Teaching computers the nuances of human conversation

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Computer scientists have successfully developed programs to recognize spoken language, as in automated phone systems that respond to voice prompts and voice-activated assistants like Apple's Siri.

But according to Marilyn Walker, professor of computer science at UC Santa Cruz, natural language processing is now so good that the failure of these systems to respond in a natural way has become glaringly obvious.

"People are starting to notice that the system isn't saying anything back," said Walker, whose research includes work on spoken dialogue systems as well as research on extending the language capabilities of interactive games, with a focus on training, assistive, and educational games.

Walker has graduate degrees in both computer science and linguistics, and she is interested in how people adapt their language to their conversation partners. Word choice and sentence construction can reveal aspects of each speaker's personality, as well as the social relationship between the speakers. The challenge is to develop software that can recognize and respond to the nuances of human conversation, altering its responses based on how the user talks to it.

Recognizing sarcasm

Ultimately, such technology could be used to create companion robots,

navigation programs, or restaurant recommendation software that interact with us more naturally. But first, researchers need to learn more about the natural patterns of human dialogue and develop computer programs that can recognize things like sarcasm. One of Walker's current projects, funded last year by the National Science Foundation, involves an interdisciplinary team of UC Santa Cruz researchers, including psychologists and linguists. The group is analyzing posts from online debate forums to learn how people use language to make arguments.

The team has gathered more than 26,000 dialogues from three online debate forums. They have crowd-sourced summaries of a selection of conversations about topics involving ideological arguments, like abortion, healthcare, and the death penalty. They also are also looking at playful debates about the merits of cats compared to dogs, and debates over technical topics, like preferences in web browsing software.

Walker said she is interested in learning more about how people use sarcasm in a conversation, and she's curious about how people present facts to support their arguments. To learn about these elements, the researchers are carefully annotating the online posts to uncover patterns in word choice and sentence construction. These patterns can be particularly tricky to find amidst quirky grammar and misspelled words common to the informal conversation of social media. The researchers plan to use the data they've gathered from summarizations and annotations to build a program that can identify sarcasm, report a poster's stance on a topic, and identify the arguments and counter-arguments for a particular topic.

Varied perspectives

The software could also sift through comments or forum posts to identify people's varied perspectives on a particular topic. Pranav Anand,

professor of linguistics at UC Santa Cruz and a co-investigator on the project, said that such a program could provide a digest or snapshot of what people have to say. "As someone who looks through comments for content, I think an end user would really appreciate that. A person would never be able to read all the comments," he said.

According to Walker, a program like this could also be useful as an educational tool. Psychological evidence suggests that a debate becomes less polarized if people are exposed to multiple arguments.

Other researchers on the grant include Jean E. Fox Tree and Steve Whittaker, both professors of psychology at UC Santa Cruz. Walker previously collaborated with Fox Tree on a project to learn more about language variation while giving directions. The researchers sent students to view public art in downtown Santa Cruz. Other students on campus helped the first group navigate the art walk by providing directions and descriptions of the artwork.

The researchers were interested in how descriptions or directions varied whether the team were friends or strangers. Friends, for example, may abbreviate directions because they can anticipate what their partner will do.

What if navigation systems in cars could learn what kinds of routes you like or common ways you get to main roads? If the system adapts its directions to your preferences, Walker imagines drivers might not want to change car brands when it comes time to buy a new car because they don't want to lose their relationship with their navigation system.

By changing how computers talk to us, it may create an unspoken relationship that strengthens our connections to devices.

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