Care Management Technologies

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Moving Ahead with CMT

CMT in the Forefront Using Machine Learning in Risk Prediction

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Morrisville, NC, March 18, 2016 - With the new emphasis on population health and accountable care, increased interest in the ability to predict untoward events and identify opportunities to circumvent these events has gained prominence. As such, Machine Learning (ML) algorithms are increasingly playing a role in Big Data analytics and risk modeling. Advanced companies are moving rapidly to ML risk modeling methods (e.g., IBM Watson, MS Azure ML, Google, Oracle and others). The advancement to ML is driven by rapid technology and big data learning coupled with the increasing awareness of the limitations of the more traditional predictive modeling methods, such as regression modeling. For example, Kansagara, et al (2011), reviewed 26 unique risk prediction models for hospital re-admission and found that only 14 were potentially useful.

CMT is on the forefront of this movement to ML risk modeling. Machine Learning (ML) typically has a few elements in common with traditional inferential statistics and there are also hybrid ML/Bayesian approaches that use tools or theory from a statistician's toolset. However, ML algorithms can provide added value by discovering complex interactions between variables which may not be apparent using traditional Bayesian methods and models.

For example, an interaction between Paxil (paroxetine) and Pravastatin that caused significantly elevated blood glucose levels was largely unknown by the medical community until it was uncovered by a machine learning experiment at Stanford University in 2011[1]. Highly granular medication data are particularly valuable as an untapped reservoir of risk factors given the paucity of research by the FDA and the pharmaceutical industry on complex interactions of medications.

Additionally, for binary classification problems, for example, predicting whether or not a person will or will not have a hospitalization in the next month, ML algorithms are much better adapted to modeling nonlinear decision boundaries than logistic regression. ML technology is becoming more advanced by leaps and bounds, and availability of massive amounts of computing power is allowing these approaches for problem solving to mature.

With the aim of providing further value to our customers, CMT tested feasibility of several ML algorithms in risk prediction. We modeled the probability of future diabetes-related hospital and ED utilization for several hundred thousand patients diagnosed with diabetes mellitus, by examining complex interactions between hundreds of variables, including:

·Demographics

·Diagnoses

·Severe Mental Illness (SMI) indications

· Utilization history

· Flags related to specific deviations from best practices, identified using CMT's proprietary algorithms

· Highly granular medication adherence and dosage information

The feasibility test was rapidly executed across multiple ML models such as Artificial Neural Networks (ANNs), Decision Trees variants, Support Vector Machines (SVMs) and more. Validation tests on a separate dataset demonstrated accuracy of predictions that were far better than chance, with a cumulative Area Under Curve (AUC) value as high as 0.83 for the ROC in one model.

So, what does this mean for you?

If you are moving toward or providing population health management services, value based purchasing arrangements (bonus incentives, case rate, capitation, bundled payments, etc), the advent of ML is of significant interest and value. Having analytic partners, such as CMT, who have facile understanding of voluminous and varied data combined with knowledge of advanced risk modeling techniques such as ML, is a must for forward thinking healthcare systems working within the Triple Aim.

To learn more about how CMT's advanced risk modeling technology can help your organization move towards the forefront of population health management and to lessen clinical and financial risk, contact John Tote, VP, Strategic Business Development at 919-219-3944 and visit CMT online at www.cmthealthcare.com.

[1] Tatonetti NP, Denny JC, Murphy SN, Fernald GH, Krishnan G, Castro V, Yue P, Tsao PS, Kohane I, Roden DM, Altman RB: Detecting drug interactions from adverse-event reports: interaction between paroxetine and pravastatin increases blood glucose levels. Clin Pharmacol Ther. 2011 Jul; 90(1):133-42. doi: 10.1038/clpt.2011.83. Epub 2011 May 25. http//www.ncbi.nlm.nih.gov/pubmed/21613990

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