor, secrecy, a sense of participating in a shared activity, and companionship.

communication. The left column shows four basic properties of EmoChat that are responsible for the themes. Like atoms, EmoChat's basic properties interact with each other in different combinations to form the emergent themes, which collectively correspond to the four values (affordances) added to partners' communication.

7.1 Adds to humor *[Value 1]*

Six out of 11 participant pairs (*i.e.* pairs 1, 4, 5, 6, 8, and 10) reported using EmoChat primarily for humor, *i.e.*, almost every message they sent on EmoChat was intentionally or unintentionally humorous. Nine out of 11 participant pairs reported that EmoChat especially enhanced the expression and/or perception of humor in textual communication.

> *"We are funny people, and we make each other laugh a lot with the emoji. EmoChat bumped the humor up by like 20%."*
> —Person 2B

We found that EmoChat enhances humor in three main ways (Humor Themes 1–3 below), which we also show pictorially in Figure 3.
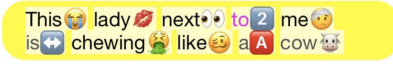
7.1.1 **Humor Theme 1:** *Using emoji instead of text makes messages funnier or more lighthearted:* Users reported that replacing text with emoji changed the tone of the message to be funnier or more lighthearted in 13 examples they shared with us.
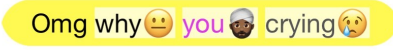
"Just texting it and putting one emoji versus having it all in emoji probably wouldn't have been as funny or amusing as it was." —Person 8A

Multiple participants attributed this phenomenon to emoji being more descriptive of a person's emotions, thoughts, and actions than words. For example:
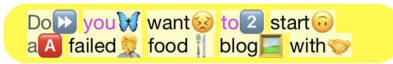
"When it's just a word, then it's up to the other person to interpret what that word would look like, so to speak. But when [someone] actually go[es] in and intentionally assign[s] a picture to a word, you're given more insight into what that person was thinking." —Person 4A

"You can actually look at emojis [sic] and connect it directly to actions." —Person 3A, while trying to explain that emoji are more descriptive of action words than text.

"I think the fact that the cow emoji actually shows up personifies the person a little bit better. And you know, gives a better picture of what I was actually experiencing." —Person 4B

"It's a phrase that we say a lot. It doesn't really mean that they're really crying. It's just like complaining. It's just funnier seeing it in emojis [sic]. " —Person 3A

Some participants also reported that replacing text with emoji changed the tone of messages that wouldn't necessarily be perceived as funny, to be more lighthearted and friendly. For example:
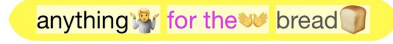
"We're addressing something that happened in our life without actually explicitly saying like who it's about. We're poking fun at one of our other friends. I actually feel like EmoChat does make it better, because when you see it in emoji, it doesn't seem as gossip-y. It's more like a funny little way of telling the story." —Person 4B

7.1.2 **Humor Theme 2:** *Replacing text with emoji leaves room for interpretation, which adds to the humor through an element of surprise.:* Participants described messages that were funny because viewing only emoji at first created ambiguity and room for interpretation. We were given 12 examples of these messages.

"I think the ambiguity [...] inherently makes it kind of funny. And then maybe the emojis [sic] themselves are also kind of more lighthearted." "[T]he emojis are kind of fun to figure out [...] like what the other person is trying to say." (person 5a)

When participants view the original text, they frequently find that their interpretation did not exactly match with the original text and as a result, respond with surprise and laughter.

"I think that the differentiator of EmoChat is that for every message, you have to think about 'what could this possibly mean.' Then, you have to click and hold it to see what it means. Because of the emoji, there's more ambiguity in what each word could mean. So, it becomes funnier when there's the reveal." —Person 4A

"It was much more funny through EmoChat because he would have to hold it to see the original message...It's funnier to see what the original was because it could be interpreted into other things." —Person 2A

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Or 😊 like writing ✍️ in hieroglyphics 🧙

"We're like writing in hieroglyphics. And then 'hieroglyphics' was a wizard and my partner was very confused, and said, 'I thought that was witchcraft'... I think the confusion made it more fun." —Person 5A

My 👩 mom 🧍‍♀️ is ↔️ crazy 😜 and ➕ sometimes 🧟 I'm 👩 afraid 😱 of her 🧍‍♀️

"She sent it for mom, she sent a pregnant lady!" —Person 5A

"I didn't really think about it. I was like, oh that makes perfect sense. And then when I sent it to him...to him, it looked like I was saying I was pregnant!" —Person 5B

7.1.3 Humor Theme 3: Text-to-emoji mappings add to the humor when they are an unexpected fit and when they do not fit at all:

Participants reported that the app's choice of emoji, whether the choice was arbitrary and unrelated, or unexpected and surprisingly fitting, added to the humor of the message. We were given 10 examples of these messages.

