UC San Diego
UC San Diego News Center

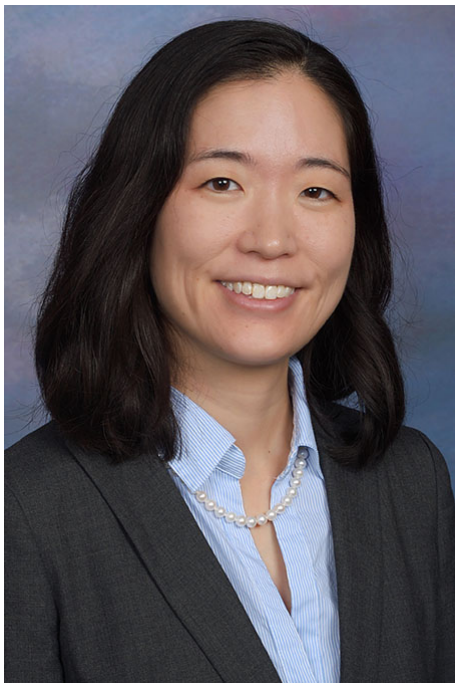
September 24, 2020 | By Scott LaFee

Talking Alone: Researchers Use Artificial Intelligence Tools to Predict Loneliness

New technologies help scientists better identify who is lonely and how older men and women differ in how they feel and express isolation

For the past couple of decades, there has been a loneliness pandemic, marked by rising rates of suicides and opioid use, lost productivity, increased health care costs and rising mortality. The COVID-19 pandemic, with its associated social distancing and lockdowns, have only made things worse, say experts.

Accurately assessing the breadth and depth of societal loneliness is daunting, limited by available tools, such as self-reports. In a new proof-of-concept paper, published online September 24, 2020 in the American Journal of Geriatric Psychiatry, a team led by researchers at University of California San Diego School of Medicine used artificial intelligence technologies to analyze natural language patterns (NLP) to discern degrees of loneliness in older adults.



“Most studies use either a direct question of ‘ how often do you feel lonely,’ which can lead to biased responses due to stigma associated with loneliness or the UCLA Loneliness Scale which does not explicitly use the word ‘lonely,’” said senior author Ellen Lee, MD, assistant professor of psychiatry at UC San Diego School of Medicine. “For this project, we used natural language processing or NLP, an unbiased quantitative assessment of expressed emotion and sentiment, in concert with the usual loneliness measurement tools.”

In recent years, numerous studies have documented rising rates of loneliness in various populations of people, particularly those most vulnerable, such as older adults. For example, a UC San Diego study published earlier this year

found that 85 percent of residents living in an independent senior housing community reported moderate to severe levels of loneliness.

Ellen Lee, MD, assistant professor of psychiatry at UC San Diego School of Medicine.

The new study also focused on independent senior living residents: 80 participants aged 66 to 94, with a mean age of 83 years. But, rather than simply asking and documenting answers to questions from the UCLA Loneliness Scale, participants were also interviewed by trained study staff in more unstructured conversations that were analyzed using NLP-understanding software developed by IBM, plus other machine-learning tools.

“NLP and machine learning allow us to systematically examine long interviews from many individuals and explore how subtle speech features like emotions may indicate loneliness. Similar emotion analyses by humans would be open to bias, lack consistency, and require extensive training to standardize,” said first author Varsha Badal, PhD, a postdoctoral research fellow.

Among the findings:

- Lonely individuals had longer responses in qualitative interview, and more greatly expressed sadness to direct questions about loneliness.
- Women were more likely than men to acknowledge feeling lonely during interviews.
- Men used more fearful and joyful words in their responses compared to women.

Authors said the study highlights the discrepancies between research assessments for loneliness and an individual’s subjective experience of loneliness, which NLP-based tools could help to reconcile. The early findings reflect how there may be “lonely speech” that could be used to detect loneliness in older adults, improving how clinicians and families assess and treat loneliness in older adults, especially during times of physical distancing and social isolation.

The study, said the authors, demonstrates the feasibility of using natural language pattern analyses of transcribed speech to better parse and understand complex emotions like loneliness. They said the machine-learning models predicted qualitative loneliness with 94 percent accuracy.

“Our IBM-UC San Diego Center is now exploring NLP signatures of loneliness and wisdom, which are inversely linked in older adults. Speech data can be combined with our other assessments of cognition, mobility, sleep, physical activity and mental health to improve our

understanding of aging and to help promote successful aging" said study co-author Dilip Jeste, MD, senior associate dean for healthy aging and senior care and co-director of the IBM-UC San Diego Center for Artificial Intelligence for Healthy Living.

Co-authors of the study include Sarah A. Graham, UC San Diego; Colin A. Depp, UC San Diego and Veterans Affairs San Diego Healthcare System; Kaoru Shinkawa and Yasunori Yamada, IBM Research-Toyko; Ho-Cheol Kim, IBM Research-Almaden, San Jose, California; and Lawrence A. Palinkas, University of Southern California.

Funding for this research came, in part, from IBM Research AI through the AI Horizons Network, the National Institutes of Mental Health (grants T32-MH019934, K23-MH119375-01), the Brain and Behavior Research Foundation, the Veterans Affairs San Diego Healthcare System and the Stein Institute for Research on Aging.

MEDIA CONTACT

Scott LaFee, 858-249-0456, slafee@ucsd.edu