New machine learning tool facilitates analysis of health information, clinical forecasting

February 25 2021

Clinical research requires that data be mined for insights. Machine learning, which develops algorithms to find patterns, has difficulty doing this with data related to health records because this type of information is neither static nor regularly collected. A new study developed a transparent and reproducible machine learning tool to facilitate analysis of health information. The tool can be used in clinical forecasting, which can predict trends as well as outcomes in individual patients.

The study, by a researcher at Carnegie Mellon University (CMU), appears in *Proceedings of Machine Learning Research*.

"Temporal Learning Lite, or TL-Lite, is a visualization and forecasting tool to bridge the gap between clinical visualization and machine learning analysis," explains Jeremy Weiss, assistant professor of health informatics at CMU's Heinz College, who authored the study. "While the individual elements of this tool are well known, their integration into an interactive clinical research tool is new and useful for health professionals. With familiarization, users can conduct preliminary analyses in minutes."

Time is a key part of clinical data that are collected in health care delivery. For example, during discussions of patients on rounds, in which doctors visit hospital patients to determine how they are doing, medical staff use visual aids that depict measurements of progression and recovery. Since electronic health records have been widely adopted, significant advances have been made in visualizing clinical data as well

as in clinical forecasting. Yet a gap remains between the two.

TL-Lite begins with visualizations of information from databases and ends with visual risk assessments of a temporal model. Along the way, users can see the effects of their design choices through visual summaries at the levels of individuals as well as groups. This allows users to understand their data more completely and adjust machine learning settings for their analysis.

To show how the tool can be used, Weiss demonstrated the model with three electronic health records pertaining to three health matters: predicting severe thrombocytopenia (having abnormally low levels of platelets in the blood) during stays in the intensive care unit (ICU) among patients with sepsis, predicting survival of patients admitted to the ICU one day after admission, and predicting microvascular complications of type 2 diabetes among patients with the illness.

"The central goal of TL-Lite is to facilitate well-specified and well-crafted predictive forecasting, and this visualization tool is meant to ease the process," says Weiss. "At the same time, organizing the clinical data stream into meaningful visualizations can be aided by introducing machine learning elements. These approaches are complementary, so leveraging the benefits of one where another hits roadblocks results in a better overall solution."

More information: Temporal Visualization and Learning for Clinical Forecasting. proceedings.mlr.press/v136/weiss20a.html

Provided by Carnegie Mellon University

Citation: New machine learning tool facilitates analysis of health information, clinical forecasting

(2021, February 25) retrieved 6 May 2024 from
https://medicalxpress.com/news/2021-02-machine-tool-analysis-health-clinical.html

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