> *"Part of the fun was typing out a message and looking at how the EmoChat algorithm assigns emojis [sic] to the words. That in and of itself, was part of the humor..."* —Person 4A

> *"I think the best part about EmoChat is the surprising use of emojis [sic] like the croissant (for 'sweet thing') or the stadium (for 'I'm not a <u>fan</u>')... There's so many emojis that you can use to express a word or a phrase. So when the app chooses something I would not choose but it's still super appropriate...that kind of makes it funny to me."* —Person 8A

Below is an example of unexpected emoji that were a surprisingly good fit:

Yea 😳 mostly ◻️ to ➡️ beat 🧹 David 👀 😤

"I was asking her about the Oculus...the virtual reality gaming system... if she was using it and she said... yeah mostly to beat our little brother (David). It was funny because the emoji that was used for beat, came up as a broom. It was hilarious, of all things. And I definitely didn't want to change that one..." —Person 8A

Certain automatic mappings that do not fit at all also injected humor into messages. For example, the use of the "pregnant woman (🤰)" emoji for the word "wait" particularly stood out:

i 👩 can't 😳 wait 🤰 to ➡️ see 😁 you 👋

"Definitely not what I was expecting, but that's what made me like it." —Person 1B

7.2 Builds secrecy for the exchange of private messages [Value 2]

Another value that we found EmoChat to add to partners' communication was a sense of secrecy, which was facilitated by EmoChat's emoji-first communication paradigm (Property 1 in Figure 3). One theme from our open coding related to secrecy, and we describe it below.

7.2.1 Secrecy Theme 1: Emoji-first communication creates a general sense of secrecy and mystery, and allows users to exchange private messages that can be hidden from others.

Participants in all promoter described about how they liked that EmoChat promoted secrecy, mystery, and/or surprise. Five out of the eight promoter pairs (*i.e.*, Pairs 1, 2, 4, 5, and 8) recalled remembered exchanging specific messages that they perceived as being "secret" or private.

This 🧑 lady 💃 next 👀 to 2️⃣ me 😊 is ↔️ chewing 😋 like 😁 a 🅰️ cow 🐮

"I wanted to send [this message] on EmoChat so that the lady [who was chewing like a cow] wouldn't see me talking about her." —Person 4B

> *"[While exchanging messages on EmoChat,] if someone was peeking over my phone, [for example], my mother, I wouldn't necessarily move my phone [away] because I know that she would not be able to interpret the messages."* —Person 8A

Some participants associated these secret messages with promoting gamification in addition to facilitating privacy:

> "It made texting [into] a game because we [exchanged] little secret messages and [had to] guess what the emojis [sic] are trying to say. It was like a mystery game. A guessing game. That was kind of cool because it made texting a bit more interactive." —Person 8A

Participants in Pairs 3 and 6 did not identify specific messages as being secret messages, but they found EmoChat to have a general sense of secrecy regardless. For example, Person 3B compared EmoChat messages to Morse code, and Person 6B described the process of viewing an EmoChat message as "perceiving a code."

7.3 Promotes creativity, gamification, fun and play *[Value 3]*

> "EmoChat is different you know! You can get really creative with it. You can make your own language but in this case with emoji. It's like really cool!" —Person 1B

Several authors have found that playfulness and creativity expressed through emoji strengthens the connections of people's relationships [5, 18, 23]. We found that EmoChat promotes creativity, gamification, fun, and play by turning communication itself into a shared activity. It does so in three main ways (Shared Activity Themes 1–3 below).

7.3.1 **Shared Activity Theme 1:** *EmoChat promotes creativity when it chooses highly fitting, descriptive, and/or 'clever' emoji, which are unexpected or not something that the participant would typically think to use.* Messages for which EmoChat's algorithm unexpectedly chose highly fitting and descriptive emoji were perceived as creative or clever by the participants. We were given at least ten examples of these messages.

Since EmoChat's algorithm collaborates with its users to form messages, it can be considered to be a mixed-initiative co-creation tool. Mixed-initiative co-creation tools enable the creation of artifacts via the interaction of human and computational agents, and can foster creativity in their human collaborators [27, 45]. Likewise, EmoChat fosters users' creativity by providing algorithmic examples of creativity through unexpected mappings.

