**Explore possible drug-drug interactions that may cause high risk of acute kidney injury (AKI) from FDA FAERS database.**

The aim of this project is to develop tools that can efficiently and effectively identify potential drug-drug interactions (DDIs) that may cause high risk of acute kidney injury (AKI) from the extensive FAERS (FDA Adverse Event Reporting System) database. The database contains over 27 million adverse drug events (ADEs) reported in patients receiving various combinations of medications.

To accomplish this goal, several steps will be used:

1. We will utilize the openFDA API to extract drug adverse events from the FAERS database for a specific drug (we called drug A, for example vancomycin (Vancocin)). We firstly calculated the **number of cases of AKI**.
2. Subsequently, we will investigate the risk of **Acute Kidney Injury** of this drug alone or the risk in drug combination by calculate reporting odds ratio (we called the index of DDI potential):

| | With AKI | Without AKI | ROR |
|---|---|---|---|
| Drug A only | 100 | 1000 | |
| Drug A + other compounds | 200 | 1500 | 1.333( 1.0353 to 1.7172) p=0.0259 |

3. We will then employ an association rule algorithm to identify drug B that may interact with drug A to cause **Acute Kidney Injury** by using association rule.
   The final output will be the **DDI index**, which is defined as the ratio of the lift value of an association rule {Drug A =1, Drug B = 1} -> {Acute Kidney Injury = 1 } (drug combination) to the lift value of another association rule {Drug A=1} -> {Acute Kidney

Injury = 1 }. Higher DDI index values indicate a higher likelihood of potential drug-drug interactions.

4. By utilizing these steps, we aim to develop a reliable web server for identifying potential DDIs that may increase the risk of AKI. The input of the web server is the drug (including brand name, generic name). The output is the **DDI potential of the drug** and DDI indices of other drugs. The web server can help healthcare professionals make informed decisions about medication therapy and ultimately improve patient safety.

   For example: input: vancomycin and vancocin (vancomycin: generic name, brand name: Vancocin)

   Output:

   1. Number of AKI cases: 100
   2. DDI potential: 1.20
   3. DDI index:

      Remdesivir, 2.0 ({vancomycin=1, remdesivir=1} → {AKI=1} lift =2)

      Warfarin, 1.5

      Penicillin, 0.8

      ……The result should be ranked descendingly with the highest DDI index.

Useful links:

OpenFDA: https://open.fda.gov/

Association Rule Mining: https://www.rdatamining.com/examples/association-rules