POPULAR SCIENTIFIC ABSTRACT

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[Predictive Models to Identify Patients with Alcohol Use Disorder]

Purpose and Aim: Alcohol Use Disorder (AUD) causes a significant amount of morbidity, mortality, and injuries. A majority of individuals suffering from AUD never undergo specialist treatment during their addiction due to the poor performance of conventional AUD identification methods, the lack of systematic screening for alcohol problems, and the taboo and stigma associated with Harmful drinking. The recent availability of vast amounts of Electronic health Record (EHR) which contain patients' discharge data, and the advancement of Machine Learning (ML) algorithms, however, have made it easier for clinical staff to offer clinical reasonings when making decisions. Therefore, this study aims to use patients' EHRs so as to develop predictive models which can be used to make the identification and the early detection of patients with AUD.

Research Questions: Approaching the research gaps for the purpose of developing predictive models for the identification and early detection of patients with AUD, we formulated the following RQs for investigation:

RQ1: What are the disease comorbidities among Harmful and Hazardous drinkers?

RQ2: What are the existing approaches of handling the class imbalance problem for classifying EHRs and how effective are they?

RQ3: How much of the classification performance and high dimensionality in the EHRs can be enhanced through the Filter, Wrapper, Embedded, and Ensemble feature selection techniques, and to what extend can the clinical factors related to AUD be identified through the feature selection methods?

RQ4: What is the best solution to build a predictive model for classifying patients into Normal, Harmful, and Hazardous drinkers?

RQ5: What is the best solution for the early detection of patients with AUD?

Methods: An iterative and exploratory research methodology, based on the Agile Scrum framework was developed. It consists of three phases which include Planning and Design as an initial exploration phase, Development as the Sprints' phase, and Testing and Documentation as the closure and release phase.

Settings: This project is a multidisciplinary research project that was developed in close collaboration with Computer Scientists and Clinical Alcohol Researchers from Odense University Hospital (OUH).

Results: We collected the EHRs of 2,551 AUD-Positive and AUD-Negative patients from OUH. Through the social network analysis, feature selection, and the ML methods, novel insights were extracted from the EHRs. The main elements being considered in this research encompassed the imbalanced class distribution, high dimensionality, the selection of an appropriate ML model, and the complexity of models for the identification and early detection of patients with AUD.

Conclusions: Besides having an accurate predictive model to identify patients with AUD, many other useful information can be provided to clinical staff so as to make it easier for them to understand their patients. The early detection of patients with AUD depends on several factors. Nonetheless, by presenting clinical factors which were highly co-related to AUD and disease comorbidities together with an accurate identification system would definitely decrease the AUD impact in our society.