If 😲 I'm 😊 being ⚪ honest 🙅, I'm 😊 not ❌ a 🅰 fan 🏟...
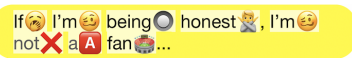
> "I like [EmoChat] because I think the emoji it chose were really creative. Like for fan, it chose the emoji of the stadium (🏟). I would never think of that. I was like wait, why did it choose the stadium? Then [I thought of] bands [performing] at the stadium. So, it was really creative and interesting." —Person 8B

I'm 🦊 testing 🧬 a 🅰 pancake

> "I thought it was clever that the word 'testing', shows up as an emoji for a double helix of human DNA. Testing seems very serious when contrasted with something like a pancake... In a regular texting app, this message would've been very, very literal. I'd be happy to know that my partner was making breakfast, but there would be no irony to it." —Person 6B

7.3.2 **Shared Activity Theme 2:** *EmoChat promotes creativity by incentivizing the sender to choose emoji that better represent the word/phrase they're trying to convey.* Participants perceived at least 10 more of the 83 messages as being creative for a different reason: because the emoji were very carefully chosen by them or their partner to be very representative of the word, phrase, or idea they were trying to convey in a surprising way. Further, the participants from six out of the eight "promoter" pairs (*i.e.* Pairs 1 to 6) liked being able to choose personalized text-to-emoji mappings.

Cool 🌱 🦕

> "The emoji that I chose to represent the word 'cool' were the saxophone emoji and the dinosaur emoji, so that it appears that the dinosaur is playing the saxophone. I think at the time it was just a chance for me to be funny to my partner, and to be creative. The default might be have been a face with sunglasses on, but here, I had the opportunity to not

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only say 'that's cool with me,' but also to share my opinion of what would be extremely cool, which, in this case, would be a dinosaur that can play the saxophone. It was a chance for me to play with it a little bit at that time, and it's amusing to scroll back and see it." —Person 6B

7.3.3 **Shared Activity Theme 3:** *Choosing personalized text-to-emoji mappings is a shared activity for partners that enables gamification, play, fun, and creativity.* The participants in Pairs 1, 4, and 6 associated the ability to personalize their text-to-emoji mappings with gamification, play, fun, and/or creativity:

"Two things I liked [about EmoChat] was the playfulness and the creativity... It is a bit of a creative act to choose art to coincide with an idea. There's something satisfying about that, particularly when you have a close relationship with the other person." —Person 6A

"EmoChat is different you know! You can get really creative with it. You can make your own language but in this case with emoji. It's like really cool!" —Person 1B

7.4 Promotes companionship through affection and the sharing of perspectives *[Value 4]*

We had designed EmoChat to enhance connection and companionship between people in close relationships, and we found this to be the case after open coding the semi-structured interviews that followed our field study. Specifically, we found that EmoChat promotes a sense of companionship by facilitating affection and perspective sharing, and that it does so in three main ways (Companionship Themes 1–3 below).

7.4.1 **Companionship Theme 1:** *Personalized EmoChat messages come across as more endearing or affectionate, as partners are able to better capture their shared nicknames, perceptions, inside jokes, cultures, and languages.* With respect to at least seven messages that participants shared with us, participants reported that being able to manually select emoji for specific words/phrases allowed them to better capture their shared nicknames, perceptions, inside jokes, and cultures, and languages. They frequently associated doing so with the message being perceived as being more endearing and affectionate:

"When you like think about [your partner's] personality together with what they picked, it becomes more personal, more endearing, more intentional than just using a word." (person 4a)

"There's also a sense of warmth when you feel like something has been personalized for you." (person 4b)

"My nostril is really well and it makes me look like a bird... Well, raven is like a word that [my partner] and I used together. Someone might read this message and interpret it differently but we know what it means." —Person 4B
"The emoji in place of the word raven definitely adds that additional layer of humor and affection to the message." —Person 4A

"Mami is one of her favorite emoji that I gave her...Mami is a nickname I call her because Spanish people just call their wives and girlfriends 'Mami.'" —Person 1B

"It says 'te quiero mas' which is 'I love you more' in Spanish, but the emoji [sic] say 'I love you' with the little heart face. So, I understood what the emojis meant [but] when I clicked [the message, I realized,] that it was in Spanish. So, it was a double surprise!" —Person 5A

7.4.2 **Companionship Theme 2:** *Emoji-first communication better conveys the emotion, sentiment, and/ or intention behind messages, as emoji often better capture these things than their textual counterparts.* In at least seven messages that participants shared with us, participants reported that by showing emoji before text, EmoChat was able to better convey the emotion, sentiment, and/ or intention behind the messages, as some emoji better capture the emotion, sentiment and/ or intention than their textual mappings.

