Once More With Feeling: Teaching Empathy to Machines

In a quest for smarter technology, Google and others in the field of affective AI are developing tools that respond to human emotions and facial expressions

By Benjamin Powers
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As a computer-science student at Cambridge University in the early 2000s, Rana el Kaliouby was often homesick. She spent hours online, punctuating messages to her family with sad-face emoticons. It wasn't enough. "All the nuances and all the richness of my feelings disappeared in cyberspace," she recalled. "I just had this aha moment: What would it take to get our technologies and our devices to understand us, just in the same way?"

That question fueled her subsequent research and ultimately led to the 2009 launch of Affectiva, a company that builds technology to read human emotions.

Affectiva is a leading player in the fledgling field of "affective AI," which aims to create artificial intelligence that recognizes and responds to our moods, emotions, facial expressions, vocal undertones and other nonverbal cues—a skill inherent to the human brain but largely absent in chatbots, digital assistants and smart devices.

"In the past number of years, we've moved toward increasingly natural user interfaces—touch, gesture, voice. Emotional awareness is the next natural progression from this," said Richard Yonck, founder of Intelligent Future Consulting. The goal is to make technology that interacts seamlessly with humans. Imagine a smartphone that detects when you're feeling down and suggests you get up and move around. Or a car that knows you're tired and recommends you pull over. Or a digital assistant that responds appropriately to your sarcastic tone. "Basically, any field or activity where you find people, you'll find opportunities for emotionally aware and responsive systems," Yonck said.

Emotionally intelligent AI could be used for nefarious ends, including identifying dissent in repressive regimes. China already uses AI-powered facial-recognition technology at subway stations, airports, border crossings and on the street to track and identify people who break the law. It's not hard to imagine authorities one day incorporating affective AI to discern their mood

or state of mind.

El Kaliouby is using it for commercial purposes. Affectiva, which said it has received $26 million in venture-capital funding, has a database of 4 billion images of people from around the world. The company uses machine learning to parse pictures of people's smiles, frowns and grimaces for use in different products. One is a market-research service that films consumer panelists through their webcams—like a remote focus group—and analyzes their real-time reactions to ads and other digital content. More than 1,400 clients have used it, including Mars, Kellogg's and CBS, the company said. Affectiva is also testing a program that uses in-cabin cameras to perceive when drivers are tired, offering prompts to get a cup of coffee or focus on the road. Using data from around the world, computer scientists at Affectiva have trained their emotion-recognition software to track expressions across gender, race and other demographics, the company said.

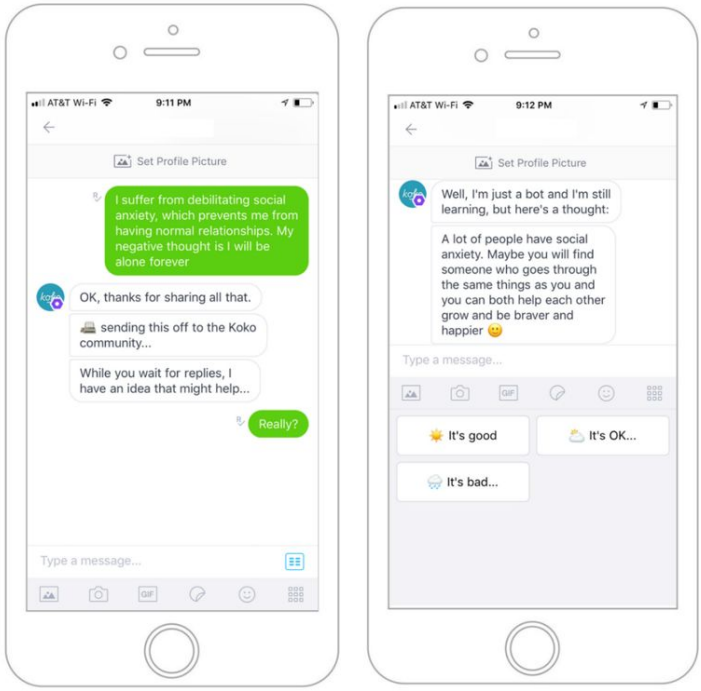
The Google Home Hub smart-home controller. The Google Empathy Lab, founded in 2015, advises product teams from hardware to Google Assistant. PHOTO: ALBA VIGARAY/EPA-EFE/REX/SHUTTERSTOCK

