OD/OUD Prediction with Machine Learning

Critical knowledge is needed for opioid epidemic prevention. Leveraging large scale electronic health records to identify patients who are at high risk of opioid overdose/opioid use disorder using intelligent machine learning/deep learning methodology. Detecting most influential features for high risk patients.

The US is experiencing opioid epidemic due to the misuse and abuse of opioids:
- > 130 opioid overdose death per day
- > 10.3 million people misused opioid prescriptions
- > 47,600 opioid overdose death per year
- > 2.0 million people had opioid use disorder
- > $504 billion economic burden to combat opioid epidemic

\[\text{Quick Facts}\]
> 5 million patients included in this study
> 100+ million clinical visits data
> 1,400+ clinical features used for prediction
> 6 types of different features (Diagnosis, Procedure, Medication, Laboratory Test, Clinical Event, Demographics)
> 0.8023 of F1-score, 0.9369 of ROAUC, 0.8184 of precision, 0.7865 of recall scores achieved by our model

\[\text{Findings}\]
> To evaluate the performance, our model is compared with other baselines including random forest, decision tree, logistic regression, dense neural network.

> The LSTM model achieved a promising result with the best F1 score and can identify important features.

> There are 12 features on medications, including the aggregated feature MME, 8 clinical events, 5 diagnoses, and 25 laboratory tests. Among the top 10 features in the list, medications dominate, followed by clinical events and lab tests. e.g. "Pain Scale Score" implies the need for pain management, where opioid is commonly prescribed.