"[Someone] recently got into fishing. So, I wanted to send the message in support [of him], hoping that he catches some fish that day... The word 'fruitful' was converted to a bouquet of flowers and I thought that [the 'bouquet of flowers' emoji] expressed my message in a better way. It made it sound like I hope that he has a bounty of fish at the end of the day. I think that emoji spoke louder than just the word 'fruitful'." —Person 4B

"[My partner] and I don't say that we love each other all the time. So, it was [a unique] moment and it was nice to feel loved by her and vice-versa."... "If [this message] was sent through [some other messaging app], it would've been a little bit bland. As in, I wouldn't really feel anything. [Using EmoChat], I felt emotion towards [the message]." —Person 2B

7.4.3 **Companionship Theme 3:** *Personalized messages and the creation of a shared language accessible to both partners, gives the receiver more insight into the sender's mind and aids in understanding.* Both partners in Pairs 2 and 4 talked about how personalized emoji mappings gives the sender more insight into the receiver's mind, and allows the receiver to better understand the message.

"When you actually go in and intentionally assign a picture to a word, you're given more insight into what that person was thinking." —Person 4A

"[The shared Emotionary] was very helpful because when when we'll be texting frequently, I would know what she's saying as I already saw her Emotionary." —Person 2B

Additionally, all participants liked the fact that the shared Emotionary allowed them to view and use their partner's mappings. Several mentioned that scrolling through them helped them understand their partner's messages better.

8 RQ2 RESULTS: WHAT MAKES SOMEONE AN EMOCHAT DETRACTOR?

As Section 6 describes, we classify three out of our eleven pairs of participants as "detractors" because at least one of the partners in each of these pairs did not enjoy using EmoChat. In Pair 9, Person 9B did not enjoy using EmoChat, while Person 9A was neutral. In Pairs 10 and 11, both partners did not enjoy using EmoChat. In order to understand what makes some people become EmoChat detractors, we analyzed the interview transcripts from these pairs. We found four reasons.

Reason 1: Detractors do not enjoy using or rarely use emoji on other texting apps

Person 9B strongly prefers words over emoji and did not like using EmoChat for anything, including humor.

"We communicate with words, which is why we have a language. We don't communicate via symbols. I think that as a society we've chosen [communicating with words] as the effective path of communication. It's really fun texting with [EmoChat] and you have to be really close to your partner to be able to use this form of communication similar to sign language. However, I personally believe in using letters, words, and sentences, as the most effective way of communicating with my partners." —Person 9B

On a similar note, Persons 10A and 10B reported that they "never use emoji" while texting on other apps. They explained that the main issue for them while using EmoChat was the "language barrier" as there exist just 3,000 emoji, severely limiting their usable vocabulary.

Reason 2: Detractors have a different sense of humor than promoters

Person 10B could not identify a single message that they found to be humorous or funny. Further, both Persons 10A and 10B agreed that they used EmoChat for mostly "dirty flirty humor." This is different from our "promoter" pairs who used EmoChat for many different types of humor, such as inside jokes, situational humor, teasing and roasting each other, poking fun at others, self-deprecating humor, bathroom humor, and clever and witty humor. Person 10B further explained that most of their messages were about "discussions on general topics" and they had no examples for messages conveying affection either.

Person 11A reported that EmoChat made them use humor in a way that they are not used to making. They explained that EmoChat made serious conversation funny, but they perceived that kind of humor as "absurd" or "awkward." Person 11A further added that they do not typically text each other throughout the day.

Reason 3: Detractors disliked personalizing mappings due to lack of creativity and/or did not find the extra effort that personalization requires to be "worth it"

Both partners in Pairs 9 and 11 agreed that they did not use EmoChat much to creatively express themselves. Persons 9A and 9B were unable to find any examples of messages that they found to be creative, and Person 9B stated that they "struggle to be creative" in general. Similarly, while Person 11B had one example of a message they found to be creative, they also stated that "there wasn't much creativity."