Google parent company Alphabet Inc. has also invested in affective AI. The Google Empathy Lab, founded in 2015, advises product teams from hardware to Google Assistant. "Over time, as assistants become even better at understanding conversation, we can become even more empathetic in our design," Cathy Pearl, the head of conversation design outreach for the Google Assistant, said in an email. "For example, in the mornings I am often in a rush and want quick responses from an assistant, but in the evening when I'm doing the dishes, I may want a lengthier conversation about, say, what music to listen to. Empathy includes understanding a user's

context (are they driving? Hand-busy? In a hurry?) and can help shape the flow of the conversation."

Rob Morris, a PhD candidate at the Massachusetts Institute of Technology's Media Lab, has researched mental-health applications of affective AI. Inspired by Stack Overflow, a program that crowdsources solutions to coding problems, he created Koko, an app for peer-to-peer emotional support, in 2012.

Using a platform similar to Facebook Messenger, users wrote anonymous messages about their depression, anxiety or everyday worries to the Koko community. A chatbot would notify community members, who were then able to respond anonymously in real-time. Messages were meant to be one-off notes of encouragement or comfort, rather than back-and-forth conversations.



Koko, an app for peer-to-peer emotional support PHOTO: ROB MORRIS

In 2016, Morris and other researchers designed an experiment to test whether a chatbot that expressed empathy could improve digital mental-health interventions. In this phase, the chatbot itself responded to users' messages, pulling answers from the repository of messages previously written by human community members. Rather than focusing on keywords, Kokobot analyzed all the words in a user's message to provide more nuanced and appropriate answers. For example, Kokobot could decipher the difference between "I tried to kill myself last year and I still have a hard time talking to my family about it" and "I want to kill myself, I'm so tired of going on." (Kokobot could also direct users to emergency health resources.)

During the monthlong experiment, 37,169 individuals participated; the platform received 72,785 posts and sent back 339,983 responses. Most users were teens, Morris said, and thousands of them posted to a Koko Tumblr about how the program helped them. Still, he found that users preferred responses that came from their peers, rather than the bot.

When it comes to interacting with AI, it's not yet clear whether users prefer an emotionally demonstrative bot or not, says Asma Ghandeharioun, an MIT PhD student researching affective

computing. “Do they like something that feels like an empathetic human being or do they prefer something that is more like a bot that doesn’t have an interest in how you’re feeling or probably knows it but doesn’t show it does?” she said.

While interning at Microsoft, Ghandeharioun helped develop EMMA, an “emotionally intelligent personal assistant,” to study how to improve mental-health interventions via digital devices. EMMA is a smartphone app. It sends users push alerts asking them to describe their emotional state from a list of options related to mood and energy level, and also tracks location data. This helps EMMA understand users’ frequent moods, enabling the program to respond to and ultimately predict their mood. For example, if EMMA notices a user hasn’t moved for eight hours in the middle of the day, it might intuit that she is depressed. The next time the user opens the app, a message might appear: “I’m sorry you are feeling sad. :(It stinks! :/ I hope you feel better.” EMMA might also suggest a “micro-activity,” such as deep breathing, talking with a friend or clicking a link to cute photos.

A key question the researchers wanted to explore with EMMA was whether designers should make affective AI more neutral or more like a counselor or trusted companion. Initial results show that extroverts are more likely than introverts to respond to messages that mirror their mood and reflect an understanding of it. One day, EMMA might be able to tailor responses to individuals, providing tough love to those who prefer it to a comforting approach, for example.

“Affective computing and emotional AI is important because emotion is core to who we are and it’s our earliest means of communication,” said Yonck. Still, seamless, ubiquitous, mood-reading AI is a long way off—and that’s probably a good thing, he said. “It will take society a while to get used to having this new, very personalized modality for interacting with our technologies.”

Corrections & Amplifications

Cathy Pearl is the head of conversation design outreach for the Google Assistant. An earlier version of this article incorrectly said Google’s head of conversation design. (12/17/2018)

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