An Interoperable Electronic Medical Record-Based Platform for Personalized Predictive Analytics

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Abstract

This project aims to enable the use of CDM-derived predictive models to evaluate patients in real-time using transactional non-CDM based EMR systems. The proposed platform consists of a message receiver, Extract-Transform-Load (ETL) engine, analytics module, and a user interface. The ETL engine converts individual patient data from HL7 CDA to OMOP CDM format in order to run prediction models that have been fitted using the OHDSI PatientLevelPrediction R package.

Introduction

Statistical prediction models have been developed for predicting risk of adverse drug events[1, 2] using observational data such as electronic health records (EHR) to assist clinical decision making and improve patient safety. There are clinical decision support systems equipped with prediction models to estimate survival[3] and risk of adverse events[4] based on individual patient data; however, these systems can only work with the (specific) data model within the system. In this project, we are introducing an interoperable platform to implement prediction models that continuously delivers personalized risk predictions based on incoming individual HL7 CDA messages from different EHR systems with different data structures.

Methods

The platform includes a message receiver , Extract-Transform-Load (ETL) engine, analytics module, and user interface (Figure 1). The "message receiver" delivers an HL7 CDA message (e.g., Continuity of Care Document) from an external system to a custom ETL module that converts the data to the OMOP common data model (CDM) v5 standard. The ETL component uses a CDA parser to extract data elements from CDAs and transforms the data using OMOP CDM and vocabularies (e.g., SNOMED CT). The resuslting data are passed to a pre-computed prediction model, such as that generated by the OHDSI PatientLevelPrediction R package to estimate outcome risk. The predictive model would of course differ for different exposures and outcomes but the process would remain the same. As a final step, the estimated risk will be shown to the care provider through a user interface.

Conclusion

We expect the proposed platform will provide an interoperable infrastructure to use CDM-based predictive models in real-time settings using a diversity of EMR systems..
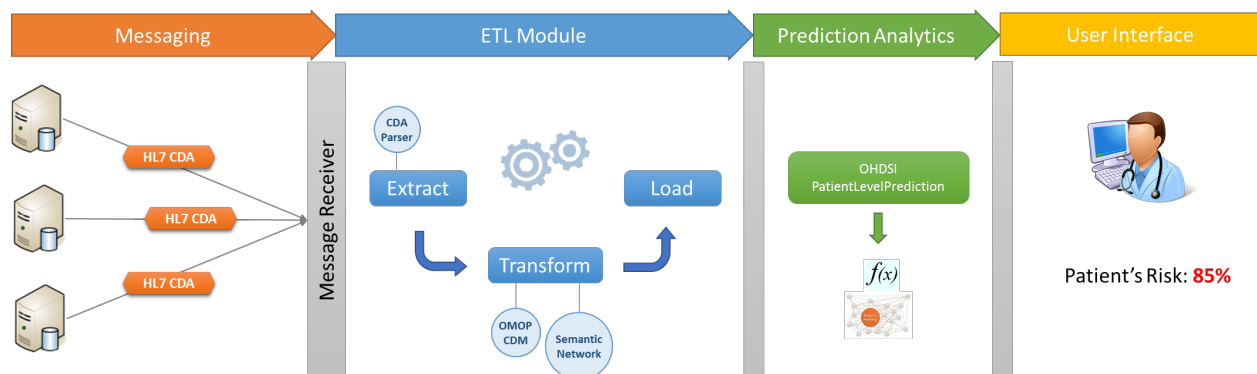

Figure 1. A schematic model of the proposed platform

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