On a separate note, Person 10b stated a strong preference for most words to be automatically mapped to fitting emoji instead of requiring personalization. Persons 9B, 11A and 11B found personalization to be burdensome and offering little value. Person 9B described personalization as being "just not necessary" and taking "so much more work than actually typing out the words." Person 11B stated that they would rather use a "sprinkle of emoji" in their messages than replace all words with emoji. They added that they do not enjoy texting in general due to the time and effort that it requires, and personalization on EmoChat further adds to this burden.

Reason 4: Detractors neither exchanged nor saw value in exchanging "secret," coded, and/or ambiguous messages that are open to interpretation.

While all "promoter" pairs (except Pair 7) explicitly associated EmoChat messages with secrecy, none of the detractor pairs found EmoChat to promote secrecy. In addition, while promoters believed that incorrect mappings and the room for interpretation that EmoChat creates adds to the humor and promotes gamification and an element of surprise, all detractors expressed very low tolerance for ambiguity in their communication. For example, Person 9B expressed a strong preference for being "very specific" in all communication over text messages.

9 RQ3 RESULTS: WHAT PURPOSES WAS EMOCHAT USED FOR?

When we onboarded our participants, we mentioned to them that we do not expect EmoChat to replace other texting/messaging apps, but rather be used in tandem with their other apps. We asked participants to use EmoChat in situations where using it makes sense. We hypothesized that they would use EmoChat for the following purposes: (1) greeting their partner; (2) letting their partner know that they're thinking about them; (3) making casual conversation; (4) making plans for some upcoming occasion; (5) expressing affection, warmth, and/or good wishes; and (6) sending
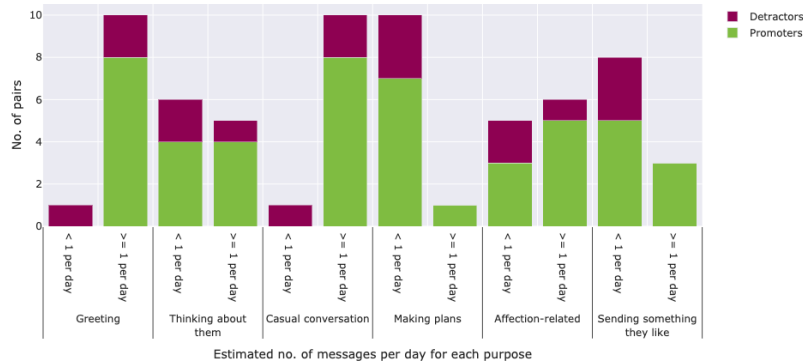
Fig. 4. Self-reported estimated of the number of messages per day each pair exchanged for each of the 6 hypothesized purposes.

their partner something they like. At the end of the study, we asked them to the frequency that they sent messages for these six purposes.

Figure 4 shows the participants' reported usage frequencies. "Making casual conversations" and "greeting your partner" were the two most frequent message purposes, followed by "expressing affection, warmth, and/or good wishes." "Letting your partner know that you're thinking about them" is less frequent, while "sending your partner something they like" and "making plans for some upcoming occasion" very rarely occur for most participant pairs.

In addition to frequency, we also asked participants to report their comfort or ease with which they can send their partner a message for each of the 6 purposes. The most interesting finding here was that detractor pairs are visibly less comfortable making casual conversation than promoter pairs (see appendix ??).

10 MISCELLANEOUS FINDINGS

We report additional minor findings below, and elaborate them further in appendix D.

- Promoter pairs reported higher relationship closeness at the beginning of the study than detractors did, but due to the small sample size of detractors, we could not assess the significance of this finding.
- Six out of the 11 pairs specifically used EmoChat in "relaxed situations," which makes sense as EmoChat enhances things people enjoy in their down time: humor, fun, play, and creative expression.
- Participants in six out of ten pairs[1] alluded to sending especially shorter messages through EmoChat. Several participants reported using EmoChat for mostly relationship maintenance, *i.e.,* exchanging quick, routine updates.

11 DISCUSSION AND FUTURE WORK

11.1 The future of emoji-first communication

Previous work has found that people use different communication apps with different sets of people they know, and these apps and the people in them are customized to facilitate these relationships [16]. EmoChat is one such app which is heavily customized to a person's relationship with someone close to them, serves very specific purposes, and appeals to certain types of users. To the best of our knowledge, EmoChat is the first ever emoji-first messaging app. Hence,

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[1]The remaining pair did not respond cohesively.

understanding the specific purposes that EmoChat serves and the type of users it appeals to can help us visualize how emoji-first messaging would fit in the future ecosystem of communication apps.

