

Title: Using Deep Learning, Data Mining, and Janusmed Riskprofile for Discovering Drug Related Problems

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Abstract:

Drug-related problems (DRPs) occur frequently and is a common cause of suffering, hospitalizations, and death. Many of these problems may be prevented if we could identify and thus avoid potentially harmful combinations of medicines or inappropriate dosing. Janusmed concept developed in Sweden provides a regularly updated evidence-based knowledge database about the increased risk of side effects when combining several medications [1]. One alert category is drug-induced risk of QT-prolongation which can cause a specific type of arrhythmia, cardiac arrest and death. In this study, we have focused on predicting one of these negative outcomes (Ventricular arrhythmia,) on patients from the Kalmar County Region (Cosmic) using recurrent neural network (GRU) and random forest models. The dataset contains of ca 240 413 patients event data (prescriptions, and other drug related events) with Ventricular arrhythmia outcome date (only 413 patients have positive outcome). The preliminary accuracy results received by GRU is 69% and 73% by Random Forest. The low accuracy could be explained by small size of positive patients (with Ventricular arrhythmia) and not all the patients have this outcome due to the medication. There might be other factors (events) which cause the outcome. Therefore, the main goal of this study was exploring patients with positive outcome to identify the groups of patients which got Ventricular arrhythmia with and without high risk from medication. The Janusmed riskprofile was used to calculate the potential risk of QT-prolongation using the medication data within a 120 days period before the outcome date. The anomaly detection (DBSCAN clustering) was applied to find groups of patients with high (low) risk and the pattern search algorithm (SDmap*) was used to identify the medications which are dominant in each group. The machine learning models accuracy was improved after identifying a group of patients with high Janusmed risk for QT-prolongation. The proposed combination of data mining, machine learning algorithms allows to identify common patient groups and further explore their medication use.

References:

1 Stockholm, R. Janusmed. Available from: <https://janusinfo.se/> .

Commented [TH1]: Ventricular arrhythmia?