Can AI prevent the spread of HIV in homeless youth?

August 8 2017

There are nearly 2 million youth who spend at least one night homeless each year in the United States. An estimated 7 percent of homeless youth are likely to be HIV positive.

Researchers from the USC Center for AI for Society (CAIS), a joint research initiative between the USC Viterbi School of Engineering and the USC Suzanne Dworak-Peck School of Social Work, have developed algorithms that are over 150 percent more effective in spreading public health information than methods currently used by many social service agencies. These algorithms help identify the most influential peer leaders to share important HIV prevention information in real-world peer networks and facilitate peer-to-peer interventions among youth who are homeless.

Influence maximization is the science of how people spread information. This particular project was adopted by a team of computer scientists and social work researchers affiliated with USC CAIS in order to improve the reach of social service agencies that had limited budget and reach for distribution of important public health communiques. The interdisciplinary team was focused on the goal of changing behavior via in-person friend-to-friend influence versus online social media networks—which the researchers believed would be less likely to change behavior versus the in-person suggestion of a friend.

The results of the study, were published in "Influence Maximization in the Field: The Arduous Journey from Emerging to Deployed

Application," presented at the 2017 International Conference on Autonomous Agents and Multi-agent Systems.

The study by Amulya Yadav, Bryan Wilder, Eric Rice, Robin Petering, Jaih Craddock, Amanda Yoshioka-Maxwell, Mary Hemler, Laura Onasch-Vera, Milind Tambe, and Darlene Woo, built upon previous work by the same team of researchers to maximize the impact of peer leaders from a Los Angeles homeless youth program. In this particular study, the researchers created algorithms and tested how successfully these algorithms performed in predicting which peer leaders would be most effective at spreading public health information among 173 homeless youth. Their two predictive tools known as HEALER (which stands for Hierarchical Ensembling-based Agent which pLans for Effective Reduction in HIV spread) and DOSIM (which stands for Double Oracle for Social Influence Maximization) were field tested over a seven-month period.

Both algorithms HEALER and DOSIM were successful in changing behavior of those individuals who received public health messages about HIV prevention.

HEALER, the first algorithm that the team developed, assumed that youth participating in the study would rate all their friends in terms of closeness and their willingness to confide in them about their sexuality and/or HIV status, and this information would be incorporated into HEALER. However, in many real-world settings, getting this information is infeasible. DOSIM removes this assumption and works even if youth participating in the study do not rate their friends at all," says the study's lead author, Amulya Yadav, a PhD student in the department of computer science at the USC Viterbi School of Engineering.

Existing methods used by many social service agencies are akin to

selecting the individuals perceived to be most popular to serve as peer leaders to share information. In doing their analyses, the researchers surmise that this popularity strategy (or centrality as the researchers call it) is less effective in getting the word out. The researchers found that this strategy spread health information to approximately 27 percent of the population. They found that among those in the center there was too much overlap—those youth who were more central remained in the same, fixed social circles so information didn't go far beyond their social groups.

In contrast, applying the USC CAIS algorithms HEALER and DOSIM helped social workers to select peer leaders who spread public health information to around 70 percent of non-peer leaders compared to the nearly 27 percent reach of the current methodology.

Beyond sharing information about HIV, the key to prevention is getting tested for HIV status. Existing methods of selecting the most popular or central individuals to be peer leaders did not seem to convince individuals to make an effort to get tested. The algorithms creating by the USC team did encourage testing. Youth selected by HEALER convinced 37 percent of their peers to get tested for HIV, and DOSIM selected youth convinced 25 percent of their friends to get tested for the HIV virus.

Milind Tambe, a computer science professor at USC Viterbi School of Engineering who co-founded USC CAIS and an author on the study said, "This paper shows the power of interdisciplinary research. AI algorithms for influence maximization were tested in the field to show the great benefits that accrue for low resource communities—research that would not get done without AI and Social Work researchers coming together to conduct it."

Eric Rice, an associate professor in the USC Suzanne Dworak-Peck

School of Social Work, at USC who co-founded USC CAIS with Tambe, said, "It was inspiring to train these youth and watch them become such effective advocates in their community. We saw real changes in conversations about sexual health and HIV testing."

Rice added, "The change in health behaviors and communication we saw were inspiring. But perhaps even more inspiring, was watching the youth who acted as peer leaders grow and thrive. For several of them, this was a turning point in their lives and they are now off the streets and have jobs."

In addition, to the important real-life, human impact, the researchers are excited about the work from an academic standpoint, "It is really exciting because this is the first time algorithms for maximization has ben deployed in the real world, said Yadav.

The researchers are now in the process of doing a more extensive study of these algorithms and additional variations. The study will look at the information flow among 900 homeless youth.

Provided by University of Southern California

Citation: Can AI prevent the spread of HIV in homeless youth? (2017, August 8) retrieved 19 September 2024 from https://phys.org/news/2017-08-ai-hiv-homeless-youth.html