Emoji-first communication is primarily suited for greetings, casual conversations, expressing affection and thoughtfulness. Emoji-first messages tend to be shorter and mostly include quick mundane updates about the users' daily lives, thereby aiding relationship maintenance. Such "continuous traces of narrative, of tellings and tidbits, noticings and thoughts" [34] are also seen as enactments of togetherness and intimacy. Hence, we conclude that emoji-first communication is most suited for close relationships in which the partners already use and appreciate emoji, have a varied sense of humor, enjoy mystery and surprise, and would enjoy texting their messaging partner in leisure for fun, play, and creative expression.

While participants appreciated EmoChat as a standalone emoji-first messaging app, in our exit interview they also expressed a desire to see emoji-first features in existing messaging apps. Even so, they wanted these emoji-first features to only work when they are texting people close to them. Hence, the emoji-first messaging paradigm introduced by EmoChat could be implemented as an additional plugin in mainstream messaging apps such as iOS's 'Messages' app. In fact, there has been an increase in demand for lightweight symbolic communication, which further strengthens the case for incorporating EmoChat in existing apps. Examples include Facebook's fixed set of emoji "Reactions," Honk's much larger set of emoji "Reactions" [26], and Apple's Animoji and Memoji. Snap Inc.'s Zenly [20] allows users to send a single emoji-like symbol from a fixed set of symbols that grows as the user engages with more friends.

Furthermore, given its small rendered size, such symbolic communication also works well on devices with small display sizes such as smartwatches. For example, Animo [28] allows users to use their smartwatch to communicate with each other through lightweight "biosignals" that are also deep, rich and authentic. Finally, given the parallels between emoji and other existing forms of symbolic communication such as bitmojis, stickers, animoji and memoji, our work on emoji-first messaging can also serve as the basis for future work on symbol-first communication in general.

11.2   Implications beyond communication

By enabling personalized communication in close relationships, EmoChat also creates the potential for a new approach for life-logging and health analytics. Since partners often use EmoChat to send quick, mundane, and frequent updates for relationship maintenance, they can also choose to use their emoji-first message log as a shared life-log or to send their partner frequent updates about their health and fitness habits such as when they woke up, what they ate and how much, and whether they exercised. Since emoji-first messaging groups many concepts and maps them to single emoji, searching an emoji-first life or health log would be easier than searching a natural language life or health log. Given the illustrative nature of emoji, visualizing the emoji-first logs can help the user reflect on their life or health and fitness habits in a more visual and engaging manner, similar to how seeing emoji place reactions on a map was engaging in Opico [24]. Emoji can also help the user visualize their life and habits at different levels of granularity. For example, if the user maps different types of workouts (*e.g.* yoga, HIIT) to the same emoji (" 3 "), the emoji-first log will encode and enable visualization of when they worked out regardless of the type of workout, while the natural language log will encode and enable visualization of specific types of workouts.

12   CONCLUSION

We built and investigated an exploratory emoji-first messaging app for pairs of users in close relationships that leverages the pair's closeness and shared experiences to create a highly personalized "communication zone" [31] for them. We investigated the affordances of *personalized* emoji-first messaging via a field study, and found that it contributes the

following values over regular text messaging: it adds to humor; it builds secrecy for the exchange of private messages; it promotes creativity, gamification, fun, and play by turning communication into a shared activity; and it promotes companionship through affection and the sharing of perspectives. Our work creates a new paradigm for messaging that communicates symbols before text and has implications for future ecosystems of communication apps.

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Appendix

A THE CHAT INTERFACE'S "PERSONALIZATION MENU"

The "personalization menu" is the region above Box 3 from Figure 1(c). It is a modal menu that appears when the user selects substrings of emoji within Box 3, the emoji message that they are crafting. The personalization menu allows the user to replace the emoji substring with their own emoji string mapping.

As shown in Figure 1(c), the personalization menu contains 10 buttons (shown in yellow). The first seven buttons are for choosing emojis that EmoChat's algorithm chose as potential alternatives (see section 3.3) to the current emoji mapping. The next two buttons are labeled "T½" and "T," and they work as follows:

(1) "T½" temporarily maps the selected input tokens to their textual counterparts instead of an emoji string. This allows the user to remap individual words (*e.g.* "love" and "you") of a previously combined phrase (*e.g.* "love you" mapped to one emoji string).

