Identifying and assessing frailty in people with diabetes should be a priority, in order to better treat and manage

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An article written by Dr. Qingsheng Wang, associate professor and director of the safety engineering program in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, was selected as an American Chemical Society (ACS) Editors' Choice. Graduate students Zeren Jiao, Pingfan Hu and Hongfei Xu from the Wang Group are co-authors of the paper. In the article, "Machine Learning and Deep Learning in Chemical Health and Safety: A Systematic Review of Techniques and Applications," which originally appeared in the journal *ACS Chemical Health & Safety*, Wang and his team examined the current literature surrounding machine learning and deep learning in the context of safety engineering.

Machine learning and deep learning are subsets of artificial intelligence and models based on machine learning/deep learning techniques can automatically learn from data and perform tasks such as predictions and decision-making. A great variety of interdisciplinary studies have shown that combining machine learning and deep learning into a comprehensive safety regime have been successful in trend identification and prediction assistance, which can greatly save manpower as well as material and financial resources.

While both machine and deep learning have very similar goals in the context of safety engineering, there are a few key differences. Machine learning incorporates probability theory, statistics, approximation theory, algorithm complexity theory and convex analysis to build algorithms that can build mathematical models based on training data for predictions or decisions without being explicitly programmed to do so. Essentially, machine learning technology can interpret huge amounts of data and offer predictions, trends and make informed decisions.

Deep learning, which is a subset of machine learning, uses artificial neural networks—computing systems inspired by biological neurons—as the architecture to characterize and learn data. Deep learning forms a more abstract, high-level representation attribute category or featured by combining low-level features to discover distributed feature representations of data, which can eliminate the feature engineering step of machine learning -based algorithms with increasing accuracy and are extremely useful for tasks like computer vision and natural language processing. Both areas are rapidly developing with great potential for application in safety engineering.

In the article, Wang and his research team analyzed and categorized more than 100 peer-reviewed papers to present a snapshot of the current machine and deep learning scholarship, as well as to present a review of the progress in the area. Further, Wang highlights the challenges and the gaps in the current machine and deep learning literature concerning safety engineering.

More information: Zeren Jiao et al. Machine Learning and Deep Learning in Chemical Health and Safety: A Systematic Review of Techniques and Applications, *ACS Chemical Health & Safety* (2020). DOI: 10.1021/acs.chas.0c00075

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