(2) "T" lets the user map the selected input token(s) to their textual counterparts such that, EmoChat always leaves these input token(s) as text in all messages until the user chooses to re-map them. Users typically use this option for words they may wish to convey without ambiguity.

The final button is labeled "…," which refers to "More Options." Tapping this button brings up a text box in which the user can enter any string that they would like to map the selected input tokens to. While users typically only enter strings containing emojis, they are free to enter text or text interspersed with emojis in this text box.

B LEARNING DEFAULT TEXT-TO-EMOJI MAPPINGS USING WORD EMBEDDINGS

Previous work has shown that while there are widely accepted interpretations of emojis [2, 42], the meaning of emojis can also be context-dependent [8]. While generating EmoChat's default text-to-emoji mappings, we capture widely-accepted text-to-emoji mappings by using EmojiNet [42] and EmojiLib [7], and context-dependent text-to-emoji mappings by learning emoji word embeddings based on how emojis are used in various textual contexts in tweets (similar to [2]). By using emoji word embeddings in addition to resources like EmojiNet and EmojiLib, we are able to generate default emoji mappings for a much larger number of words and phrases. For example, we are able to map both "stadium" and "fan" to "🏟", while EmojiNet and EmojiLib are able to map "stadium" to "🏟" but not "fan". Below, we describe how these two types of text to emoji mappings were learned:

B.1 Widely accepted text-to-emoji mappings from EmojiNet and EmojiLib

Both EmojiNet and EmojiLib contain a list of emojis along with their category and 'name'. 'Name' is a short description of what that emoji could generally be interpreted as. We process them as follows:

(1) To preprocess or clean up 'name', we covert it to lowercase and remove all '?'s and '!'s. We also remove 17 words like "symbol", "face" and "button" as these are used repeatedly across many emojis.

(2) If 'category'∈ {objects, food and drink, travel and places, animals and nature, people, people and body, and activities}, we use Python's pluralize package [36], to extract the plural form for 'name' *i.e.* 'plural of the name'.

(3) We add 'name'→emoji and depending on the 'category', possibly plural of the name'→emoji, to our *"EmojiNet–EmojiLib dictionary"*. Given that an emoji can occur in both EmojiNet and EmojiLib and can be mapped to the 'name' and the 'plural of the name' which can be one or more words, each emoji can be mapped to more than one textual string which is a word or phrase.

B.2   Text-to-emoji mappings from Twitter

To learn text to emoji mappings from tweets, we fetched roughly 60 million tweets from Internet archives[2] and processed them as follows.

(1) We preprocess each tweet such that there's a space before and after each emoji occurrence.
(2) We use FastText (with default parameters) [3] to learn emoji word embeddings such that the emojis and words occurring in tweets are mapped to the same vector space.
(3) In order to query words and emojis separately, we split the file containing the vector representations of emojis and words into one file for emoji vectors and another file for word vectors.

To fetch an emoji mapping for a word, we get the vector of the word, and then find the emoji vector that is nearest to this word vector. This allows us to map words to emojis. Further, the emoji vectors can be ranked based on their closeness to the word vector to get alternative emoji options for that word.

Finally, to fetch an emoji mapping for a string containing multiple words, we get average the vectors of words in the string to get an 'averaged vector'. Then, we find the emoji vector that is nearest to this averaged vector. This string to emoji mapping method is *only* used to generate alternative options for multi-word phrases that the users have previously defined custom mappings for (see section **??**).

C   SEMI-STRUCTURED EXIT INTERVIEW

Partners were interviewed together via video call at the end of the study. The interview took roughly 60 minutes, and was structured to get the participants to reflect on their usage of EmoChat and answer general questions about their usage and impressions of EmoChat. The interview had two parts which are described below.

C.1   Reflecting on and sharing examples of messages exchanged

For the first part of the interview, each participant was asked to give one example each for the following prompts: (1) a message they really liked, (2) a message they found to be especially funny, (3) a messaged they perceived as especially warm, affectionate and/ or appreciative, and (4) a message they perceived as especially creative. For every example they provided, they were asked to explain the reasons for their choice and to explain whether they think that their experience of sending/ receiving that message would've been different had they been using a regular texting app instead of EmoChat and why.

In response to the above questions, we received a total of 83 examples of messages from our 11 participant pairs. Most of the results presented in section 6 are based on these examples.

C.2   Answering general questions about their usage and impressions of the app

Participants were asked several general questions. Their responses to the following questions were interesting and referenced in different sections of the paper:

Usage-related:

(1) Did you notice any patterns related to the physical/ contextual situations (*e.g.* location or time of the day) you used EmoChat in? If yes, what were they?, (2) Did you use EmoChat for shorter or longer messages? Did you need to explicitly shorten or simplify messages?, (3) Did you try any non-English messages? (4) Did you map any English words that aren't real words (*e.g.* slang, nicknames)? (5) What kinds of humor did you express (*e.g.* self-deprecating,

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[2]https://archive.org/search.php?query=collection%3Atwitterstream&sort=-publicdate

roasting your partner)? (6) The frequency of use and comfort for sending the following message types: greeting your partner, letting their partner know that they're thinking about them, making casual conversation making plans for some upcoming occasion, expressing affection, caring and/ or good wishes, and sending your partner something they like. (7) Did you feel like you were exchanging secret messages? When? (8) How particular were you about getting things right? How did you feel about ambiguity in your messages?

The participants' responses to usage-related questions are used in section 6.

Impressions and understanding of EmoChat features:

(1) How do you feel about the shared Emotionary? Is it better to have a shared Emotionary as opposed to a personal-only Emotionary? (2) How did you enter mappings into the emotionary? That is, did you map words while chatting by using the personalization menu in the Chat UI, or did you use the 'Add' button in the Emotionary?

We comment upon the participants' responses to the above questions in section 3.

Informing future work:

(1) What kind of words would you rather leave as text always? What kind of words is there no emoji representation for? (2) How do you feel about EmoChat as a feature in regular messaging apps? What would that look like?

We comment upon the participants' responses to the above questions in section 11.

D   ELABORATING MISCELLANEOUS FINDINGS

D.1   Effect of the partners' relationship on their perception or usage of EmoChat

As shown in table 1, promoter pairs reported higher relationship closeness at the beginning of the study than detractors. However, since the number of detractor pairs is small, the significance of this finding cannot be statistically assessed. There is no evidence of a relationship between whether a pair enjoyed using EmoChat and their amount of usage of EmoChat's features like the total number of messages exchanged and the number of words in shared Emotionary.

D.2   When was EmoChat used?

Participants were asked whether they used EmoChat in specific physical/ contextual situations or at specific times of the day. Participants in 3 out of 11 participant pairs (*i.e.* pairs 5, 8, and 9) reported no patterns in when they used EmoChat. Participants in pair 7 text in another language half the time, and used EmoChat when they wanted to text in English only. Participants in pair 10 used EmoChat mostly in the morning. The remaining 6 out of 11 participant pairs (*i.e.* pairs 1, 2, 3, 4, 6, and 11) reported using EmoChat in 'relaxed situations.' For example, during shared experiences such as watching the same movie, when relaxing at home, taking a break at work, or when they wanted to do 'something different' after talking on various apps throughout the day. Hence, EmoChat users prefer texting their messaging partner in leisure, which makes sense as EmoChat enhances things people enjoy in their down time: humor, fun, play, and creative expression.

D.3   Short vs. long messages

Participants in 6 out of 10[3] pairs alluded to sending especially shorter messages through EmoChat. While this was partly because shorter messages were easier to understand in emojis, participants also repeatedly talked about using EmoChat instead of other texting apps when they wanted to send short 'random funny facts' and quick updates.

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[3]We use N=10 instead of 11, as pair 9 was unable to understand the question and gave an unrelated answer that we excluded.

D.4   Unusual uses of EmoChat

We also found that messages were perceived as creative when the content of the message (input text and/or output emoji) was unusual or something that the participants were not expecting to exchange on EmoChat. In fact, for at least 5 of the 19 messages that the participants reported in response to the prompt on 'sharing examples of creativity', they reported perceiving those messages as creative because the content of the message was unusual or the message was not the kind of message they were expecting to exchange on EmoChat. The participants were surprised that they were able to exchange such messages on EmoChat. These messages included things like 'picturesque' conversations consisting of multiple exchanged messages, choosing emojis to represent words in a language other than English, leveraging a language other than English to meaningfully map English words to emoji, and typing out names of people they know and interpreting the emojis that EmoChat selects as their friends' 'fate' (the participant compared this to 'palm reading').

"(Here, I am) speaking in Pidgin which is one of the dialects in Nigeria. I thought it was kind of cool that we (were able to choose) emojis for a different language. I thought it was pretty creative." "It was pretty creative to see how emojis can be aligned with (not only) different languages (but also) specifically slang words, (which are) words that don't necessarily exist in English." (pair 8)